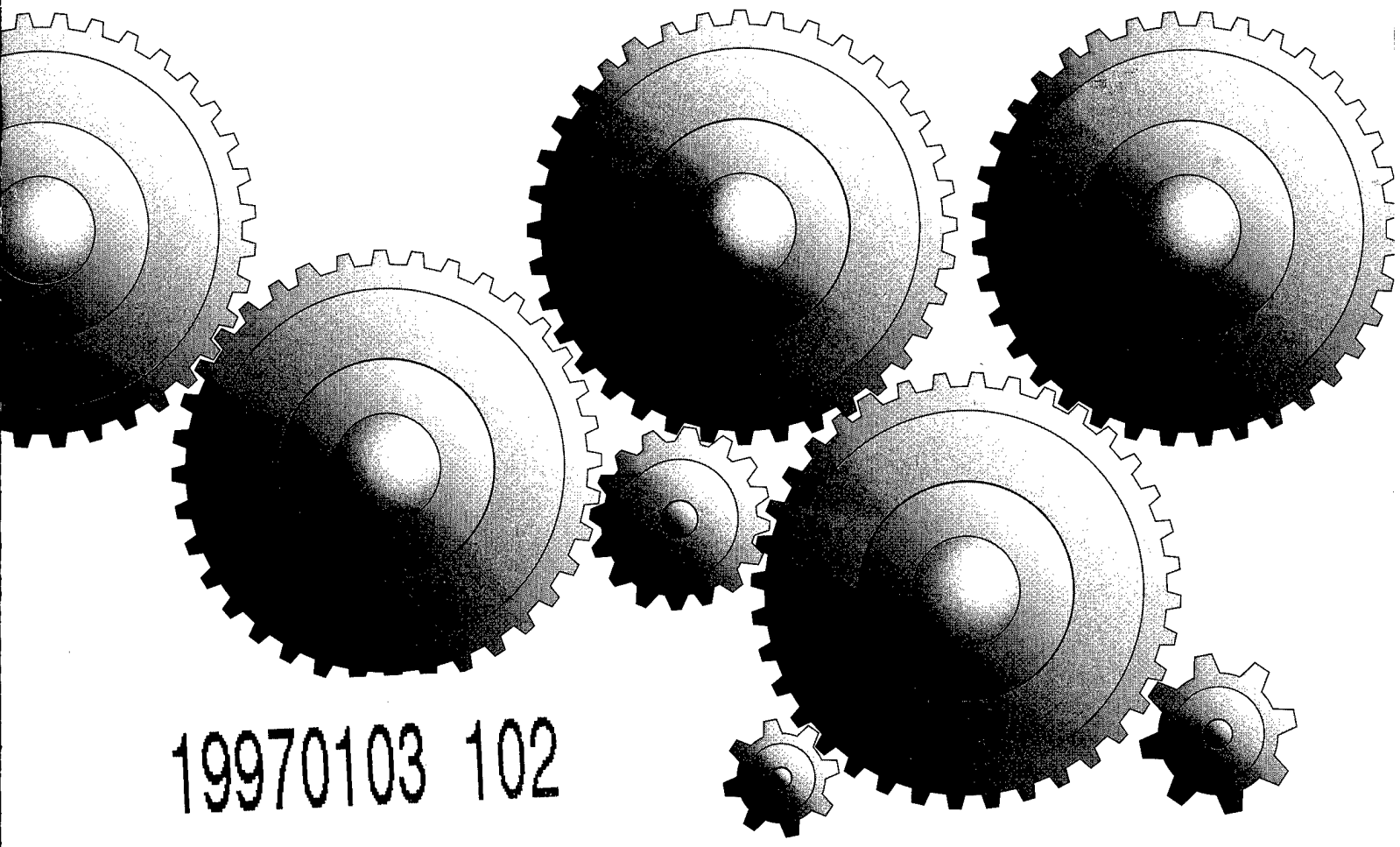
U.S. Army Corps of Engineers
Water Resources Support Center
Institute for Water Resources

Second Edition

Infrastructure Report Summaries:

A Comprehensive Summary of Issues and Literature



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Federal Infrastructure Strategy Program

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Federal Infrastructure Strategy Reports

This is one in a series of reports published by the U.S. Army Corps of Engineers as part of the Federal Infrastructure Strategy program, a three-year intergovernmental effort which explored the development of integrated or multi-agency federal infrastructure policies. This reference document is a summary of published information relating to public works issues of national significance. It represents an update to a previous compilation of infrastructure abstracts published in 1992. This second edition presents abstracts of selected works and a comprehensive bibliography of reports published in the 1980s and 1990s, with special emphasis on relevant documents covering the period subsequent to 1988. Other reports in the series include:

Framing the Dialogue: Strategies, Issues and Opportunities (IWR Report 93-FIS-1)

Challenges and Opportunities for Innovation in the Public Works Infrastructure, Volumes 1 and 2, (IWR Reports 93-FIS-2 & 93-FIS-3)

Infrastructure in the 21st Century Economy: A Review of the Issues and Outline of a Study of the Impacts of Federal Infrastructure Investments (IWR Report 93-FIS-4)

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Infrastructure in the 21st Century Economy: An Interim Report, Volumes 1-3 (IWR Reports 94-FIS-7,8 & 9)

Local Public Finance Impact Model: User's Guide and Technical Documentation (IWR Report 94-FIS-10)

Corps of Engineers Technology Transfer: Nondestructive Testing, Evaluation, and Rehabilitation Strategies for Roadway Pavements (IWR Report 94-FIS-11)

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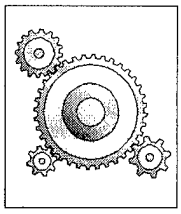

The Federal Infrastructure Strategy Program

INFRASTRUCTURE REPORT SUMMARIES (Second Edition):

A Comprehensive Summary of Issues and Literature

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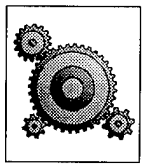


PREFACE

This report was prepared as part of the Federal Infrastructure Strategy (FIS) Program, a three-year effort administered by the U.S. Army Corps of Engineers which explored the development of integrated or multi-agency federal infrastructure policies. The program was undertaken in response to an Administration budget initiative and subsequent House Report (No. 101-536) accompanying the 1991 Energy and Water Development Appropriations Act. The FIS study agenda followed-up on the past work of the National Council on Public Works Improvement, the Congressional Budget Office, and other related efforts.

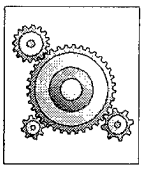
The FIS program was approached as a series of interagency consultations and collaborative studies aimed at enhancing the knowledge base for improving the performance and efficiency of federal infrastructure investments, including those ultimately made at state and local levels. Much of the policy research was accomplished in consultation with other federal agencies, often with the leadership of independent third party experts who organized and facilitated the consultations, workshops and inquiries on specific issues. These included organizations such as the Advisory Commission on Intergovernmental Relations, the American Public Works Association, the Civil Engineering Research Foundation, the National Academy of Public Administration, the National Research Council and The Urban Institute.

Development of the strategy recognized that the Nation's infrastructure needs have been defined many times over from numerous perspectives. Instead, the program was aimed at building a consensus on the actions needed to answer three questions deemed essential to a federal strategy:

(1) What new federal infrastructure policies and principles are needed?
(2) What issues should these policies and principles address?
(3) Can federal agencies use these principles to work more closely together and with other levels of government and the private sector to improve the performance of infrastructure?

This report is a reference document summarizing information published on public works issues of national significance. It represents an update to a previous compilation of infrastructure abstracts published in 1992. This second edition presents abstracts of selected works and an annotated bibliography of recognized reports published in the 1980s and 1990s, with special emphasis on documents of interest subsequent to 1988.

While this report attempts to accurately capture the sense of many works summarized herein, the Institute for Water Resources bears the sole responsibility for the content of the report abstracts and bibliographical annotations. Such summaries do not necessarily represent the official views or policies of the Administration, the Department of the Army or the Corps of Engineers.



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Policy guidance for the FIS was provided by the Office of the Assistant Secretary of the Army (Civil Works), while program execution was overseen by the Corps of Engineers Directorate of Civil Works through Mr. Donald Kisicki, Chief, Office of Interagency and International Activities, and Mr. Kenneth H. Murdock, Director, Water Resources Support Center.

The Corps Institute for Water Resources (IWR) had detailed management responsibility under Mr. Kyle E. Schilling, Director of the Institute, Dr. Eugene Z. Stakhiv, Chief, Policy and Special Studies Division, and Mr. Robert Pietrowsky, Program Manager. Preparation of this report was directed by Mr. Pietrowsky.

Much of the information contained in this report was gathered from conversations and written materials provided by representatives of the many federal agencies, departments and Congressional offices, state and local governments, infrastructure users, academic analysts, advocacy groups, and public and private infrastructure providers cooperating in the FIS program. The U.S. Army Corps of Engineers expresses its sincere thanks to all who participated and helped the program become a true collaborative effort.

The Corps would especially like to thank the agencies, institutions and respective staffs which provided material for the specific reports summarized herein. Individuals who gave of their time and, in some cases, actually provided draft abstracts, included: Jeffrey L. Mayer, *Economics and Statistics Administration*, and Richard N. Wright, *National Institute of Standards and Technology, U.S. Department of Commerce*; John J. Dragonetti, *Geological Survey, U.S. Department of Interior*; Katherine E. Collins, Louise F. Stoll and Merry Lawhead, *U.S. Department of Transportation*; John M. Rodgers and Chuck Stan, *Federal Aviation Administration*; Sue Binder, Madeleine S. Bloom, Arthur (Jake) Jacoby, Thomas J. Pasko, Jr. and Germaine Williams, *Federal Highway Administration*; Don Emerson, *Federal Transit Administration*; George F. Ames, *U.S. Environmental Protection Agency*; Bruce McDowell and Charles Griffiths, *Advisory Commission on Intergovernmental Relations*; Michael Deich, *Congressional Budget Office* (currently with the *National Economic Council*); Gary Jones and Yvonne Pufahl, *U.S. General Accounting Office*; Jay Fountain, *Government Accounting Standards Board*; Tom Deen and Tina Casgar,

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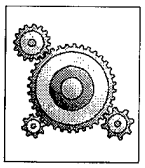

EXECUTIVE SUMMARY

The condition of the Nation's infrastructure is a subject of widespread interest. Inquiries into the subject address the complex interrelationships of infrastructure financing, the institutional arrangements involving all levels of government and the private sector, political structure, public works innovation, technical engineering, construction, and ownership (operation and maintenance) issues, management needs and improvements, assessments/forecasts of economic productivity, environmental issues and the legislative aspects national public works policies.

In 1990 the House Committee on Public Works and Transportation requested the U.S. Army Corps of Engineers to produce abstracts of significant infrastructure studies. In response to this request the Corps published an edition of *Infrastructure Reports: Summaries* in January 1992. The original compilations contained abstracts of 49 reports which were published between 1983 and 1991. Summaries were grouped into three categories: Policies and Issues Related to Infrastructure Studies and Research; Financing and Management of Public Works; and, the Nation's Public Works.

This second edition is intended to serve as a more comprehensive reference document of published work in connection with the completion of the Federal Infrastructure Strategy (FIS) program. The updated report includes additional and revised abstracts on work reflecting an interest in the Nation's infrastructure, with an emphasis on the period after the publication of *Fragile Foundations* (1988) by the National Council on Public Works Improvement (NCPWI).

This report consists of three components:

(1) An analysis of current and evolving national infrastructure polices;
(2) Abstracts of approximately 100 studies; and,
(3) An annotated bibliography of infrastructure-related reports.

Each section addresses infrastructure categories consistent with the NCPWI: highways, air transportation, mass transit, water resources, water supply, wastewater treatment, solid waste, and hazardous waste. A general category is also used to treat overarching works which treat more than two modes. The general section is in turn sub-divided into: infrastructure finance, infrastructure roles, needs assessments, and miscellaneous.

Many of the current concerns over the provision of infrastructure address policies affecting the relationship between dollars spent and services delivered. Increasing concerns over environmental protection, fiscal constraints on government budgets at all levels, and renewed emphasis on infrastructure performance are having profound impacts on the way the nation's public works are being managed, as well as changing funding priorities and government responsibilities.

The *Current Issues in Infrastructure Policy* section provides a brief yet comprehensive update of public works issues, with a special emphasis on the post-1986 period (subsequent to the NCPWI period of analysis), and including an assessment of what the likely issues for tomorrow may be. As part of this analysis it utilizes expenditure data from *Updating Trends in Public Infrastructure Spending and Analyzing the President's Proposals for Infrastructure Spending from 1994 to 1998*, by the Congressional Budget Office (August 1993). The comparison of expenditure data for the periods 1980-1986 and 1987-1990 provides a useful context for the policy discussion.

Average Annual Expenditures and Growth Rates

- From 1987 to 1990, annual constant dollar expenditures for infrastructure by all levels of government averaged almost $135,000 million, a 19 percent increase over the annual average from 1980 to 1986.

- The annual growth rates (across all categories) indicate a general rise in the growth rate of real expenditures in the 1987-90 period relative to 1980-86, from 1.68 percent to 3.10 percent.

- All categories except mass transit, water transportation, and water supply expenditures indicated a relative increase in the rate of growth over the two periods.

- The rate of growth for capital outlays rose from 1.13 percent to 3.69 percent, while growth in operations and maintenance outlays rose less dramatically, from 2.12 to 2.64 percent.

Federal Direct Expenditures for Infrastructure

- Federal direct expenditures for infrastructure, relative to total federal expenditures, increased only very slightly, on average, over the two periods, from 37.4 to 37.7 percent.

Share of State and Local Expenditures

- State and local government's share of total expenditures increased from an average of 68.9 percent in 1980-86 to 75.7 percent in 1987-90.

- This increase is largely due to the greater responsibility assumed by state and local governments for capital expenditures, whose share rose from 47.3 percent to 60.7 percent.

- Aviation is the only category showing a relative decline in the percentage of state and local expenditures for capital outlays.

Total Infrastructure Expenditure Relative to Gross Domestic Product (GDP)

- While the absolute level of constant dollar expenditures has changed, the relative distribution of expenditures across modes for both capital and non-capital expenditures has remained stable across the two periods.

- Highway expenditures continue to account for the largest proportion of both capital and operations and maintenance (O&M) outlays, accounting for over 50 percent of the capital expenditures and over 30 percent of the total O&M outlays.

- Overall, the total constant dollar infrastructure expenditures as a percentage of constant dollar gross domestic product have not declined significantly between the 1980-86 and 1987-90 periods. The average percentage in the two periods has not changed substantially, although more variation (decline) in the annual percentages occurs in the period prior to 1987.

Trends in Infrastructure Investment

- The general distribution of total expenditures across all modes is not likely to shift significantly in the near future.

- In light of current efforts to reduce the size and purview of federal programs, it is likely the actual federal expenditures for public works will decline.

- In addition, as the federal government reduces its financing role, the trend toward an increasing share of state and local government infrastructure investment will continue.

- While the proportion of total infrastructure expenditures devoted to O&M has remained relatively steady (through 1990 data), there is increasing evidence that the future emphasis will shift from expenditures for new capital to managing the existing stock more effectively, as well as developing alternative uses of existing facilities. This includes directing more expenditures toward maintenance; managing demand; and, appropriately pricing the use of public works.

- One clear example of this trend is presented by the operations and maintenance (O&M) expenditures by the U.S. Army Corps of Engineers. The Corps O&M expenditures, as a percent of total outlays within major civil works investment categories, have increased from approximately 35 percent in 1980 to over 50 percent by 1984. The most dramatic component of this change is the increase in the Corps O&M expenditures for multi-purpose projects as a percent of total multi-purpose outlays, with O&M only 32 percent of the total in 1980, and reaching 84 percent in 1992.

Major Themes in Infrastructure Policy

- Inherent in a national perspective is the recognition that most of the current policy themes are common to all infrastructure modes. Issues representative of this commonality include:

  o **Project selection and evaluation** - Policy makers have expressed increasing interest in utilizing benefit-cost studies to make more informed decisions regarding budget priorities for both capital and O&M public works programs and within a system-wide evaluation stance;

  o **Project financing** - As the federal government reduces its financing share and clarifies its role in the area of environmental protection, state and local governments will need to cooperate on a variety of financing options, including dedicated user fees, exactions from private developers, federal capital budgeting, the creation of infrastructure banks, and increased use of trust funds;

o **Economic growth and productivity** - While the debate continues over the magnitude of the impact that public capital has on the growth and productivity of the private sector, policy makers are demanding better information from which to make reasoned investment choices. And although the short term employment stimulus of public works expenditures is still considered important, other factors such as cost effectiveness, alternatives to new construction, improved management/performance of existing facilities, and public safety have dominated the decision making process in recent years, and will likely continue to do so in the future;

o **Infrastructure management and pricing** - State and local governments are looking at changing the structure of rates charged for services provided for the purposes of managing demand for the existing supply of services and modifying existing use patterns;

o **Role of new technologies** - New technologies present opportunities for improving the structural design and performance, revenue potential, and facility life of new facilities, while reducing long-term O&M costs and improving the rehabilitation of existing public works through application of advances in renewal engineering and deterioration science;

o **Infrastructure performance** - Current economic conditions (tight budgets, modest growth, and difficulty in raising additional revenues) provide a climate that intensified much of the interest in measuring and evaluating performance outcomes of public works infrastructure; and,

o **Environmental regulation** - Local and regional development are increasingly affected by federal requirements that establish minimum standards for environmental protection. The ability of state and local governments to address these requirements is a primary issue of debate in Congress, and will impact the re-authorizations of several major environmental statues.

- Although many of these topics do not necessarily represent new thinking in this area, they do underline the renewed interest in such areas such as performance, financing, and the roles of government. These themes also indicate how interrelated all phases of infrastructure development have become: new projects as well as maintaining existing facilities are likely to be examined in much greater detail, from improving the identification and selection of individual projects and examining the performance of entire public works programs, to the most appropriate means of financing a project, to efficient operation and management of all facilities.

Abstracts and Bibliography

- The abstracts for selected works reinforce and present additional depth to the brief discussion of the issues summarized above. The abstracts section is followed by a bibliography with a broad range of relevant literature that can be used to further investigate public works issues.

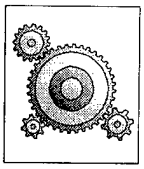

TABLE OF CONTENTS

PREFACE iii

ACKNOWLEDGMENTS v

EXECUTIVE SUMMARY vii

TABLE OF CONTENTS xi

INTRODUCTION 1
- A. BACKGROUND 1
- B. PURPOSE OF REPORT 1
- C. SCOPE OF REPORT 1
- D. REPORT STRUCTURE 2

I. CURRENT ISSUES IN INFRASTRUCTURE POLICY

A. INTRODUCTION 7

B. TRENDS IN INFRASTRUCTURE INVESTMENT 7
- 1. INFRASTRUCTURE INVESTMENT 1980-1986 AND 1987-1990 8
- 2. ANTICIPATED TRENDS IN INFRASTRUCTURE INVESTMENT 14

C. MAJOR THEMES IN INFRASTRUCTURE POLICY 17
- 1. IMPROVING EVALUATION AND SELECTION OF INFRASTRUCTURE PROJECTS . 18
- 2. ALTERNATIVE MEANS OF FINANCING INFRASTRUCTURE PROJECTS 20
- 3. INFRASTRUCTURE INVESTMENT, ECONOMIC GROWTH AND PRODUCTIVITY . . 23
- 4. IMPROVING INFRASTRUCTURE MANAGEMENT AND PRICING 23
- 5. APPLICATION OF NEW TECHNOLOGIES AND RESEARCH AND DEVELOPMENT 26
- 6. EVALUATING CONDITIONS AND PERFORMANCE OF PUBLIC WORKS FACILITIES 27
- 7. ENVIRONMENTAL REGULATIONS EFFECT INFRASTRUCTURE PLANNING AND DEVELOPMENT 28

D. ABSTRACTS AND BIBILIOGRAPHY 30

II. SELECTED ABSTRACTS

A. GENERAL

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2. GOVERNMENT ROLES IN INFRASTRUCTURE 61

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C. AIR TRANSPORTATION 171

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D. MASS TRANSIT 181

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G. WATER RESOURCES 215

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H. SOLID WASTE 225

Confronting The Garbage Crisis: Increased Federal Involvement As A Means Of Addressing Municipal Solid Waste Disposal, Jonathan Phillip Meyers, *Georgetown Law Journal*, February 1991 227

Curbing Waste In A Throwaway World: Report On The Task Force On Solid Waste Management, National Governor's Association, Task Force on Solid Waste Management, May 1990 229

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Toward Sustainable Waste Management, Deborah D. Anderson and Laurie Burnham, *Issues in Science and Technology*, Fall 1992 239

I. HAZARDOUS WASTE 241

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III. BIBLIOGRAPHY

A. SORTED BY CATEGORY 253

1. GENERAL 255
2. HIGHWAYS 305
3. AIR TRANSPORTATION 323
4. MASS TRANSIT 331
5. WATER SUPPLY 339
6. WASTEWATER TREATMENT 347
7. WATER RESOURCES 357
8. SOLID WASTE 367
9. HAZARDOUS WASTE 381

B. SORTED BY AUTHOR 393

List of Tables

Table 1: Average Annual Government Expenditures on Infrastructure and Annual Growth Rates 10

Table 2: All Government Expenditures Capital and Other Expenditures as Percent of Total 11

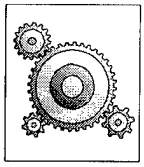
Table 3: Own State and Local Expenditures, as Percent of All Government Expenditures 12

Table 4: Federal Direct Expenditures as a Percent of Total Federal Expenditures 13

Table 5: Federal, State, and Local Governments Distribution of Expenditures Across Categories, 1987 Dollars 15

Table 6: All Government Expenditures as Percent of Gross Domestic Product (GDP), Capital and Operations and Maintenance, Billions of 1987 Dollars 16

Table 7: US Army Corps of Engineers Expenditures on Operations and Maintenance as Percent of Total 17



INTRODUCTION

A. BACKGROUND

The Federal Infrastructure Strategy (FIS) program is a federal interagency effort, facilitated by the U.S. Army Corps of Engineers, to explore the development of overarching federal infrastructure policies. This initiative is addressing the roles of the various levels of government and the private sector in devising approaches and solutions for improving infrastructure performance, ensuring more efficient investment, and protecting the environment. The focus of the FIS is on public works categories consistent with the framework used by the National Council on Public Works Improvement, including transportation, water resources, and waste management.

In 1990 the House Committee on Public Works and Transportation requested the U.S. Army Corps of Engineers produce abstracts of significant infrastructure related studies. The outcome of that effort, *Infrastructure Reports: Summaries*, was made available in January 1992. In conjunction with the conclusion of the FIS program, the documentation herein reflects an update to the 1992 document to provide a more comprehensive list of reports published in the 1980s and 1990s with an interest in the Nation's public works infrastructure.

B. PURPOSE OF REPORT

This report is intended to provide a consolidated reference work of published information relating to the provision of infrastructure. The report provides a quick source document for policy makers, researchers, and others interested in recent developments and issues in public works.

C. SCOPE OF REPORT

The breadth of published information relating to public works infrastructure is considerable, particularly in light of the involvement by all levels of government, the private sector, as well as associations and other interest groups, in this area. To keep the document manageable, emphasis has been placed on documents published since 1980 which address infrastructure policies and issues of national importance. Specific attention is paid to federal government documents and relevant documents in the academic literature, covering the period 1988 to the present. Much of the thinking prior to this time is detailed in the National Council on Public Works report series covering the public works categories presented here.

The infrastructure modes included in this report are: highways; air transportation; mass transit; water supply; wastewater treatment; water resources and water transportation; solid waste management; and,

management of hazardous waste. Virtually all policy related infrastructure topic areas were considered for inclusion, including:

- Government roles in infrastructure;
- Performance based measurement and decisionmaking;
- Infrastructure and economic growth and productivity;
- Infrastructure and economic development, urban growth and decay;
- Investment analyses, strategies and tools for improving public works efficiency;
- Capital and investment budgeting at all levels of government;
- Maintenance planning, evaluation and reporting;
- Technological evolution, R&D innovation, technology transfer, and adoption of new technologies;
- Roles of Federal standards, regulations and permitting in the provision of public works;
- Infrastructure financing mechanisms;
- Infrastructure management practices;
- Needs assessments;
- Demand management and pricing; and
- Environmental quality and public perceptions.

The actual representation of information provided varies by mode, reflecting differences in available information, coverage of topics across the respective modes, and the combination of several topics within individual reports. While there is growing interest in infrastructure in developing and other developed countries, the literature in this area is not emphasized here because the primary focus is on documents related to domestic infrastructure policy.

Within these broad guidelines, the references provide a comprehensive list of infrastructure literature. As work continues to evolve in the area of public infrastructure, many documents currently in progress could not be included.

D. REPORT STRUCTURE

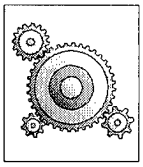
The remainder of the report consists of three sections: Section I, Current Issues in Infrastructure Policy; Section II, Selected Abstracts; and Section III, Bibliography.

Section I presents a forward-looking discussion of current issues and trends related to infrastructure investment, financing, and related topics. The abstracts, organized by infrastructure mode, are selected to highlight significant studies within their respective category: General; Highways; Air Transportation; Mass Transit; Water Supply; Wastewater Treatment; Water Resources; Solid Waste; and Hazardous Waste. Because of the range of subjects in the General category, these abstracts are subdivided into four groups, based on their general content: Infrastructure Finance; Infrastructure Roles; Needs Assessments; and Miscellaneous.

The abstract selections are intended to provide a broad perspective of the infrastructure debate across all modes and within specific categories. Some documents have had a significant impact on the infrastructure debate, such as *Fragile Foundations*, while other more recent documents are included to provide insights to current thinking on important issues.

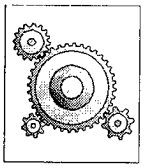
The bibliography provides a comprehensive listing of reports covering public works infrastructure. The list is provided in two formats for ease of use: the first is sorted by the infrastructure category, as in the abstract section, with references listed alphabetically within each group; and the second is sorted alphabetically overall, by author. Each report that is abstracted is identified in the bibliography section with an asterisk (*) immediately following the classification of infrastructure mode.

As in the abstract section, the bibliography also includes a General category in addition to the specific modal categories. The General category includes all documents that cannot be assigned to one or two specific modes. Documents covering two modes are cross-referenced to both modes; documents covering more than two modes are included in the General group. Documents referenced to two individual modes will appear twice in the bibliography list that is sorted by mode, once under each category.



SECTION I:

CURRENT ISSUES IN INFRASTRUCTURE POLICY



Current Issues in Infrastructure Policy

A. INTRODUCTION

Public works infrastructure is important to our Nation's economy for the direct and indirect services it provides. The magnitude of expenditures devoted to the maintenance and operation of existing facilities, and construction of new facilities, by all levels of government, is considerable. The challenge presented to policy makers is determining appropriate levels of public funds devoted to developing, expanding, improving, maintaining, managing, and operating infrastructure over the planning horizon, as well as balancing these needs against the provision of other public services.

The relationship between dollars spent and services delivered is of fundamental importance in the current infrastructure debate, and the amount of expenditures required to provide these services are the primary concerns that underlay most, if not all, of the current themes in this area today. Increasing concerns for the environment, fiscal constraints on government budgets at all levels, and renewed emphasis on infrastructure performance have affected the way in which infrastructure is financed and managed, as well as changing funding priorities and government responsibilities.

The purpose of this section of *Infrastructure Report Summaries* is to provide a brief yet comprehensive review of current issues in infrastructure policy. This review presents an overview of infrastructure expenditures and major policy themes common to all categories of infrastructure decisionmaking. This summary of current themes and issues in federal infrastructure investment pays particular emphasis to the period since 1988, the year of the National Council on Public Works Improvement (NCPWI) reports.[1] These reports provide a comprehensive look at public works through 1988, and present many of the issues that remain topical today. Issues topical to the infrastructure categories specific to this report are of primary interest: highways, air transportation, mass transit, water resources, water supply, wastewater treatment, and hazardous and solid waste. The water resources category is also stratified to highlight water transportation data. The topics emphasize issues relevant for infrastructure in general, with specific examples related to individual public works categories.

B. TRENDS IN INFRASTRUCTURE INVESTMENT

Public works infrastructure is a comprehensive term used to describe not only the structures and facilities that are essential to a developed economy such as ours, but the services that flow from them. The categories of infrastructure presented in the *Infrastructure Report Summaries* exhibit similar characteristics in that they provide services directly supporting the Nation's economy, have facilities with high fixed costs, and rely upon, and require, large amounts of public funding. Many of these categories

[1]Abstracts of these reports are provided in the Abstract portion of this report under the respective infrastructure category.

can be direct inputs to private sector production, such as the various modes of transportation, or can be the output of the production and consumption processes, such as waste management.

1. INFRASTRUCTURE INVESTMENT 1980-1986 AND 1987-1990

As many, if not all, of the policy issues in infrastructure development and finance are related to expenditure levels required to provide necessary public works services, a brief examination of expenditures in the past decade provides a useful background to the discussion of policy issues. The expenditure data presented here are from *Updating Trends in Public Infrastructure Spending and Analyzing the President's Proposals for Infrastructure Spending from 1994 to 1998*, Congressional Budget Office, August 1993.[2] The available data from 1980 to 1990 are grouped into two periods, 1980-1986 and 1987-1990, to allow comparison of expenditure patterns before and after publication of the NCPWI reports.

Average Annual Expenditures and Growth Rates

Table 1 provides average annual expenditures, by type and infrastructure mode, in millions of 1987 dollars, as well as the average annual growth rate for each expenditure type during the two periods. Expenditures are classified into capital outlays and other expenditures, which are primarily for operations and maintenance.

As indicated in Table 1, the magnitude of expenditures for public works infrastructure, by all levels of government, is considerable. From 1987 to 1990, annual constant dollar expenditures for infrastructure by all levels of government averaged $134,829 million, a 19 percent increase over the annual average from 1980 to 1986. Expenditures for highways represent the largest component of the total while mass transit, water supply, and wastewater treatment, the next largest categories, are less than one-half that of highway expenditures.

The annual growth rates indicate a general rise in the rate of growth of real expenditures in the 1987-90 period relative to the 1980-86 period, from 1.68 percent to 3.10 percent. All but mass transit, water transportation, and water supply expenditures indicate a relative increase in the rate of growth over the

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[2]Nominal expenditures for all categories but solid waste management are obtained from this source. Nominal solid waste management figures are obtained from Government Finances, U.S. Bureau of the Census. As this source does not recognize solid waste as a federal government function, federal expenditures are zero. Capital outlays, direct and indirect, for Federal state, and local governments, are converted to real 1987 dollars by the Engineering News Record construction cost index. Direct non-capital Federal outlays are converted to 1987 dollars by the index of federal non-defense purchases of services. State and local non-capital outlays are converted to 1987 dollars by the index of state and local government purchases of services.

Note that the data in Tables 1 through 6 may not correspond exactly to similar information presented in *Living with Constraints: An Emerging Vision for High Performance Public Works, Concluding Report: Federal Infrastructure Strategy Program Summary of Results, Findings, and Recommendations*, IWR Report 95-FIS-20. The data in this report are augmented by expenditures on solid waste management, and nominal dollars are converted to constant dollars using a different deflator than in IWR Report 95-FIS-20.

two periods. The rate of growth for capital outlays rose from 1.13 percent to 3.69 percent while growth in operation and maintenance outlays rose less dramatically, from 2.12 percent to 2.64 percent.

Within individual modes, highways, mass transit, water transportation, and water supply show reductions in the rate of growth in expenditures for operations and maintenance. Only water transportation and water supply indicate declining rates of growth across the two periods.

Distribution of Capital and Non-Capital Expenditures

Table 2 presents capital and non-capital expenditures as an average percent of total expenditures for each infrastructure category. Although capital outlays averaged more than 41 percent of total expenditures for all categories in both periods, changes are evident at the modal level. Capital outlays for highways, air transportation, and solid waste management have increased relative to expenditures for operations and maintenance. Water supply expenditures are distributed almost identically, while the remaining categories indicate a relative decline in the proportion of capital outlays. This latter trend is suggestive of a greater emphasis on expenditures for operations and maintenance as opposed to new capital outlays, particularly in water transportation, water resources, and wastewater treatment. The relative shift in expenditures from capital to operations and maintenance may be the result of several factors, including a general decline in the number of large infrastructure projects and efforts to better manage facilities that are currently in place.[3]

Share of State and Local Expenditures

One of the more significant trends exhibited by these data is the increase in state and local government outlays relative to total government outlays, as shown in Table 3. State and local government's share of total expenditures increased from an average of 68.9 percent in 1980-1986 to 75.7 percent in 1987-1990. This increase is largely due to greater responsibility assumed by state and local governments for capital expenditures, whose share rose from 47.3 percent to 60.7 percent. Aviation is the only category showing a relative decline in the percentage of state and local expenditures for capital outlays.

A slight increase in the proportion of other expenditures by state and local governments occurred largely because they have traditionally been responsible for many operation and maintenance expenditures, particularly for highways. Other expenditures in water resources, however, indicate a substantial shift to state and local governments, as does wastewater treatment.

Federal Direct Expenditures for Infrastructure

Table 4 presents federal direct expenditures as a percent of total federal government infrastructure expenditures. Federal direct expenditures for infrastructure, relative to total federal expenditures, increased only very slightly, on average, over the two periods, from 37.4 to 37.7 percent. Only aviation and water resources evidence much change in relative direct federal capital outlays. This trend, along

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[3]While there is a general view that greater emphasis is being placed on maintaining existing facilities, such a change in priorities may not be evident directly from the data in these tables. The data are only through 1990, and such a shift is likely to appear gradually in these aggregate data. Also, the data do not distinguish between maintenance and operations expenditures which can obscure relative changes in maintenance expenditures.

TABLE 1

Average Annual Government Expenditures on Infrastructure and Annual Growth Rates

Infrastructure Category	Expenditure Category	Annual Avg. ($) 1980-86	Annual Avg. ($) 1987-90	Growth Rate (%) 1980-86	Growth Rate (%) 1987-90
All Categories	**Total**	**113,359**	**134,829**	**1.68**	**3.10**
	Capital	47,385	59,999	1.13	3.69
	Other	65,974	74,830	2.12	2.64
Highways	**Total**	**46,819**	**55,024**	**1.20**	**1.85**
	Capital	24,014	30,940	1.05	3.14
	Other	22,805	24,084	1.37	0.26
Mass Transit	**Total**	**14,130**	**15,873**	**4.60**	**1.67**
	Capital	3,724	4,425	5.82	7.81
	Other	10,406	11,448	4.19	-0.72
Aviation	**Total**	**8,111**	**10,442**	**2.18**	**5.67**
	Capital	2,381	4,019	5.25	7.65
	Other	5,730	6,422	0.78	4.45
Water Transportation	**Total**	**5,070**	**4,761**	**3.05**	**-4.23**
	Capital	1,637	1,294	8.25	-13.24
	Other	3,432	3,466	-0.15	-0.35
Water Resources	**Total**	**6,957**	**8,390**	**-2.46**	**9.08**
	Capital	3,388	3,892	-2.44	8.11
	Other	3,569	4,498	-2.48	9.98
Water Supply	**Total**	**13,231**	**16,645**	**3.52**	**2.68**
	Capital	4,524	6,172	2.66	2.44
	Other	8,707	10,473	4.03	2.82
Wastewater Treatment	**Total**	**13,650**	**16,035**	**-0.32**	**3.17**
	Capital	7,057	7,876	-4.02	1.40
	Other	6,593	8,159	4.29	4.86
Solid Waste Mgmt.	**Total**	**5,391**	**7,659**	**3.40**	**11.47**
	Capital	659	1,380	12.35	17.47
	Other	4,732	6,279	2.16	10.24

Source: Apogee Research Inc. from Congressional Budget Office data. Dollar figures are in millions of 1987 dollars.

TABLE 2

All Government Expenditures
Capital and Other Expenditures as Percent of Total

Infrastructure Category	Expenditure Category	Average (%) 1980-86	Average (%) 1987-90
All Categories	**Total**	**100.0**	**100.0**
	Capital	41.7	44.5
	Other	58.3	55.5
Highways	**Total**	**100.0**	**100.0**
	Capital	51.2	56.2
	Other	48.8	43.8
Mass Transit	**Total**	**100.0**	**100.0**
	Capital	26.3	27.8
	Other	73.7	72.2
Aviation	**Total**	**100.0**	**100.0**
	Capital	29.2	38.5
	Other	70.8	61.5
Water Transportation	**Total**	**100.0**	**100.0**
	Capital	31.9	27.0
	Other	68.1	73.0
Water Resources	**Total**	**100.0**	**100.0**
	Capital	48.8	46.5
	Other	51.2	53.5
Water Supply	**Total**	**100.0**	**100.0**
	Capital	34.2	37.1
	Other	65.8	62.9
Wastewater Treatment	**Total**	**100.0**	**100.0**
	Capital	51.5	49.1
	Other	48.5	50.9
Solid Waste Mgmt.	**Total**	**100.0**	**100.0**
	Capital	12.1	17.9
	Other	87.9	82.1

Source: Apogee Research, Inc. from Congressional Budget Office data.
Percentages based upon constant 1987 dollars.

TABLE 3

Own State and Local Expenditures as Percent of All Government Expenditures

Infrastructure Category	Expenditure Category	Average (%) 1980-86	Average (%) 1987-90
All Categories	**Total**	**68.9**	**75.7**
	Capital	47.3	60.7
	Other	84.5	87.7
Highways	**Total**	**72.5**	**75.1**
	Capital	48.9	57.3
	Other	97.4	97.9
Mass Transit	**Total**	**69.3**	**78.7**
	Capital	19.7	41.3
	Other	86.9	93.2
Aviation	**Total**	**39.7**	**42.7**
	Capital	51.9	48.3
	Other	34.8	39.2
Water Transportation	**Total**	**33.8**	**37.3**
	Capital	53.3	71.2
	Other	25.3	25.5
Water Resources	**Total**	**32.6**	**52.7**
	Capital	19.2	35.5
	Other	45.3	67.5
Water Supply	**Total**	**94.4**	**98.6**
	Capital	83.7	96.3
	Other	100.0	100.0
Wastewater Treatment	**Total**	**68.7**	**84.0**
	Capital	40.0	67.4
	Other	100.0	100.0
Solid Waste Mgmt.	**Total**	**100.0**	**100.0**
	Capital	100.0	100.0
	Other	100.0	100.0

Source: Apogee Research, Inc. from Congressional Budget Office data.
Percentages based upon constant 1987 dollars.

TABLE 4

Federal Direct Expenditures as a Percent of Total Federal Expenditures

Infrastructure Category	Expenditure Category	Average (%) 1980-86	Average (%) 1987-90
All Categories	**Total**	**37.4**	**37.7**
	Capital	16.5	16.9
	Other	85.6	89.7
Highways	**Total**	**3.6**	**2.5**
	Capital	0.5	0.1
	Other	60.8	60.8
Mass Transit	**Total**	**1.8**	**1.6**
	Capital	0.0	0.0
	Other	6.1	6.7
Aviation	**Total**	**86.4**	**83.6**
	Capital	42.2	52.7
	Other	100.0	100.0
Water Transportation	**Total**	**99.8**	**99.2**
	Capital	100.0	100.0
	Other	99.7	99.0
Water Resources	**Total**	**95.9**	**96.3**
	Capital	92.9	94.1
	Other	99.9	100.0
Water Supply	**Total**	**0.0**	**0.0**
	Capital	0.0	0.0
	Other	N/A	N/A
Wastewater Treatment	**Total**	**0.0**	**0.0**
	Capital	0.0	0.0
	Other	N/A	N/A
Solid Waste Mgmt.	**Total**	**N/A**	**N/A**
	Capital	N/A	N/A
	Other	N/A	N/A

Source: Apogee Research, Inc. from Congressional Budget Office data.
Percentages based upon constant 1987 dollars.

with the increase in the state and local share of expenditures shown in Table 3, emphasizes the major trend in infrastructure financing responsibilities.

Total Infrastructure Expenditures Relative to GDP

While the absolute level of constant dollar expenditures has changed, the relative distribution of expenditures across modes for both capital and non-capital expenditures has remained stable across the two periods, as shown in Table 5. Highway expenditures continue to account for the largest proportion of both capital outlays and operations and maintenance, accounting for over 50 percent of total capital outlays, and over 30 percent of total operations and maintenance expenditures, or more than 40 percent of all infrastructure expenditures. Table 6 indicates that, overall, total constant dollar infrastructure expenditures as a percentage of constant dollar gross domestic product have not varied substantially during the 1980 to 1990 period. The average percentage in the two study periods has not changed, although more variation in the annual percentages occurs in the period prior to 1987.

2. ANTICIPATED TRENDS IN INFRASTRUCTURE INVESTMENT

The general distribution of total expenditures across modes is not likely to shift significantly in the near future. However, while not yet evident in the data presented above, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and other federal legislation and regulations will likely have an impact over the long term on both the distribution and level of expenditures. As there is a general trend toward smaller projects in all categories of infrastructure, this will certainly impact capital outlays within each category.

The Congressional Budget Office, in *Updating Trends in Infrastructure Spending* (1993), predicted that total federal outlays for all infrastructure programs would grow at an annual compound rate of 4.5 percent in nominal terms from 1991 to 1998. Growth below this average was predicted for all categories but highways and air transportation.[4] In light of current efforts to reduce the size of the federal government, however, it is likely that actual federal expenditures for public works will decline. Whether the relative distribution of expenditures among categories changes will depend upon a variety of factors, including efforts to privatize public operations such as the FAA.

In addition, as the federal government reduces its role in financing infrastructure projects, the trend toward an increasing share of state and local government infrastructure investment will continue. Faced with limited resources themselves, state and local governments will find it difficult to replace federal dollars. The challenge, then, to these governments will be to develop innovative finance techniques to fund additional outlays, as well as rely upon traditional options such as general and dedicated taxes, user fees, benefit charges, and public-private partnerships.

Concerns over equity and reliability of some of these revenue sources may make some more politically feasible than others; therefore the choices will be made in conjunction with other revenue needs. In addition, compliance with federal regulations will alter expenditure priorities

[4]A revision to this report was underway at the time this report was prepared. The CBO has likely changed their forecast from the earlier report.

TABLE 5

Federal, State, and Local Governments
Distribution of Expenditures Across Categories
1987 Dollars

Infrastructure Category	Expenditure Category	Average (%) 1980-86	Average (%) 1987-90
All Categories	**Total**	**100.0**	**100.0**
	Capital	100.0	100.0
	Other	100.0	100.0
Highways	**Total**	**41.3**	**40.8**
	Capital	50.6	51.6
	Other	34.6	32.2
Mass Transit	**Total**	**12.5**	**11.8**
	Capital	7.9	7.4
	Other	15.8	15.3
Aviation	**Total**	**7.2**	**7.7**
	Capital	5.0	6.7
	Other	8.7	8.6
Water Transportation	**Total**	**4.5**	**3.5**
	Capital	3.4	2.2
	Other	5.2	4.6
Water Resources	**Total**	**6.1**	**6.2**
	Capital	7.2	6.5
	Other	5.4	6.0
Water Supply	**Total**	**11.7**	**12.3**
	Capital	9.5	10.3
	Other	13.2	14.0
Wastewater Treatment	**Total**	**12.1**	**12.0**
	Capital	14.9	13.1
	Other	10.0	10.9
Solid Waste Mgmt.	**Total**	**4.8**	**5.7**
	Capital	1.4	2.3
	Other	7.2	8.4

Source: Apogee Research, Inc. from Congressional Budget Office data.
Percentages based upon constant 1987 dollars.

TABLE 6

All Government Expenditures as Percent of Gross Domestic Product (GDP)
Capital and Operations and Maintenance
Billions of 1987 Dollars

Year	Total Expenditures	GDP	Percent
1980	112.7	3776.3	2.99
1981	111.9	3843.1	2.91
1982	107.4	3760.3	2.86
1983	108.4	3906.6	2.77
1984	110.6	4148.5	2.67
1985	117.9	4279.8	2.76
1986	124.6	4404.5	2.83
1987	128.7	4539.9	2.84
1988	132.8	4718.6	2.82
1989	136.6	4838.0	2.82
1990	141.1	4897.3	2.88
Average:			
1980-1986	113.4	4017.0	2.83
1987-1990	134.8	4748.5	2.84

among alternative uses, requiring greater fiscal management and responsibility by state and local governments.

While the proportion of total expenditures devoted to operations and maintenance has remained relatively steady, there is increasing sentiment that, while additions to infrastructure capital will be necessary, the emphasis will shift from expenditures for new capital to managing the existing stock of capital more effectively, as well as developing alternative uses for the existing facilities. This includes directing more expenditures toward maintenance of existing capital, and away from new capital investment; managing the demand for existing infrastructure and appropriately pricing its use. This shift in emphasis is likely to be more evident for some modes than others.

For example, Table 7 presents operations and maintenance expenditures by the US Army Corps of Engineers as a percent of total outlays within their major investment categories: navigation; flood control; and multi-purpose. The data indicate that operations and maintenance expenditures have remained a relatively constant share of flood control expenditures, while they have increased for both navigation and multi-purpose. The most dramatic change has been in the distribution of multi-purpose expenditures, with O&M only 32 percent of total in 1980, and reaching 84 percent in 1992.

These expenditure trends illustrate the fundamental issues in water resources:

- A decline in capital outlays relative to operations and maintenance, as the majority of large water resources projects are completed; and

- A shift in emphasis to maintaining existing facilities, as well as redesigning existing facilities for new uses.

For other infrastructure modes, similar changes in priorities may become more apparent as the declining federal role takes effect.

TABLE 7

US Army Corps of Engineers Expenditures on Operations and Maintenance as Percent of Total

Year	Navigation	Flood	Multi-	Total
1980	48.89	22.09	31.92	35.46
1981	46.03	38.51	38.15	41.31
1982	50.79	31.70	48.72	42.91
1983	57.60	34.35	54.84	47.57
1984	64.98	34.68	63.75	51.67
1985	68.11	34.12	69.05	52.93
1986	67.08	31.05	79.20	52.87
1987	69.96	33.54	79.30	54.72
1988	60.46	34.81	84.37	52.28
1989	59.08	41.19	82.86	54.09
1990	57.77	37.79	84.00	51.08
1991	61.98	34.74	77.14	51.37
1992	59.12	34.10	83.85	51.85

Source: U.S. Army Corps of Engineers and Apogee Research, Inc. Total percentages include expenditures on Mississippi River and Tributaries, not shown separately.

C. MAJOR THEMES IN INFRASTRUCTURE POLICY

The integral part that public infrastructure plays in the economy is evidenced by the degree to which infrastructure interacts with all sectors of the economy, from private households and firms, to local, state, and federal levels of government. The financing of new facilities and delivery of services to end users involves joint decisionmaking by all these groups.

As a result, consideration is being given to the interrelationships among different infrastructure categories, and how the provision of services by one category may be complementary to services provided by another category. Benefits may spillover across local, state, or regional lines. This interaction among public works users and decisionmakers dictates that a national perspective to infrastructure policy be emphasized and maintained.

Inherent in a national perspective is the recognition that many current policy themes are common to all infrastructure modes. Issues representative of this commonality cover a wide range of topics:

- Project selection and evaluation;
- Project financing;
- Economic growth and productivity;
- Infrastructure management and pricing;
- Infrastructure condition and performance;
- Environmental regulations and legislation; and
- The role of new technologies.

These themes indicate how integrated all phases of infrastructure development have become: new projects as well as maintaining existing facilities are likely to be examined in much greater detail, from improving the identification and selection of projects and examining performance of infrastructure programs, to the most appropriate means of financing the project, to efficient operation and management of all facilities, to monitoring the performance of individual projects as well as entire programs. Thus, a full circle is drawn, as the information obtained from measuring the performance of programs and projects is incorporated into the identification and development of new projects and improved management and operation of existing facilities.

Many of these topics do not necessarily represent new thinking in this area, but more a renewed interest in areas such as performance, financing, and the roles of government. Growing concern at all levels of government with declining budgets and limited options for increasing revenues has focused attention on how to get the most out of the capital currently in place, as well as improving the decision process regarding new capital investments.

As new financing mechanisms are considered and implemented, concerns for equity and efficiency will be raised. This will be true particularly as new government revenue sources are considered, and expanded use of user fees are considered. The equity implications of any financing mechanism will bear heavily upon public acceptance, and the political viability, of additional investments in infrastructure.

Several of these issues and ideas are currently in place at the state and local government level, such as performance monitoring, performance budgeting, and capital budgeting. Due to the success at these levels, there has been renewed interest in applying similar initiatives at the federal level. Each of these broad issue areas will be addressed in turn.

1. IMPROVING EVALUATION AND SELECTION OF INFRASTRUCTURE PROJECTS

In the current era of fiscal restraint and government downsizing, a premium will be placed upon proper allocations of scarce funds over the various levels and types of government services. To perform

this difficult task requires appropriate measures and incentives by which to improve project evaluation and selection.

Policy makers have expressed increasing interest in utilizing benefit cost studies to make more informed decisions regarding budget priorities within individual public works, based upon economic or planning needs. It has also been recognized that projects should not be considered in isolation, but consider system-wide effects and impacts on other modes as well. ISTEA has made this official policy. However, project evaluation must also catch up to this need, in part to facilitate our ability to prioritize projects across modes, as well as within a specific mode.

Improving project evaluation and selection has become more of a priority at the federal level, as evidenced by issuance of Executive Order 12893 directing the use of benefit-cost related measures to assess investment viability. In addition, a U.S. Advisory Commission on Intergovernmental Relations (ACIR)/U.S. Army Corps of Engineers report on the Federal Infrastructure Strategy (FIS) Program, *High Performance Public Works: A New Federal Infrastructure Investment Strategy for America*, recommends expanding the use of benefit cost analysis within federal agencies involved in public works investment decisions, and improving the consistency and accuracy of benefit cost studies.

The White House's Executive Order 12893, issued January 1994, on "Principles for Federal Infrastructure Investment" applies to both direct and indirect federal expenditures for infrastructure and includes these investment principles:

- Infrastructure investments are to be based upon a systematic analysis of expected benefits and costs;
- Once operational, infrastructure projects must be managed efficiently;
- Federal agencies should seek private sector participation in the investment and management of infrastructure; and
- Federal agencies should encourage more effective state and local infrastructure programs.

As part of a benefit cost analysis, the Order states benefits and costs should include the full life-cycle of the project. Lifetime costing recommends selecting the most appropriate technology at time of initial outlay, where consideration is taken of the "full" cost of the asset over time, including maintenance and operations, and nonmonetary costs.

Different proposals for improving project selection include the establishment of infrastructure commissions and increases in the percentage of funds that states and localities are required to contribute to qualify for federal infrastructure funds. The presumption of the latter proposal is that state and local governments would be reluctant to invest in economically unproductive projects if required to fund a greater portion themselves. Such proposals, however, have been criticized because they would impose undo burdens on already tight state/local budgets.

In addition, efforts have been made to eliminate demonstration projects, particularly highway projects, that are often funded on the basis of an individual congress member's priority, and not due to economic or planning needs. Eliminating the earmarking of projects was proposed in the National

Performance Review, while the Competitiveness Policy Council proposed a three-year moratorium on earmarking new projects to increase public support for increases in infrastructure spending. While the rationale for the different proposals may differ, the results would be similar: to free up money for economically justifiable projects.

2. ALTERNATIVE MEANS OF FINANCING INFRASTRUCTURE PROJECTS

The role of federal, state, and local governments is changing in the way public infrastructure is financed, constructed, and managed. As the federal government reduces its role as a provider of financial resources, and clarifies its role in the area of environmental protection, state and local governments will be required to find the appropriate balance. As projects to expand existing capacity of public works are restricted by environmental concerns or public concerns about regional growth and financial cost, many state and local governments are looking to alternative financing mechanisms. The federal government is looking at ways to work with state and local officials to mitigate the impacts of federal mandates on the local economy as well as the public budget.[5] Thus, new cooperative efforts among government levels will be important as we move into the next generation of infrastructure finance.

A common means of generating revenue for infrastructure investment is through dedicated user fees, although other options, such as exactions from private developers, are being incorporated. Trust funds are one means by which dedicated revenues can be controlled and their use restricted to the intended public works category. This form of finance has increased since the mid-1980s. Capital budgeting is another means of restricting funds for use only on public works investments. This mechanism is currently practiced at the state level, and has been raised again as an option at the federal level.

User Fees

User fees have financed infrastructure investment for some time. While they are primarily employed for generating revenues, user fees may have additional benefits by reducing service demand. They can be established to require greater payments from those that impose relatively more damage on public works facilities (for example, specific fees attributable to trucks), and as a result reduce maintenance expenditures.

Various trust funds have been established to control the revenues obtained through these sources. The Highway Trust Fund, established to provide dedicated funds to highway projects, is funded through various excise taxes on highway related activities, primarily gasoline taxes and other related inputs. The Surface Transportation Assistance Act of 1982 provided for the establishment of a Mass Transit account within the Highway Trust Fund. Revenues to this fund began in 1983, of which one cent per gallon of the federal motor fuel tax was earmarked for this fund, which was increased to 1.5 cents per gallon December 1, 1990.

Revenues for the Airport and Airway Trust Fund are accounted for through taxes on passenger tickets, freight (the waybill tax), and the non-commercial fuel tax and international departure tax. While

[5]Congressional mandate reform proposals and Executive Order 12866, Regulatory Planning and Review, reflect this effort.

these funds are primarily transportation related, several funds have been established in other areas as well:[6]

- Inland Waterways Trust Fund (IWTF);
- Harbor Maintenance Trust fund, established in 1986; and
- Oil Spill Liability Trust Fund, established in 1990.

The Inland Waterways Revenue Act of 1978 established the IWTF, whose primary revenue source is a tax on fuel used on specific inland waterways by commercial carriers of waterborne cargo. The Harbor Maintenance Revenue Act, Title XIV of the Water Resources Development Act of 1986 (P.L. 99-662), created the Harbor Maintenance Trust Fund and established an ad valorem user fee on commercial cargo loaded and unloaded at specified U.S. ports and from collection of charges and tolls imposed by the Saint Lawrence Seaway Development Corporation.

Dedicated user fees have also been suggested for financing water supply and wastewater treatment facilities. These financing options include establishment of a water and wastewater treatment fund, much like those found for transportation, which would finance local construction of water and wastewater infrastructure from the collection of federal fees imposed on water and sewer bills.

The existing funds represent a different proportion of total federal expenditures, as well as total expenditures, across the different modes. For example, while the Highway Trust Fund is the source for virtually all of federal highway expenditures, it represents a smaller percentage of total highway expenditures, when state and local government expenditures are included. Thus, infrastructure finance must rely on other revenue sources to cover total expenditures, which impose significant burdens on already strained budgets. ISTEA addresses this concern by allowing more flexibility in the use of highway and mass transit capital funds across modal lines; for example, these funds can be used to finance highway, mass transit, or nontraditional projects such as high occupancy vehicle lanes. This flexibility will be critical as state and local governments face the combined challenges of highway congestion, air pollution, and transportation infrastructure needs.

As a result, other mechanisms have been proposed to alleviate this burden. Some of these impact not only the funding requirements of government, but other areas as well, such as performance and maintenance of these investments.

Exactions

Exactions represent a form of public/private partnership in which the private sector finances and builds public infrastructure in exchange for the right to build residential, commercial, or industrial facilities. State and local governments are requiring more private development of infrastructure for the rights to develop certain areas. In most situations, however, once the infrastructure is built, maintenance and operation responsibilities revert to the public sector.

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[6]*Federal Transportation Financial Statistics Fiscal Years 1983-1993*, Federal Highway Administration, provides more detailed information about federal trust funds and other transportation related outlays.

Capital budgeting

Capital budgets establish separate accounts for capital outlays as a means of maintaining control over public works expenditures, improve planning, as well as providing some insulation from general budget fluctuations. While they have been in operation at the state and local government level, capital budgeting remains under consideration at the federal level.

Infrastructure bank

Related to the concept of capital budgeting is the establishment of an infrastructure bank. The Commission to Promote Investment in America's Infrastructure proposed the federal government intervene in the financing of infrastructure by state and local governments by establishing a National Infrastructure Corporation, and an Infrastructure Insurance Company.

Both corporations would support investment in infrastructure investment through user charges. In response to the Commission's report, the Congressional Budget Office questioned whether redistributions of money for these uses would result in net gains in social welfare.

Infrastructure banks have been used successfully in the international arena. Specialized banks have been effective in encouraging self-financing infrastructure projects, through publicly subsidized interest rates or loan guarantees provided by the national government.

National Highway System

A major provision of ISTEA is the establishment of the National Highway System (NHS) in order to focus federal resources on roads that are considered most important to interstate travel and national defense, including the entire Interstate Highway System, as well as roads that connect with other modes of transportation, and are essential for international commerce. As currently envisioned, the NHS would constitute a system of highways that carry approximately 40 percent of total vehicle miles travelled and 75 percent of interstate truck traffic, and would provide the focus for major State highway investment decisions.

A total of $21 billion was authorized for the NHS for the years FY 1992-1997. The formula for fund distribution is the same as that for the new Surface Transportation Program (STP). A state may choose to transfer up to 50 percent of NHS funds to the STP program, or transfer up to 100 percent if requested by the state and approved by the Secretary of Transportation.

Although part of the NHS, the Interstate System will receive separate funding under three programs: Funding for construction of Interstate components not yet completed; Interstate Substitute highway projects; and an Interstate Maintenance program. The latter program is for projects to rehabilitate, restore, and resurface the Interstate Highway System. Reconstruction is also eligible if it does not add capacity, although HOV and auxiliary lanes can be added.

3. INFRASTRUCTURE INVESTMENT, ECONOMIC GROWTH AND PRODUCTIVITY

Throughout the 1980s significant attention was paid to the decline in public investment in infrastructure facilities, generally indicated as a declining proportion of U.S. Gross Domestic Product. Coincident with this was a general decline in U.S. productivity. Attempts to explain the decline in productivity during this period identified the relative decline in public investment, and its impact on the stock of public capital, as a contributing factor. *Fragile Foundations* recognized a decline in public investment and the importance of public capital in the economy and the need to maintain and expand public facilities as it provided the first comprehensive look at a wide variety of public works.

Over the last several years a large literature in both the academic and government sectors has begun to address the important contribution public capital makes to the growth and productivity of the private sector.[7] Public capital investment is seen as raising productivity of the private sector through lower production costs, and providing important links to private capital, as well as providing a fiscal stimulus through job generation. As such, investment in public capital has both short-term employment impacts and long-term productivity impacts, making investment in these areas both politically and economically attractive. While debate over the magnitude of these impacts continues, policy makers at all levels of government continue to demand better information from which to make reasoned assessments of infrastructure needs, and outlays, consistent with shrinking budgets and increased demands for other services.

While the employment stimulus of infrastructure expenditures is still considered important, other factors such as cost effectiveness, alternatives to new facility construction, improved management and performance of existing facilities, and public safety have dominated the decision making process in recent years, and will likely continue to do so in the future.

In considering the overall value of public works infrastructure, increasing emphasis is also being given to the interrelationship of public works provision, as opposed to considering individual modes in isolation from each other. The consideration of public works as representing a network of interrelated services has been brought about in large part by budget constraints, limited financing options, and environmental regulations.

4. IMPROVING INFRASTRUCTURE MANAGEMENT AND PRICING

Proper management and pricing of infrastructure services and facilities is of primary concern to officials at all levels of government. Managing the demand on infrastructure facilities is crucial as it is becoming more difficult both economically and environmentally to site and construct new facilities. Options for controlling demands on public works include price and non-price mechanisms, both of which impact individual service users.

In addition to demand side measures, alternative facility management options are being actively pursued in attempts to provide greater service levels at lower cost. These arrangements include

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[7]For a recent review of this literature, see Edward M. Gramlich, "Infrastructure Investment: A Review Essay," *Journal of Economic Literature*, September 1994.

public/private partnerships, establishment of special districts, regionalization of services, and application of new technologies.

Demand management

State and local governments are looking at changing the structure of rates charged for services provided for the purposes of managing the demand for the existing supply of services and modifying existing use patterns (for example, to encourage conservation of existing water supplies or encourage use of alternative transportation modes to reduce congestion).

Increases in the rate structure impact the service demand as well as provide a source of funds for the provision of public services at the state and local level. Other revenue raising approaches to demand management include permit requirements (entry fees) on individual users, and congestion pricing on highways and airports (highway tolls are used primarily as a financing option, rather than for demand management). Congestion pricing can reduce the need for additional capital outlays as well as improve roadway performance through more efficient traffic flow.

Some of the pricing and rate policies being adopted for water conservation include: excess use surcharges; seasonal rates; increasing block rates; and marginal cost rates. When implementing such rate changes, consideration must be given to the overall impact on water rate revenues as demand for water declines. In addition, reductions in water use impact the volume of wastewater, which may raise the cost of wastewater treatment in areas with large capacity facilities as treatment flows drop below initial design projections.

Peak period or congestion pricing is also considered as a means of reducing demand for public facilities in order to reduce congestion. This is the practice of instituting higher charges for periods of peak demand, which generally impose the greatest costs on the system. Such pricing has been considered by airports for airlines (which today pay an undifferentiated landing fee at airports) as a way of discouraging peak use and thus encouraging more efficient use of the existing capacity of the air transport system.

Demand management techniques can also include options that are not revenue raising, such as restricting access to facilities during peak periods (e.g., high occupancy vehicle lanes on major urban highways).

Privatization

Interest in privatization has been brought on largely by the budget situation of state and local governments. Attempts to privatize traditionally government run enterprises covers the range of services provided by public works. While the responsibilities and obligations of private enterprise varies by the type of facility and jurisdiction, the general arrangement is one in which the private sector designs, builds, and operates the facility.

The primary motivation behind privatization is the thinking that the private sector is more efficient and can build and operate facilities at lower cost. Privatization thus reduces some of the fiscal pressure on state and local governments to provide a complete array of services when it may not be able to finance them. For example, the Department of Transportation and the Federal Aviation Administration are

examining the possibility of corporatizing the FAA in part to improve procurement flexibility and accelerate the technology acquisition process.

Additional arguments for privatization are that it increases investment in infrastructure and improves the quality of projects selected. However, as Gomez-Ibanez, et al. point out, while private investment in infrastructure may increase, this investment would likely be at the expense of other private investment if the amount of available private capital does not change.[8] Also, because project selection often depends upon public subsidies, this may distort the choice from higher quality projects.

In addition, while privatization may often be beneficial to a government's financial status, it may not always be accepted by the general public. For example, the belief that publicly provided services may be more responsive to equity, environmental, and aesthetic concerns, such as the siting of waste disposal facilities, may be difficult to overcome.

Public/private partnerships

Public/private partnerships (PPS) are working relationships in which public and private interests share features of ownership in public works. Privatization is a particular form of public/private partnership. As such, the advantages to PPS are similar to those of privatization.

In addition to privatization, other types of partnerships include contract services, and turnkey facilities. Each arrangement represents a different relationship between the government and private entity. Under a contract service arrangement, the private entity provides a specific municipal service, or operates and maintains a public works facility owned by the government. In a turnkey arrangement, the public sector retains ownership of the facility, while the private sector designs, constructs, and operates the facility.[9]

Privatization and public/private partnerships can be considered as management tools as well as a means of freeing up resources for use in the provision of other public services. The financial advantage is that the private sector accepts responsibility for the operation and maintenance of the facility, lowering the cost to the public sector. The management advantage is that the private sector has the incentive to provide an equal or better level of services at lower cost, thus providing more efficient service.

Regionalization

Regional service provision is becoming an important component of public works planning and management. Public works such as wastewater treatment, solid waste management, and water supply are amenable to regional service provision. Regionalization of services can include the operation, maintenance, or finance of individual service categories. This allows areas to take advantage of economies of scale offered by individual facilities, thereby lowering overall costs.

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[8]Jose A. Gomez-Ibanez, John Meyer, and David Luberoff, "Solid Waste Disposal: Public or Private?," CHEMTECH, February 1992.

[9]See Public Private Partnerships for Environmental Facilities: A Self-Help Guide for Local Governments, U.S. Environmental Protection Agency, Office of Administration and Resource Management, May 1990, for additional details.

In solid waste management, a growing number of states have taken the lead in regional waste facility planning. Connecticut, Rhode Island, Maryland, and Delaware have active regional programs in operations, technical assistance, and/or finance. With the changing economics of solid waste disposal, effective regional planning may ensure that waste generators take advantage of the economies of scale of modern waste disposal facilities.

Special districts

Establishment of special districts within the state or local government that is responsible for specific types of infrastructure can be advantageous in that they concentrate authority over expenditures and revenues in a single agency. This arrangement also makes it possible to set jurisdictional boundaries which allow capture of economies of scale in provision of services.

5. APPLICATION OF NEW TECHNOLOGIES AND RESEARCH AND DEVELOPMENT

New technologies and research and development can be considered at all levels of infrastructure development. For new projects, research and development can lead to improved structural design and facility life, as well as lower long-term maintenance and operations costs. New technologies may provide alternative approaches to solving specific needs, such as MagLev trains in place of additional highway corridors or more traditional mass transit methods such as buses.

New technologies are not limited to application to new projects, however. Existing facilities and programs can benefit from the development of new technologies as well. As we move away from large projects that dominated the infrastructure scene in years past, new technologies will be important in the area of demand management and maintenance of existing facilities.

For example, new technologies for more efficient use and management of existing infrastructure facilities are gaining support. In the area of surface transportation this is exemplified by the Intelligent Transportation System (ITS), the Strategic Highway Research Project, and new modes of transportation. ITS is a means of providing highway users congestion and safety information and can also be used to collect user fees without the congestion and delays imposed by traditional toll booth collection points. In addition, improvements in engineering requirements of facilities for longer life and reduced maintenance are in development, such as more durable surface materials for roads and bridges.

Within the aviation industry, air traffic control technologies being considered or under development are designed to increase the number of operations (takeoffs and landings) per hour per runway. Reducing separation times between incoming or outgoing flights, allowing more flexible use of airspace, enhancing surveillance, and permitting more rapid and accurate communications between aircraft and control towers are some of the advantages of these new technologies.

Precision runway monitors (PRMs) and Global Positioning Systems (GPS) are examples of the type of technology which can allow more accurate detection of aircraft position and flight path, thereby increasing air space management efficiency and airport capacity and reducing delays.

The use of new technologies for service provision by mass transit are also being considered. For example, Intelligent Transportation Systems (ITS) and Magnetic Levitation technology (or MagLev) are being considered for transport systems along highway rights-of-way. While capital costs are very high,

MagLev requires less energy per passenger mile than automobiles or airplanes and can carry extremely large passenger loads. MagLev could also be used for freight, which could help offset operating costs.

Investment in research and development of new technologies can, therefore, have a significant effect on the performance and operation of public works facilities. To recognize the importance of such a relationship, Executive Order 12881, issued November 23, 1993, established a cabinet-level National Science and Technology Council (NSTC) to coordinate the interagency science and technology policy-making process and ensure that science and technology issues are considered in the development and implementation of federal policies and programs.

Objectives of the NSTC include establishment of national goals for federal technology investments and to ensure that technology policies and programs are developed to achieve such goals. To assist in this process, NSTC established several research and development coordinating committees, including Environment and Natural Resources Research and Transportation R&D.

6. EVALUATING CONDITIONS AND PERFORMANCE OF PUBLIC WORKS FACILITIES

Public works are important for the direct and indirect services they provide: mobility of people and products; protection of public health and safety; economic growth; community well-being; and generally improved public welfare. As mentioned previously, these services work together in the private sector economy to improve productivity and competitiveness.

Accordingly, issues critical to developing an appropriate performance framework for application to government services include how to **define** and **measure** the performance of public works both within individual modal programs and across all of public works. These factors will be important components for future infrastructure investments in both new and existing facilities.

Traditionally, performance has been measured by the inputs to specific programs, such as dollars spent or persons employed. Attention then turned to measures of program outputs, such as vehicle miles traveled or miles of river meeting water quality standards. Recently, however, analysts began to think in terms of outcome measures -- efficient movement of products to markets or declines in the incidence of water-borne diseases, for example. Outcomes describe changes in well-being that are directly attributable to efficient use of inputs and generation of programmatic outputs.

Recent literature suggests that outcomes should and will receive increasing attention as performance measurement matures and evolves over time. Current economic conditions -- tight budgets, modest growth, and difficulty in raising additional revenues -- provide a climate in which the public must be confident in investment decisions for today and the future. It is this climate that has generated much of the current interest in measuring and evaluating the performance of public works infrastructure.

Recent federal initiatives are establishing requirements and implementing procedures for federal agencies to improve performance monitoring. For example, the Government Performance and Results Act of 1993 (P.L. 103-62) requires federal agencies to develop strategic plans and annual performance plans, and prepare program performance reports. ISTEA calls for a higher degree of intergovernmental coordination in making transportation spending decisions, and broadens the decision-making process to more formally include Metropolitan Planning Organizations.

Proper measurement of performance as well as appropriate application of performance measures to decision making are important considerations in the development of performance monitoring. Because of the variety in inputs, outputs, and outcomes both within and across the various public works categories, multiple performance measures are required to capture these variations. Developing the appropriate measures to use and how to incorporate these measures into the decisionmaking process is one of the many challenges facing public officials as we attempt to improve our decision making process.

7. ENVIRONMENTAL REGULATIONS EFFECT INFRASTRUCTURE PLANNING AND DEVELOPMENT

State and local governments are increasingly subject to federal requirements that establish minimum standards for environmental services. Compliance with these requirements is a major concern for all involved, as the ability to finance, site and build, and operate and maintain public works facilities are affected. Local and regional development are likely to be affected as well, as these requirements encompass virtually all types of public works. The ability of state and local governments to address these requirements is a primary issue of debate in Congress, and will impact the reauthorizations of several major environmental statutes.

Environmental Statutes

The broad array of federal environmental statutes relate primarily to protecting the public's health and safety. The major environmental statutes that affect the public works categories in this report include:

- Clean Air Act, which establishes standards for wastewater treatment and municipal solid waste facility emissions (including landfills and waste incinerators), and contains provisions concerning pollutants from automobiles which can require transportation control measures;
- Clean Water Act, which establishes federal standards for municipal wastewater treatment facility discharge and stormwater runoff;
- Safe Drinking Water Act, establishing federal standards for water supply systems;
- Resource Conservation and Recovery Act (RCRA), or Solid Waste Disposal Act, which establishes federal standards for municipal landfills and waste disposal management; and
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund), which provides for cleanup of abandoned waste sites and establishes liability on owners of property and sources of waste.

The Clean Air Act and Clean Water Act link infrastructure and the environment, particularly in the area of transportation, representing a new direction of federal involvement in transportation policy. The federal role, with the passage of ISTEA and the Clean Air Act, has also impacted the planning regulations for investment in transportation projects. For example, ISTEA requires that transportation projects be planned with greater involvement from the public and with greater understanding of the impacts of transportation projects.

The Clean Air Act Amendments of 1990 (CAAA), along with ISTEA, emphasize the links between transportation and air quality concerns -- both through incentives to make investments that promote air quality and through regulatory restrictions on transportation decisions in regions that fail to meet federal air quality standards. As a result, transportation decision-makers face fundamental changes in what transportation services and facilities they provide, how decisions are made, and who influences these decisions.

RCRA regulates the treatment, storage, and disposal of currently generated hazardous wastes. CERCLA, commonly referred to by its financing mechanism the *Superfund*, provides funding and enforcement authority for clean up of hazardous waste sites created in the past and for responding to hazardous substance spills. These regulations apply to both private and public sectors. Therefore, while federal, state, and local governments regulate private sector hazardous waste generation, treatment, and disposal, they must also comply with these same regulations. In addition, the federal government provides funding for the remediation of non-federal contaminated sites through the Superfund and Leaking Underground Storage Tank programs (LUST).

Other environmental statutes that must be complied with in planning and developing infrastructure projects are the National Environmental Policy Act, the Historic Preservation Act, and Executive Order 11990 which requires no net loss of wetlands.

Federal unfunded mandates

Federal mandates involve the federal government directly in the management of state and local governments, while generally leaving the financing of the initiatives to the localities themselves. Federal mandates cover a wide variety of public programs, including Medicaid requirements, employee health insurance, as well as environmental and public safety requirements. Concern by state and local governments about their abilities to finance current mandates is directly related to the tight budget situations most state governments find themselves in. The federal government is not likely to be providing additional funds to alleviate this problem, although recent efforts are being directed toward improving relations between federal, state, and local governments.

A recent report for the U.S. Army Corps of Engineers, *Local Government Public Works Agencies: The Effect of Federal Mandates on Their Activities and Improving their Management Performance*, by the National Academy of Public Administration, concludes that:

> No federal mandate is an absolute roadblock to implementing any of the more than 400 public works management practices in the American Public Works Association (APWA) manual. However, federal mandates have expanded the missions of local public works agencies, complicated their service operations and construction projects, shifted heavy costs to their local governments, and substituted federal priorities for local priorities in the allocation of resources.
>
> More specifically, the survey of local governments found that:
>
> - Federal mandates impose heavy financial burdens on local governments at a time when their finances are constrained, and the federal share of funds is declining;

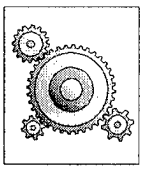
- Federal mandates preempt local resources, resulting in a reduction in infrastructure construction and maintenance expenditures; and

- The largest regulatory costs imposed on local governments come from environmental protection mandates on clean water, safe drinking water, resource conservation and recovery, and clean air.

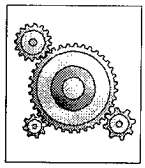
As these conclusions indicate, federal mandates without the backing of funds to implement or enforce them can leave local governments in a difficult position. However, this has not gone completely unnoticed at the federal level. Reforms proposed for the Clean Water Act, Safe Drinking Water Act, and Superfund are designed to increase the authority and flexibility of states to respond to local conditions. A recent Executive Order, issued October 26 1993, is designed to improve relations between federal, state, and local governments.

D. ABSTRACTS AND BIBLIOGRAPHY

The following abstracts were selected to provide additional depth to many of the issues discussed in this section as they relate to infrastructure in general and to specific infrastructure categories. The bibliography provides a broad selection of relevant literature to further investigate the issues presented herein.



SECTION II: SELECTED ABSTRACTS



A. GENERAL

1. INFRASTRUCTURE FINANCING

AN ANALYSIS OF THE REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE

1. REFERENCE:

U.S. Congressional Budget Office, February 1994.

2. BACKGROUND/SUMMARY:

This Congressional Budget Office (CBO) report analyzes the report of the Commission to Promote Investment in America's Infrastructure. The Commission was created by Congress in order to identify new ways of encouraging investment in the nation's infrastructure. The Commission reported that current levels of spending and traditional means of financing are inadequate to meet current and future U.S. infrastructure needs. The Commission attributed the projected inadequacy to resource constraints, limitations of current financing arrangements, and lack of political support for infrastructure projects at the state and local levels. It concluded that the federal government would have to provide leadership in developing new means of financing infrastructure, especially for projects paid with user charges.

The Commission proposed that the federal government intervene in the financing of infrastructure by state and local governments in several ways. A new National Infrastructure Corporation (NIC) would purchase and bear the credit risk of municipal bonds issued to provide long-term financing for infrastructure projects and a new Infrastructure Insurance Company (IIC) would insure infrastructure bonds issued to provide long-term financing for new projects. Both corporations would support investment in transportation and environmental projects financed with user charges, and could support investment in other forms of infrastructure as well. The Commission also requested policymakers to consider easing current restrictions on tax-exempt financing for infrastructure that is used for private activities and giving a new tax break to participants in pension plans that purchased qualified infrastructure securities.

3. ABSTRACT:

As requested by the House Committee on the Budget, this report reviews how the commission's recommendations could affect the allocation of society's resources and examined alternative ways to organize the two corporations. It describes the municipal bond market, reviews several factors that may cause investment in infrastructure by state and local government to be less than optimal, and analyzes how the Commission's proposals could affect the allocation of resources in the economy. The report also describes the advantages and disadvantages of alternative approaches to organizing the NIC and the IIC.

The major conclusions of this report include the following:

- The Commission's proposals would increase investment in municipal infrastructure by subsidizing the development and financing of new projects. The NIC would lower the

interest rates that municipalities pay on their infrastructure bonds by bearing credit and development risks on subsidized terms. Also, the changes in tax law that the Commission proposed would provide subsidies that would also lower the interest rates paid by municipal borrowers.

- The primary effect of the Commission's proposals would be to divert resources from investments, such as business plant and equipment, housing, and other government spending and direct them toward state and local infrastructure projects financed with user charges. This shift would improve the allocation of resources if it directed them toward activities that produced greater benefits. The Commission's proposals would achieve such a shift if they corrected for "spillover benefits", benefits from a project that spill over to residents of other jurisdictions who do not pay for the project. However, the CBO concluded that neither the NIC nor the IIC could correct spillover problems.

- Although the municipal bond market is not perfect, it has many of the attributes of a well-functioning credit market. The Commission's proposals are neither necessary nor likely to address market imperfections that exist.

- The new tax subsidies recommended by the Commission would also be unlikely to improve the allocation of resources. By permitting subsidies for private-purpose activities, the changes in tax law could increase the cost of financing public-purpose infrastructure facilities and further distort private and municipal decisions about investment.

- There is little evidence that diverting funds to the NIC and IIC from alternative private investment or current federal grants for state and local infrastructure would produce more benefits for society.

- How the activities of the NIC and the IIC would affect the allocation of resources may be analyzed independently of how the corporations should be organized. For example, if the NIC was set up as an on-budget federal agency, policymakers could obtain accurate, complete information about its activities and directly control the cost of the subsidies that it provided to municipal borrowers.

- If the NIC was established as a private, for-profit finance company and subsidized with a long-term federal loan that had a below-market interest rate, the cost of the subsidy of the loan would be controlled in the appropriation process and recorded in the budget. As a finance company, it would have to stand on its own after it repaid the government's loan, which would subject the NIC to significant market discipline and give it a strong incentive to use the limited, one-time subsidy it received to build its capital and establish a track record, as opposed to providing ongoing subsidies to municipal borrowers.

- Organizing the NIC as either an on-budget agency or a finance company would have fewer risks than establishing the corporation as a government-sponsored enterprise. If the NIC was organized as a government-sponsored enterprise, the federal budget would not measure, and policymakers could not control, the subsidies provided by the implicit federal guarantee of its obligations.

- As a federal agency, the IIC could not insure tax-exempt infrastructure bonds unless policymakers reversed the long-standing federal policy of not providing explicit federal guarantees of tax-exempt debt.

- If the IIC was organized as a private, for-profit bond insurer that was partially owned by the federal government, the budget would record the cost of purchasing stock in the company. As a private insurer, the IIC would be subject to less direct control than as a federal agency but could insure tax-exempt bonds. Moreover, if the IIC was a private insurer, it would have an incentive to manage itself prudently, because investors would be unlikely to perceive an implicit federal guarantee of the bonds that it insured.

BUILDING PROSPERITY: FINANCING PUBLIC INFRASTRUCTURE FOR ECONOMIC DEVELOPMENT

1. REFERENCE:

Municipal Finance Officers Association, Government Finance Research Center, October 1983.

2. BACKGROUND/SUMMARY:

This report surveys the irregular and complicated landscape of the needs for, and financing of, public works in this country, especially focusing on the role of state and local governments. It notes that in linking capital and operating budget decisions with economic development considerations, governments are required to forecast economic trends. Local governments adopting this approach will probably find it necessary to expand their sphere of reference regarding economic events in order to make informed judgments. Factors that traditionally have not played a major role in the choice of capital projects will be incorporated into the planning process.

The report also argues that structural economic changes and technological innovation influence business location decisions which, in turn, influence the demand for public works. As domestic corporations become multinational corporations, increased mobility enables firms to reduce their dependence on specific sites, even though labor factors exert a strong influence on location decisions.

3. ABSTRACT:

A vast assortment of factors has contributed to the deterioration of the Nation's infrastructure. Construction delays, fraud and waste, fragmented decision making, inflation, high interest costs, reduced access to credit markets, tax and expenditure limitations, voter rejection of bond issues, federal tax reforms, population changes--these and more have all played a part in the decline.

The desultory performance of state and local government finances underscores the need to examine both conventional and innovative arrangements for financing the Nation's public works. Traditional approaches need to be reviewed and revised, where necessary, to make the best use of limited public resources. Creative financing methods can be utilized, where appropriate, to tap new sources of revenues and increase the flexibility of state and local governments in public facilities financing.

Recent research on capital programming and budgeting efforts by the states and localities suggests that a wide gap often exists between the theories that govern the capital allocation process and its implementation in the field. A number of factors, not the least among them the inherent political nature of the process, often force a compromise and a reassessment of how public funds for capital purposes should be spent.

Where projects need to be financed in part out of state or own resources, the longevity of most capital projects has forced a strong bias toward debt financing as the "only" equitable alternative. The result is that few state and local governments undertake a sound analysis of different financing techniques. Such an analysis will need to be much more sophisticated than in years gone by because of the rapid changes occurring in the fiscal circumstances of governments at all levels and in the capital markets.

Infrastructure improvement--repair, replacement, and new construction--can be financed in a variety of ways. Aside from traditional methods such as the issuance of municipal bonds, numerous innovative methods are available to jurisdictions. Traditionally, a major source of capital funds has been the federal government, but cutbacks at that level have forced innovative financing schemes to be adopted by state and local governments alike. This need has been reinforced because the unfavorable credit conditions that have caused problems for private-sector borrowers also have been at work at the state and local levels.

A review of trends in federal participation in infrastructure financing has shown capital spending on the decline as a proportion of total federal outlays. Nevertheless, the contributions and impacts made by direct federal public works investment and grants are substantial. Not only does federal spending account for more than half of all investments in the Nation's public capital stock, it exerts a strong influence on the selection and priority setting of state and local capital investment projects. The lack of federal aid for most kinds of maintenance instills bias toward new construction, often at the expense of caring for the existing network of roads and water and sewer systems.

CAPITAL BUDGETING AND FINANCE: THE LEGISLATIVE ROLE

1. REFERENCE:

National Conference of State Legislatures, November 1987.

2. BACKGROUND/SUMMARY:

The Capital Budgeting and Finance Subcommittee of the National Conference of State Legislature's (NCSL) Fiscal Affairs and Oversight Committee was formed in March 1985 and charged with developing recommendations for strengthening legislative oversight of the state capital budgeting and finance process. Twenty-two legislators and 10 legislative fiscal office directors from around the country served on the subcommittee, as did a private sector representative from the State Governmental Affairs Council. Technical assistance was provided by a three-member technical advisory committee. Publication and distribution of this report was provided for by funding from The First Boston Corporation. Data collection and analysis was provided for by a grant from Moody's Investors Service, Inc.

The report notes that there is a growing need to replace or upgrade existing state and local capital stock and to invest more in new projects to support economic development. It concludes that the rate of state and local capital investment has not kept pace with growing capital needs.

3. ABSTRACT:

Capital expenditures account for an average of 8 to 10 percent of total state expenditures. Individual projects may cost more than the entire annual budgets of a number of smaller state agencies; the operating expenses associated with a single, large capital project may amount to millions of dollars over its useful life. Legislatures must have the structure and capacity for deliberate, informed review of proposed capital projects.

States often budget too little for maintenance, preferring to spend whatever dollars are available for capital investment on new projects where the public can see something for its money. A commitment to project funding also should mean a commitment to necessary maintenance once the project is completed.

The development and use of explicit criteria for reviewing capital budget requests should be an essential part of every legislature's capital project review process. Without such criteria, there may be an increased tendency to select projects on the basis of a political beauty contest or "delivering the pork" rather than on need and efficiency. Currently, only four legislatures use explicit review criteria.

In selecting a method of project finance, an important aim of the state should be to keep total project costs as low as possible. States should consider all reasonable financing options. At the same time, states should maintain close oversight of the use of each of these tools to make sure

they are being used appropriately, that the state is not overextending its credit, and that economies of scale in project financing are realized. Wherever it is feasible and efficient to do so, user fees should be relied on to finance capital projects.

Debt management problems vary from state to state. Examples include low absolute debt ceilings or highly restrictive voter approval requirements that effectively close off the appropriate use of general obligation debt as a financing option; an unchecked proliferation of authority debt; overextension of the state's credit; and high debt issuance costs. In addition, as a result of the federal Tax Reform Act of 1986, states must allocate federally imposed volume caps on certain tax-exempt bonds. Because debt management practices have important economic and fiscal policy implications, legislatures should take an active role in formulating and monitoring debt policy.

Many local governments are finding it increasingly difficult to pay for needed capital projects, not only because of tight budgets but also because of state restrictions on local indebtedness, taxes, and expenditures; changes in federal tax laws that affect local financing options and costs; sizable cuts in federal aid; and, in some instances, cuts in state aid. After assessing their own fiscal condition, capacity, and constraints, as well as those of local governments, states may decide to assist local governments in funding needed capital projects by setting up state revolving loan programs; buying down local interest rates; guaranteeing local loans; providing bond insurance; establishing bond banks; increasing state aid; and/or loosening state restrictions on local taxing authority, expenditures, and indebtedness.

FEDERAL BUDGET FOR PUBLIC WORKS INFRASTRUCTURE

1. REFERENCE:

U.S. Congressional Budget Office, July 1985.

2. BACKGROUND/SUMMARY:

At the request of the Senate Committee on Environment and Public Works, this study examines the likely effect of recent policy and budget proposals for seven areas of public works infrastructure and reviews the development of current federal policy and to focus on ways to improve the effectiveness of these programs in light of existing budgetary constraints.

3. ABSTRACT:

This report examines current federal policies for infrastructure spending and presents options for change, including the proposals contained in the Administration's 1986 budget and in budget resolutions passed by the House and the Senate. These proposed changes are analyzed within the context of the historic purpose of the programs and the recent trends in federal and state spending. The study focuses on seven components of public works infrastructure--highways, aviation, mass transit, wastewater treatment, water resources such as ports and inland waterways, water supply, and railroads. All of these components offer services that directly support the U.S. economy, have facilities with high fixed costs, and require a substantial amount of public funding.

General conclusions of this report are listed below:

- Federal, state, and local governments spend about $90 billion a year to operate, maintain, and expand the capacity of the nation's public works infrastructure. While federal spending accounts for only about one-third of this total, the structure of the federal programs and the allocation of these funds among the different components of infrastructure play a vital role in the effectiveness of these public works.

- Federal infrastructure programs are also the focus of much of the debate over ways to control the federal deficit. To the extent that spending levels are trimmed, it is important that changes be made in a way that encourages the most cost-effective use of remaining federal funds as well as the resources of state and local governments and the private sector.
- Federal spending on infrastructure in 1984 totaled nearly $30 billion--just 3% of all federal spending but more than one-sixth of spending in the nondefense discretionary section of the budget, which includes natural and human resources, international affairs, and transportation, space, and science. Appropriations for discretionary programs must be renewed annually.

- Overall government spending on public works infrastructure has shown modest change in recent years increasing from about $78 billion in 1968 (in 1984 dollars) to a peak of about $94 billion in 1980, then falling slightly to $90 billion in 1983. Three dramatic changes have occurred in the composition of this spending, however:

  - Spending on operations has increased from one-third of the total in 1968 to 60 percent in 1983;

  - Spending is less concentrated on a few infrastructure systems; and

  - State spending, especially for operations, has increased.

- The growth in infrastructure spending over the past 15 years has been driven by the twofold increase in state and local spending for operations, which at $45 billion now totals about one-half of infrastructure spending by all levels of government. Capital spending by state and local governments dropped by nearly 35%, from $30 billion in 1968 to less than $20 billion in 1983. In contrast, federal spending on infrastructure remained fairly steady at between $25 billion and $30 billion a year, with a smaller shift in the proportion devoted to operating costs.

FINANCING THE FUTURE: REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE

1. REFERENCE:

The Commission to Promote Investment in America's Infrastructure, February 1993.

2. BACKGROUND/SUMMARY:

The Commission to Promote Investment in America's Infrastructure was established by the Congress in Section 1081 of the Intermodal Surface Transportation Efficiency Act of 1991, "...to conduct a study on the feasibility and desirability of creating a type of infrastructure security to permit the investment of pension funds in funds used to design, plan, and construct infrastructure facilities in the United States. Such a study may also include an examination of other methods of encouraging public and private investment in infrastructure facilities.

The study indicated that public sector spending on infrastructure in America amounts to more than $140 billion annually. While projections of the shortfall range from another $40 to $80 billion annually to meet critical infrastructure needs, the traditional sources of infrastructure finance, such as government grant programs, tax-exempt bonds and private capital, all face serious impediments in filling the gap.

3. ABSTRACT:

This report is only the most current addition to a continuing national discussion on infrastructure investment and finance. From the beginning, the Commission was determined to build on the previous research of other groups, commissions and studies. Particularly useful to the initial framing of the Commission's task were a decade of studies on the questions of infrastructure needs and infrastructure finance.

In its assessment of the infrastructure financing problem, the Commission presents five conclusions:

- There is a wide gap in the level of current infrastructure finance and projected needs. Capital-intensive, long-term projects with histories of federal and state grant financing, particularly environmental projects, face immediate financial shortfalls.

- Current infrastructure finance programs, such as government grant programs, the tax-exempt bond market, and government tax programs, can be strengthened and made more effective.

- The relative complexity, tax status and other factors currently make infrastructure investment unattractive to certain institutional investors, including pension funds.

- New financial structures and federal leadership will be vital in any new, sustainable effort to fund the nation's infrastructure needs.

- New communities of interest among various levels of government and the private sector are necessary to raise the priority of meeting the infrastructure challenge and to facilitate the flow of new sources of capital into infrastructure development.

The Commission has three major recommendations to develop new financing options to facilitate access of these projects to large pools of capital:

- Create a national infrastructure corporation to leverage federal dollars and boost investment in infrastructure projects with a capacity to become self-sustaining through user fees or dedicated revenues.

- Create a new range of investment options to attract institutional investors, including pension funds, as new sources of infrastructure capital.

- Strengthen existing infrastructure financing tools and programs by making federal incentives more consistent and by providing uniform treatment for investment in infrastructure projects.

FINANCING INFRASTRUCTURE: INNOVATIONS AT THE LOCAL LEVEL

1. REFERENCE:

National League of Cities, December 1987.

2. BACKGROUND/SUMMARY:

This report, prepared by Apogee Research for the National League of Cities, presents cases where communities have used innovation and imagination in financing. The report presents 24 different cases of how communities have financed their infrastructure costs. Each case is disaggregated into the following areas: summary, background, program characteristics, experience, applicability, and a point of contact should the reader have further questions. The report also includes a primer on financing techniques.

This report observes that there has been a phase-out of general revenue sharing, along with the imposition of more stringent restraints on the accessibility of the tax-exempt debt market through tax reform. The federal government is reducing its amount of financial assistance for general revenue sharing.

3. ABSTRACT:

This report hopes to encourage cities to use their entrepreneurial spirit to adopt and adapt new approaches to financing. Criteria are presented which can best help local officials to decide which ideas fit their particular problems. These new techniques are generally not restricted by rates of growth or population density. Therefore, they can be used by all regions of the country, not just those that are urban or experiencing growth.

The techniques described in the report are grouped into four categories:

- Special Financing Districts -- Distinct areas designed to create funds for specific projects;
- Exactions -- Money, land, or construction services that a developer or property owner provides to a public jurisdiction;
- Utilities -- Independent public corporations established to finance, construct, operate, and maintain public works; and
- Public/Private Partnerships -- Working relationships in which public and private interests share ownership or certain features of ownership in public works.

These approaches generally rely on user-based financing, so the burden is allocated proportionally. The ideas presented here can be used to allow for projects of all sizes and costs.

HARD CHOICES: A REPORT ON THE INCREASING GAP BETWEEN AMERICA'S INFRASTRUCTURE NEEDS AND OUR ABILITY TO PAY FOR THEM

1. REFERENCE:

U.S. Congress, Joint Economic Committee, February 1984.

2. BACKGROUND/SUMMARY:

The Joint Economic Committee of the U.S. Congress requested that the Graduate School of Public Affairs at the University of Colorado prepare an analysis of state infrastructure conditions and develop an aggregate estimate of national infrastructure needs and available revenues through the end of the century. A National Advisory Committee was appointed by the Joint Economic Committee to oversee and assist with the study as well as to provide Congress with policy options for addressing national infrastructure problems. Individual case studies were prepared by universities in each state in conjunction with their respective governor's offices.

The study concluded that the U.S. faces a serious, but manageable problem related to the condition and adequacy of its basic infrastructure: surface transportation, water supply and distribution, sewerage collection and treatment facilities. Economic data indicates that in real terms the country's investment in its infrastructure has not kept pace with needs. State and local infrastructure outlays have declined from 2.2% of GNP in 1961 to 1.9% and have been reduced across all regions of the nation. Continued reduced levels of investment and/or continued levels of investment insufficient to meet priority needs will result in many undesired consequences.

3. ABSTRACT:

For the 23 state studies, total infrastructure needs (highways, other transportation, water, sewerage) for the 1983 to 2000 period are projected to be about $750 billion in 1982 dollars. Revenue to meet these needs is projected to be about $460 billion, resulting in a revenue shortfall of $290 billion.

For the country as a whole, infrastructure needs for the four categories addressed in this study are estimated to be $1,160 billion in 1982 dollars. Revenue to meet these needs is projected to be $710 billion, leaving a financing gap of $450 billion.

Individual infrastructure components (e.g. water, sewer, etc.) illustrate the greatest regional variation. The greatest regional per capita infrastructure needs are projected for the Midwest. The region forecasting the smallest total requirements is the West. The Northeast, South and South-Central regions project total needs of similar magnitudes.

All regions project future needs that are in excess of historical expenditure levels. All regions expect revenue to be insufficient to meet future infrastructure demands. Annual per capita

revenue shortfalls range from $82 to $176 for funding highways, other transportation, water and sewerage systems.

The single most dominant need across the country is highways and bridges. Total capital needs for this infrastructure component for the 23 states were estimated to be $466 billion, or 62% of the combined needs for highways, other transportation, water and sewerage systems. Assuming the same per capita relationship holds for other states throughout the country, total highway needs are projected to be $720 billion over the 1983 to 2000 period in 1982 dollars.

On a regional basis, the greatest highway needs are projected for the Midwest. Annual per capita needs in the Midwest are projected to be $257, or 281% more than recent levels of capital outlay for highways.

Total sewerage treatment needs are projected to be $106 billion in the 23 states studied, or $163 billion nationally in 1982 dollars. The greatest needs are projected for the Northeast and Midwest. The per capita requirements in these two regions are substantially larger than their recent expenditure levels and about triple the needs of the South and South-Central.

Water needs are projected to be $62 billion in the states under study, or $96 billion nationally in 1982 dollars. Water supply is predominantly a concern of the South-Central and West Regions where per capita needs are projected to be $44 and $31 respectively. Protecting supplies and renewing aging distribution networks are major concerns of the Northeast and Midwest.

Other transportation (i.e., ports, airports, railroads, mass transit) is a vital infrastructure component, but one in which the private sector has traditionally played a major role. Projected other transportation needs varies greatly from $3 per capita in the South-Central to $65 per capita in the Northeast. This variation is largely attributable to the relative importance to the various states and regions of "other transportation."

HISTORICAL PERSPECTIVES ON FINANCING INFRASTRUCTURE: HOW DID WE GET WHERE WE ARE?

1. REFERENCE:

George E. Peterson, The Urban Institute, 1991.

2. BACKGROUND/SUMMARY:

This report was prepared by the Urban Institute for the Conference on Infrastructure Needs and Policy Options sponsored by the American Enterprise Institute and the House Wednesday Group. It reviews the history of the infrastructure debate, with special attention to five topic areas:

- Infrastructure needs estimates;
- Infrastructure condition and performance;
- The linkage of infrastructure to economic performance and productivity;
- Federal versus state-local financing roles; and
- The need to secure voter approval for infrastructure financing.

3. ABSTRACT

The report traces the evolution of infrastructure needs studies, and describes the changes in approach to needs studies that have been made in response to methodological criticism. Two traditional approaches to needs estimates are discussed.

One approach calculated how far infrastructure spending had declined since the 1960s, in real dollars or a share of Gross National Product. The cumulative shortfall was treated as an investment backlog that needed to be liquidated.

The second approach relied on engineering standards for the condition of capital facilities. The cost of upgrading and expanding existing facilities to meet these standards became investment "need" while the "needs gap" was defined as the difference between the annualized cost of fully meeting needs and current investment levels.

The report concludes that these traditional approaches to needs studies have proved unhelpful in making investment decisions. "The approach assumes that the economic structure of production remains unchanged over time, with the consequence that every class of facility that is found in the inherited capital stock should be repaired, replaced, or maintained to maintain a constant proportion to total output. In fact, however, parts of the existing capital stock were inefficient investments when first made, and others have become inefficient through sectoral competition,

or locational shifts in economic activity. Neither type of capital deserves replacement today." The report also dismisses approaches that rely on outdated benchmarks. "As a practical matter, the reference points most commonly chosen for needs calculation turn out to be arbitrary and expensive. Investment gaps have been calculated with respect to the late 1960s, the peak period of post-World War II infrastructure investment. Investment 'needs' on this definition, become the spending levels necessary to restore investment to its historically peak rate and keep it there."

Recent needs studies have overcome some of the limitations of the traditional approaches, which has resulted in a steady reduction in the magnitude of estimated needs. In addition, the perception of needs studies has also evolved. The report states that "needs studies in effect have become no more than a starting point in assessing capital investment options. They highlight the costs of restoring the in-place capital network to standard condition, and used properly, can help identify priority segments of the system, where, in view of replacement or repair costs, alternative capital management options should be examined."

Next, the report reviews studies on infrastructure condition and performance. It finds that "most national transportation condition indicators have stabilized," and that evidence of systematic increases in failure rates, or systematic deterioration in facility condition, was limited to a few functions -- most notably mass transit and highways. The report concludes that condition and performance ratings are most valuable at a local level, where improvements in performance can be used to report to the public on the results of local reinvestment strategies.

The study then reviews the various reports and articles that have drawn a link between infrastructure and economic productivity. It finds that many federal and local agencies conduct benefit/cost or rate of return analyses to justify individual investments. On the aggregate level, however, the returns are more difficult to analyze. The report concludes that until the mechanisms that produce "network" returns can be identified, the focus for cost-benefit analysis on infrastructure should be on the project level, not on the aggregate level.

Next, the report reviews the federal and state-local financing roles for infrastructure. It concludes that over the past several years, essentially all federal capital programs take the form of closed-end matching grants, with federal cost sharing only operating up to some maximum dollar cost to the federal budget. Almost all recipient governments have total spending that goes well beyond the maximum level that qualifies for federal matching. At the margin, states and localities are paying the full costs of investment. As a result, the federal government is exerting little effect on state and local capital expenditure through price incentives.

However, federal grants have accelerated the adjustment of states and localities to newly-defined federal priorities, especially for activities where state-local spending has historically been low. The report suggests that federal aid should be structured to steer state-local expenditures into repair and maintenance -- a substantial change from the federal government's traditional posture. This could be accomplished by altering the federal aid structure to require that states meet maintenance standards before using federal funds for new construction.

Finally, the report examines the constraint that state and local officials themselves identify as the principal obstacle to adequate infrastructure investment: the need to secure voter approval for

bond or tax financing. It reviews data on approval rates in state and local bond elections since 1946, and finds that approval rates initially were high until the late 1960s and declined between 1968 and 1977. Since 1978, voter support for infrastructure bonds has gradually increased. However, "public officials' perceptions of bond elections seem to have been indelibly marked by the experience of voter rejection in the late 1960s and 1970s." In reality, however, voters have displayed a willingness to support infrastructure initiatives, and to discriminate between different types of capital proposals.

The author concludes that the voter approval system does not need to be changed in order to ensure adequate financing for infrastructure. Instead, the report recommends that "the reservoir of voter support should be strengthened through greater efforts to involve taxpayers in the selection of local investment strategies and choices of infrastructure funding levels."

INFRASTRUCTURE FINANCE AND INSTITUTIONS, A REVIEW OF INTERNATIONAL EXPERIENCE

1. REFERENCE:

Bizhan Azad and Michael Jacobs, Massachusetts Institute of Technology, Department of Urban Studies and Planning, September 1986.

2. BACKGROUND/SUMMARY:

This report reviews international experiences in financial mechanisms and institutional arrangements that offer innovative solutions to infrastructure problems in the United States. It stresses the importance of using a demand rather than a needs approach to assess infrastructure projects and financing tools. It finds that the demand approach is very valuable in identifying and analyzing the effectiveness of the tools under consideration.

3. ABSTRACT:

Single-function agencies have a role to play. While they do make urban planning and management more difficult, the single-function agency does offer accountability and fiscal transparency. The tradeoffs involved in the use of single-function agencies require more research to find ways of reaping the benefits they offer without incurring too much cost. Case studies of multi- and single-function jurisdictions should provide a valuable opportunity to learn more about this question.

General conclusions of this report are provided below.

- Bank Loans. In many countries, local governments borrow from private banks to finance infrastructure investment. These arrangements require government participation to channel resources and provide interest subsidies.

- Infrastructure Banks. In a few countries, specialized infrastructure banks have been particularly effective in encouraging the development of self-financing infrastructure projects. They require public subsidy of interest rates or use of the credit of the national government to guarantee loans to local jurisdictions.

- Asset Value Realization. Many countries use land readjustment procedures to capture some of the increases in property values attributable to infrastructure development. This strategy has been successfully used to finance the construction of new facilities in a wide range of urban and rural areas.
- Tax-Sharing Mechanisms. In parts of Europe, income taxes collected by the national government and redistributed to local authorities account for a significant share of the local revenues. This allows local governments to finance their activities from revenues

that are more efficient and progressive than the property taxes on which U.S. municipalities depend.

- Integrated Single-Purpose Institutions. Special purpose districts responsible for particular types of infrastructures are very efficient, because they concentrate authority over expenditures and revenues in a single agency. They also make it possible to set jurisdictional boundaries so they can capture economies of scale in the provision of services.

INFRASTRUCTURE FINANCE IN THE UNITED STATES: ISSUES AND MECHANISMS

1. REFERENCE:

Clare Delmar and Aurelio Menendez, Massachusetts Institute of Technology, September 1986.

2. BACKGROUND/SUMMARY:

This report, prepared for the National Council on Public Works Improvement, explores the area of financing infrastructure expenditures. This report provides a normative framework for analyzing and evaluating methods for financing infrastructure. It sets forth general principles of need, demand, public goods, capital goods, efficiency, and equity. The responsibility for infrastructure within the context of these principles is also analyzed. A descriptive framework for analyzing and evaluating infrastructure financing is presented. Current trends in government finances and infrastructure expenditures are explored. A comprehensive discussion and analysis of non-debt, debt, and private sector financing tools for infrastructure currently used in the United States is presented.

3. ABSTRACT:

Although there is growing concern over "the national infrastructure crisis," the magnitude of the problem is difficult to measure. A major factor in this measurement limitation is the lack of detailed data on the condition of our infrastructure and analyses to establish priorities for reinvestment in facilities. Establishing priorities for reinvestment is further complicated by the distinctive features of infrastructure. Because it is a durable asset, the condition of infrastructure must be monitored over time. The research clearly points to the need for more data on the condition of infrastructure and the current methods of infrastructure finance.

Several key findings include: the trade-off between the desirability of recovering the full costs from the users of infrastructure facilities and the limitations of doing this because of the nature of infrastructure and the equity issues involved in providing it; and privatization is a much more complex issue than previously thought. The willingness of the private sector to finance infrastructure is tempered by the acceptance of the public to their role; and the most promising trends were observed under areas of economic growth, and thus have less to offer to declining areas. There is still a crucial need for research to define the nature of these problems and to identify personal solutions.

PAYING FOR PROGRESS: PERSPECTIVES ON FINANCING ENVIRONMENTAL PROTECTION

1. REFERENCE:

U.S. Environmental Protection Agency, 1990.

2. BACKGROUND/SUMMARY:

Paying for environmental programs presents one of the major challenges for the 1990s. Research is needed as recent regulations on environmental quality are causing a larger cash outlay for new infrastructure systems. Solving this problem will require new thoughts from a number of different areas. This report looks at alternative ways of financing environmental protection. For this report, speakers with different perspectives (not necessarily consistent with U.S. EPA) were invited to present their views, based on their area of expertise. Leaders from government, conservation groups, financial arena, industry, and academia contributed to this study by writing articles and presenting cases.

3. ABSTRACT:

This report covered the following topics:

- The changing roles of federal, state, and local government;
- Creative approaches to environmental funding; and
- Overcoming barriers and introducing incentives.

EPA must seek and support creative ways to leverage available resources while achieving the level of environmental protection that the citizens of this country are demanding. To achieve this, EPA is pursuing several directions that will deliver results and make environmental protection more cost effective.

Future approaches to economic growth must cut waste, improve efficiency, and conserve natural resources for the use of this and future generations. Pollution prevention has become a priority for the EPA in future planning. Market-based incentives should be used whenever possible.

REPORT OF THE PRIVATE SECTOR ADVISORY BOARD ON INFRASTRUCTURE FINANCING TO THE COMMITTEE ON THE BUDGET, U.S. SENATE

1. REFERENCE:

Private Sector Advisory Panel on Infrastructure Financing, March 1989.

2. BACKGROUND/SUMMARY:

Senator Pete V. Domenici (Rep. N.M.) established the Private Sector Advisory Panel on Infrastructure Financing to advise the Senate Budget Committee on the role of the federal government in financing infrastructure facilities. The Panel was asked examine the potential for state and local investments in infrastructure, review new market instruments and debt financing mechanisms, determine the usefulness of new state and local financing institutions such as infrastructure banks and revolving funds, recommend long-term, predictable sources of funding, and investigate the potential for private sector investment in public works.

This report was authorized by Congress, Special Foundation Grants, etc. to respond to Congressional Budget Office and Joint Economic Committee estimates that there will be a $240 billion to $448 billion shortage of funds for infrastructure initiatives nationally by the year 2000. The report examines options for infrastructure financing, and recommends effective ways to select and fulfill the best option. The report provides important insight with respect to trends in infrastructure funding over the past few decades and with regard to projected funding shortfalls in the coming years.

3. ABSTRACT:

The Panel reviewed activities in several states and held a series of hearings to gain insights and information. The states which participated in case studies included Florida, Indiana, New Jersey, Texas, and Washington. Public hearings were held in Washington, D.C., Albuquerque, Trenton, Indianapolis and Seattle.

The Panel did not attempt to measure the level of need for increased infrastructure funding which has been well-documented in studies by the Joint Economic Committee and the Congressional Budget Office. Instead, the Panel focused on the evolution in governmental responsibility for infrastructure financing, the impact of that shift on state and local financing, and the potential for new and innovative financing mechanisms to meet capital needs.

General conclusions of the Panel are listed below.

- The continued productive capacity of the American economy depends on the availability of adequate basic public facilities. Rebuilding, revitalizing, and expanding America's public infrastructure is imperative to our future.

- America's need for more and better public facilities is a national issue that must be addressed nationally. Public works are not only essential for interstate and international commerce, they are essential for the health, safety, and general welfare of the American people.

- A significant federal role in building and rebuilding our Nation's infrastructure is altogether appropriate. Since both the states and the local governments lack the capacity to address this need equitably and comprehensively, a revived federal involvement is essential.

- The federal contribution to infrastructure financing has declined. With the sole exception of outlays earmarked from motor fuel tax receipts in the Highway Trust Fund, federal infrastructure spending has diminished, with state and local interests bearing an increasing share of the burden.

- The financial responsibility for meeting America's infrastructure needs has fallen most heavily onto state and local governments. In six categories of public works investment--highways, water supply, wastewater treatment, aviation, mass transit, and water resources--annual federal spending recently was $25.5 billion, compared to non-federal annual spending of $63.6 billion.

- As the federal government shifted priorities away from infrastructure financing, new federal laws have mandated state and local compliance with new requirements for water pollution control, clean drinking water, and the clean-up of hazardous wastes. While essential for the public welfare, these new laws provided little in additional funding to assist in meeting the considerable cost of state and local compliance.

- States and localities have faced not only the federal shift in priorities but have had to contend with the "taxpayer revolt" which in many localities capped property taxes which are a primary source of revenue for local governments. To contend with the resulting revenue shortfalls, local governments have increasingly turned to the bond market to borrow funds necessary to finance infrastructure facilities.

- Within the past decade, the annual volume of tax-exempt debt issued for public works rose from just over $6 billion in 1977 to four times that level. State and local governments turned to new forms of loans, debt packages, credit enhancements, and other forms of financing. User fees and other exactions also have become increasingly popular, and many localities are exploring the potential for public/private partnerships.

- Yet these initiatives have been insufficient. Demands for public facilities have continued to exceed the ability of state and local governments to respond. State and local governments lack the resources and the flexibility to shoulder the expanding burden of financing America's infrastructure need. Compared to the dimensions of need for new and improved public facilities, state and local resources are insufficient.

- Infrastructure banks, revolving loan funds, and other innovative funding systems are being used effectively in a number of states. They offer the potential to become local infrastructure investments, when sufficiently capitalized.

- Over the years, the federal government has, through the tax code, encouraged investments in public works indirectly through the availability of tax-exempt municipal bonds, favorable depreciation allowances, and investment tax credits. Historically, this indirect federal contribution had provided a substantial and valid subsidy of state and local infrastructure financing.

The recommendations of the Panel are listed below:

- Congress should create an infrastructure trust fund to capitalize infrastructure state banks and revolving loan funds;

- Congress should create a new category of tax-exempt bond, an infrastructure bond;

- Public/private partnerships must be encouraged in infrastructure financing;

- Federal technical support should be emphasized for all areas of infrastructure development;

- Existing federal trust funds for infrastructure must be preserved as an essential federal component for constructing infrastructure; and

- Federal agencies should review standards and regulations related to infrastructure programs.

A STUDY OF PUBLIC WORKS INVESTMENT IN THE UNITED STATES

1. REFERENCE:

U.S. Department of Commerce, April 1990.

2. BACKGROUND/SUMMARY:

This report, prepared for the U.S. Department of Commerce by Consad Research Corporation, is mandated by Section 110 of the Public Works Employment Act of 1977 (P.L. 95-28) to examine long-term characteristics of federal, state and local public works investment spending. In defining the study, the Secretary of Commerce identified two separate requirements: a very long-term historical study, and a separate, more intensive examination of recent trends in new capital investment, financing, and maintenance of public works. The historical study covers the history of public works in the United States from about 1790 to the present. This report also contains a detailed examination of trends in investment and financing of public works infrastructure (PWI) from 1957 through 1977.

3. ABSTRACT:

A long historical view suggests that almost any type of governmental expenditure has at one time or another been classified as a "public work." Certain activities have alternated between the private and public domains, and between federal and state or local levels of government. Both urban and regional development have received primary emphasis in different historical periods. Some of the major points and conclusions in the historical overview of PWI include the following:

- During the early period of American capitalism until about the 1870s, public works tended to be developmental in nature, devoted to the building of transportation networks and resource discovery.

- By the 1870s, industrialization and private capitalism were in full bloom, and public works became increasingly designed to accommodate the needs of the urban agglomerations that had been spawned by the rise of manufacturing industry. Accommodation of urban needs meant paying for the social costs of private urban development.

- During World War II, industrial construction was widely undertaken as a "public work" with government spending.

- After World War II, public works returned to the conventional categories of the years before 1932. But governments have now adopted tax and subsidy methods for encouraging an enormous range of private construction with public controls.

The historical study concludes that the label "public works" has always been flexibly applied, depending on the needs of the times. Policy-makers have displayed great flexibility in devising innovative public works programs to meet either developmental or distribution needs.

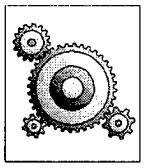
In 1977, the terminal year of this study, current dollar PWI spending was $44.1 billion or about 2.3 percent of GNP. Of this amount, about $6.5 billion of investment was undertaken as direct investment by the federal government, and the rest by state and local governments. However, about 40 percent of the investment by state and local governments was financed through federal grants-in-aid (approximately $15 billion). This, along with direct federal investment, provides the federal government with an important role in PWI decision-making, since it funds close to 50 percent of total PWI expenditures.

Focusing first on trends in aggregate, current dollar PWI and, then, on trends after adjusting for inflation, the principal findings are:

- Current dollar gross PWI (federal, state and local combined but not adjusted for depreciation) was at an aggregate level of $44 billion in 1977 compared to $15 billion in 1957, an increase of 5.5% a year on the average. The pattern, however, was not one of steady rise. Current dollar PWI peaked at $46 billion in 1975.

- From 1957 to 1968 gross PWI in constant dollars increased at an average annual rate of 5.3%, rising from $23 billion in 1957 to $41 billion in 1968. Between 1968 and 1977, however, gross PWI, in constant dollars, declined at an average annual rate of 3.7%, and by 1977 had dropped to approximately $29 billion (again, in 1972 dollars).

The study provides a summary view of trends in the aggregate dollar volume of gross PWI. The effect of inflation has been significant. The price of PWI projects has increased at a faster rate than prices in the economy as a whole. Over the study period, the GNP price deflator increased by 118%, but the price index of PWI projects increased by 133%. The greatest increase has occurred since 1972. A project costing $100 million in 1972 would cost $150 million in 1977.



2. GOVERNMENT ROLES IN INFRASTRUCTURE

THE ALLOCATION OF GOVERNMENTAL RESPONSIBILITIES IN CONSTRUCTING, MAINTAINING, AND FINANCING PUBLIC WORKS

1. REFERENCE:

National Council on Public Works Improvement, October 1986.

2. BACKGROUND/SUMMARY:

This report, prepared by Porter Wheeler for the National Council on Public Works Improvement, examines the role of a decentralized government in the context of infrastructure investment and repair. The report asserts that a recurrent theme in American political history has been the great emphasis placed on political decentralization as an enduring value. The Constitution's design reflects this value by its effort to create a limited national government that is compatible with sovereign and vibrant states. It claims that a consensus has developed, in recent years, among citizens and public officials alike, that the American system of government has grown too centralized, too complicated, and tends to lack accountability at critical points.

The report concludes that the attractiveness of the decentralized model in the political and economic realm cannot be denied, but centralization continues to characterize much public works activity. This is a dichotomy: as public works creates inherent centralization, attempts are made to move away from it.

3. ABSTRACT:

The level of government responsible for public works improvements varies considerably across facilities and across activities within facilities. The federal government plays some role in almost all facilities activities. The current balance of responsibilities for urban mass transit is unstable and probably unsustainable. The liability insurance crisis is discouraging private assumption of existing governmental responsibilities.

The federal government has a fiscal advantage in approving major "white elephant" projects and does so regularly. Pricing and local financing are inadequately coordinated with federal capital grants, leading to weak or nonexistent investment plans in the business sense. The increasing importance of operations and maintenance suggests that state and local government should be given greater responsibility for many components of the public works infrastructure. State and local governments compete with each other for business development, imposing constraints on their willingness to assume new financial responsibilities.

CHANGING STATE ROLES IN PUBLIC WORKS

1. REFERENCE:

National Council on Public Works Improvement, September 1987.

2. BACKGROUND/SUMMARY:

This report, prepared by Larry Ledebur, et.al for the National Council on Public Works Improvement, studies how the state role has evolved in infrastructure development. This report notes that public infrastructure in the United States is provided through a partnership of federal, state, and local governments, and that most of the Nation's infrastructure is constructed and maintained by local governments. The federal role has been to provide funding, set standards, and define needs through both grants-in-aid and regulation. However, cutbacks in the volume and types of federal assistance for public works in the 1980s are forcing realignments in these relationships.

3. ABSTRACT:

The rate of increase in state aid in each of three categories of public works (highways, airports, and wastewater treatment authorities) sharply decreased in the period 1983-1986. The conclusion that states are increasing aggregate direct assistance to local public works to compensate for adverse effects of lost federal aid, however, is misleading and masks the diversity of action and reaction among the 50 states. At least nine states have constitutional or legislative constraints to state and/or local government activity which constitute significant restraints on their capacity to respond to federal cutbacks in public works assistance. In at least 11 states, local governments have primary or exclusive responsibility for public works in their jurisdictions. Several of these states appear to view federal cutbacks as local government problems.

States should formalize their planning process -- perhaps modeled on the process through which highway projects are managed. The process should include an inventory of public facilities and broad public participation. Also, states should consider special impact programs to assist local governments uniquely affected by fiscal stress, special circumstances and/or federal cutbacks, as well as considering creating "circuit breakers" to protect those with low-incomes from the consequences of rising user-fees. Moreover, states should assist local governments in taking advantage of new maintenance technologies. Local governments are often too small and too concerned with day-to-day operations to monitor new technologies and techniques that may help to reduce costs. States should consider acting as a clearinghouse for new ideas and perhaps even providing some funds for local service innovation centers.

FEDERAL AND STATE ROLES IN INFRASTRUCTURE

1. REFERENCE:

National Council on Public Works Improvement, July 1986.

2. BACKGROUND/SUMMARY:

This report, prepared by Larry Ledebur, et.al., for the National Council on Public Works Improvement, examines the interplay between federal and state governments in financing infrastructure. It notes that since 1980, the nature of federal participation in infrastructure has been evolving with the elimination of programs, creation of new programs, changing budget allocations, and alterations in funding mechanisms. These changes in the federal system are the backdrop against which changes in federal and state infrastructure investments, programs, and funding mechanisms have occurred.

3. ABSTRACT:

This report examines federal public works programs and the extent to which overall changes in the philosophies underscoring federal programs and tools, in general, have translated into changes in federal public works programs. This report also explores the state role in provision of public infrastructure with a particular focus on the nature of the state program, assistance provided to substate governments for infrastructure investment and maintenance, innovations in public works finance, and the extent to which states are adopting low cost alternatives to new investments.

This report makes the following recommendations:

- Limit the federal role in building new highways. Because of a high federal matching share (90 percent), localities are encouraged to include projects which are not really needed. An increase in highway user-fees should also be considered, along with a reduction of subsidies.

- Private operations of transit systems should be encouraged, since the reduction of the federal matching grant would preclude the construction of new projects that are not cost effective.

- Efficiency can be improved in the federal funding program by 1) reducing and retargeting federal capital grants to airports and by 2) charging general aviation users their full share of federal expenditures.

- The grant program for building wastewater treatment plants should be eliminated.

- An increase in the user-fees for inland waterways should be implemented and subsidies should be reduced for federally produced hydropower.

- Rate increases for water supply should be considered, which may well reduce consumption and the need for additional capacity.

Three significant findings of the study are listed below:

- The New Federalism philosophy is reflected in changes that have occurred in federal public works programs and expenditures since 1981. To date, however, the extent of these changes is considerably less significant than in other domestic program areas.

- Proposed, but not yet legislated changes in federal public works programs would bring the full impact of the New Federalism philosophy to bear on the federal role in provision of public capital by sharply slashing federal expenditures and turning over expanded responsibilities to state governments.

- States are becoming primary innovators in infrastructure finance in the federalist intergovernmental system, particularly in programs to assist their local governments in funding public works investments.

INTERGOVERNMENTAL DECISIONMAKING FOR ENVIRONMENTAL PROTECTION AND PUBLIC WORKS

1. REFERENCE:

U.S. Advisory Commission on Intergovernmental Relations, November 1992.

2. BACKGROUND/SUMMARY:

Two pressing national goals -- protecting the environment and providing public works -- are compatible in theory but frequently conflict under current government policies. As a result, the U.S. Advisory Commission on Intergovernmental Relations (ACIR) concluded that intergovernmental decisionmaking in this area may be approaching gridlock. ACIR's aim was to find better ways to make decisions that will respect both environmental and infrastructure needs.

The Commission found considerable frustration generated by overlapping requirements, duplicative regulations, and delays that make planning more difficult and costly for public officials and agencies without necessarily enhancing environmental protection. In developing this report, ACIR consulted widely and convened a panel of experts who gave the Commission first-hand information about how decisions are made. Their suggestions helped formulate recommendations which they believe are sound, reasonable, and workable.

3. ABSTRACT:

The *National Environmental Policy Act* (NEPA) has appropriate procedures for resolving many of the difficulties, but decisionmakers do not always utilize those rules in concert with the various media-based compliance process. To realize the true potential of this crosscutting environmental law, frequently identified with the environmental impact statement (EIS) process, requires new legislation. The aim would be to use NEPA more effectively as an "umbrella process" that integrates the various sequential regulatory, decisionmaking processes.

ACIR proposed that Congress give the Council on Environmental Quality (CEQ), or its successor agency, statutory authority for the EIS regulations. ACIR also recommends that public works providers consider the environment at all stages of a project, and that federal, state, and local governments coordinate their overlapping procedures and requirements.

The principal findings of this study are:

- With respect to infrastructure, federal rules and procedures governing decisionmaking for protecting the environment often are complex, conflicting, difficult to apply, adversarial, costly, inflexible, and uncertain.

- Federal decisionmaking rules and procedures too often result in delay, wasted effort and money, lost opportunities to accommodate both environmental protection and infrastructure objectives, prolonged litigation, and more process without necessarily providing more environmental protection.

- There are five main reasons for the current difficulties in environmental decisionmaking:

  1) Some environmental standards, or their application, are unnecessarily arbitrary.

  2) Federal decisionmaking frequently has too many sequential steps and too many potential veto points, and is too detailed, pervasive, and distant from the site to be efficient, effective, and realistic.

  3) There are many agencies having different environmental responsibilities, multiple veto points, and diverse triggers for vetoes, but not enough data, analyses, expertise, money, time, and personnel to coordinate their activities.

  4) Mechanisms for balancing diverse needs and values and avoiding impasses and litigation are underdeveloped.

  5) Frequently, there is a failure to internalize full environmental costs within the total project costs that should be shared among all of the benefitted parties.

PUBLIC WORKS ISSUES PAPER: GOVERNMENT ROLES

1. REFERENCE:

National Council on Public Works Improvement, October 1987.

2. BACKGROUND/SUMMARY:

The assessment of government roles in providing public works is both difficult and important. Assessment is difficult because public works facilities combine highly localized benefits with benefits of a national scope, such as inner-city trucking and most air travel. This paper, prepared by Apogee Research, Inc. for the National Council on Public Works Improvement, reviews the principles for governmental role assignment including evidence of the effectiveness of financing mechanisms.

3. ABSTRACT:

The general conclusions of this report are listed below:

- Increase "fiscal equivalence." The automatic incentive of citizens to spend their own money wisely, means that the closer the link between the government that provides the service and the citizens who benefit, the more efficient the service.

- Decentralize. In many instances federal financing unjustifiably constrains state and local governments, thus creating inefficiency. With many federal grants, inefficiency may be caused by overly high standards unjustified by specific situations and priorities.

- Reduce "intergovernmentalization." This describes some increasingly awkward intergovernmental partnerships which, because of federal dominance, may be partnerships in name only. The phrase "sorting out," or separately assigning functions to their most appropriate level of government, is also used for this policy direction.

- Obtain regulatory relief. This should be implemented to encourage decentralization, fiscal equivalence, and the simplification of intergovernmental arrangements. Such regulations are often unnecessary when programs are simple.

THE PUBLIC WORKS RESPONSIBILITIES OF FEDERAL, STATE, AND LOCAL GOVERNMENTS AND THE PRIVATE SECTOR

1. REFERENCE:

National Council on Public Works Improvement, October 1986.

2. BACKGROUND/SUMMARY:

This study by William Colman presented the National Council on Public Works Improvement (the Council) with background information on the respective responsibilities of federal, state, and local governments in policy formation, financing, and managing public works.

This study draws much from previous reports on infrastructure, comparing the figures that have been generated by them. The role of the different levels of government has been evolving. Since the Great Depression of the 1930s, the role of the federal government in the area of public works has been expanding. Different types of revenue generation have been used to finance these projects. Slowly there has been more integration between the different levels of government. All types of infrastructure are discussed, as well as ways to improve inter-governmental relations.

3. ABSTRACT:

Of all the areas under study by the Council, only the Interstate Highway System and the hazardous waste/toxic substance activities warrant an indefinite financial presence of a grant nature. Wastewater treatment, until feasible economic alternatives to direct regulation are proven out, will require a targeted federal regulatory involvement, but only with residual financial outlays.

Most of the water resources area can be gradually transformed into an intergovernmental revolving loan operation with limited net federal drawdowns of any significant size. For all or part of this to happen, economic efficiencies, means-tested subsidies, aggressive user-based financing, activist state government both on the regulatory and fiscal fronts (e.g. state infrastructure or general bond banks and continuing concern with and assistance to their distressed communities) will be necessary. These and other extremely difficult policies and practices will have to be put into place by all or most states.

Such changes are needed if the federal government is to be economically efficient, administratively efficient, and politically bold enough to be able to deal with new and as yet unforeseen problems that are sure to emerge from a society undergoing rapid technological and occupational change. The dislocations arising from technological change alone are likely to demand all, or more than all of the federal savings through gradual disengagement from the infrastructure fields. It should be emphasized that many of these problem areas have been, or are becoming, normal and regular responsibilities of state and local government, with rising participation by the private sector.

STATE ASSISTANCE FOR LOCAL PUBLIC WORKS

1. REFERENCE:

Terry Busson and Judith Hackett, The Council of State Governments, August 1987.

2. BACKGROUND/SUMMARY:

This report examines the role of the state in providing public assistance to local governments for public works and provides a wealth of facts, figures and insights about state assistance for local public works. It gives an authoritative picture of the diversity of the states and regions, the evolving state role in infrastructure assistance, and timely information about innovative state approaches.

3. ABSTRACT:

The report focuses attention on four major questions concerning the evolving state role in public works:

- What is the financial trend in state aid for public works;
- To what extent is such state aid filling the gap left by declining federal aid;
- How promising are state aid innovations for meeting local public work needs; and
- As state aid replaces federal aid, what changes are occurring in the program purposes and structure, and in the geographical and jurisdictional distribution of funds?

A majority of states have increased their gasoline and motor fuels tax and other fees related to trucks and automobiles in order to pay for increased costs and program needs, especially bridge inspection and replacement.

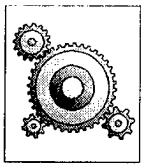
There has been an increase in the authority given to local governments to levy a local option tax to support specific public works activity. Also, a majority of the states provided increased authority to local governments to raise user fees, expand bond limits, or use other tax options.

The primary method for funding new water and wastewater programs has been through bond or loan programs. Twenty-five states created bond banks, bond programs, or revolving loan funds between 1981 and 1986.

A majority of states have increased the percentage they pay toward meeting the match required for EPA construction grants. This increase was usually supported by general fund monies in the more well-to-do states and by loan or bond programs in those states experiencing financial difficulties.

States have continued to provide funds for local public works and, in many cases, have increased their efforts. This has resulted in growing state debt, up from $260 million in FY 1978 to $595 million in FY 1986. In addition, states have mounted innovative programs to assist local public works in the face of federal cutbacks. These innovations include all types of public works and all types of funding mechanisms. Moreover, innovations seem to be closely related to state economic well being.

Most states continue to support local public works using the same methods they did prior to federal cutbacks.



3. NEEDS ASSESSMENTS

AMERICA IN RUINS: THE DECAYING INFRASTRUCTURE

1. REFERENCE:

Pat Choate and Susan Walter, 1983.

2. BACKGROUND/SUMMARY:

America's public facilities are wearing out faster than they are being replaced. Under the exigencies of tight budgets and inflation, the maintenance of public facilities essential to national economic renewal has been deferred. Replacement of obsolescent public works has been postponed and new construction has been canceled.

The deteriorated condition of basic facilities that underpin the economy will prove a critical bottleneck to national economic renewal during this decade unless the nation can find new ways to finance public works. The Executive Branch must share responsibility for creating and managing public works policy more coherently than in the past.

3. ABSTRACT:

The study concluded that the nation's public works investments, measured in constant dollars, fell from $38.6 billion in 1965 to less than $31 billion in 1977 -- a 20% decline. On a per capita basis, public works investments in constant dollars dropped from $198 per person in 1965 to $140 in 1977 -- a 29% decline. When measured against the value of the Nation's Gross National Product, public works investments declined from 4.1% in 1965 to 2.3% in 1977 -- a 44% decline. Each of these measures reflects that, although government expenditures have significantly increased during this same period, federal investments in public facilities have been declining both relatively and absolutely.

There are several reasons for these declines - a decrease in the Nation's birth rate and the maturation of the "baby boom" have helped reduce the need for some kinds of investments. But the greater part of the decline reflects the growing habit of government at all levels to cut back on construction, rehabilitation, and maintenance in order to balance budgets, hold down the rate of tax growth, and finance a growing menu of social services. While such approaches keep budgets in balance and meet near-term needs, they impose serious long-term costs. Public facilities wear out and become obsolete.

To address these concerns, the authors make several recommendations. With the inventory as a starting point, Congress should then require preparation of a Capital Budget that proposes phased capital investments matched to both short-term cyclical and long-term national needs. The budget would display preconstruction, construction, maintenance, and operating costs.

Congress should direct the Executive Branch to report by an appropriate date steps by which delays in public facilities construction can be reduced through reforms in federal, state, and local

administrative procedures. Similar efforts in reducing other regulatory delays are already underway at the direction of the President. Also, Congress and the Executive Branch should consider undertaking a series of reforms designed to minimize corruption and waste connected with public works expenditures.

At the same time, the Executive Branch should undertake an administrative evaluation of the scattered public works activities of the federal government and be prepared to consummate consolidated reforms simultaneously with the proposed Public Works Report to Congress.

Congress or the Executive Branch should direct the Advisory Commission on Intergovernmental Relations, or a new body constituted for the purpose, to review the public works responsibilities of each level of government and propose appropriate guidelines for allocating functions and responsibilities.

Congress should require the preparation of a Special Analysis to accompany each annual budget, outlining the Nation's public works needs as they affect national economic performance and should direct the Executive Branch to undertake an inventory of national public works needs as they affect the economy.

AMERICA'S INFRASTRUCTURE: EFFECTS OF CONSTRUCTION SPENDING

1. REFERENCE:

Associated General Contractors of America, 1984.

2. BACKGROUND/SUMMARY:

In May 1984, the Associated General Contractors of America requested Data Resources Incorporated (DRI) to prepare an economic impact study of the effect of a sustained, additional $10 billion federal construction expenditure on the aggregate U.S. economy between 1985 and 1990. The study was performed using their model of the U.S. economy.

The study concluded that the nation's roads, bridges, and sewer systems will pose increasingly serious health and safety problems through the end of this century, due to neglect over the past 15 years. In the 1950s, total government spending on construction increased an average of 6 percent a year after adjustment for inflation, and 3 percent annually in the 1960s. However, in the 1970s, spending decreased at a rate of 2.4 percent. The study points to a report by the Joint Economic Committee of Congress which estimates that an annual commitment of $70 billion until the year 2000 is needed to deal properly with the decay of the Nation's capital stock, two-thirds the amount federal and local authorities are currently spending on new construction and repairs.

3. ABSTRACT:

This report examines effects that a significant (16%) increase in public construction would have on the federal budget and the U.S. economy as well as industrial production and employment. Using the current DRI forecast of the economy as a baseline, the simulation results indicate that a sustained $10 billion (1984 dollars) annual increase in infrastructure spending, effective beginning in fiscal 1985 would:

- Expand total output 0.3% a year. Higher demand raises prices by 0.3% as well, pushing nominal gross national product (GNP) 0.6% above the baseline level.
- Boost economy-wide employment by 19.2 million man-years over six years. Therefore, each $1 billion (1984) dollars in construction spending eventually creates 32,000 jobs.
- Increase potential GNP 0.6% by 1990, raising productivity while building a strong foundation for growth through the 1990s.
- Induce major increases in construction and construction equipment spending, with significant feed-through effects in the primary metals and both the non-electrical and electrical machinery industries.
- Generate output growth that initially returns one-third of the program cost in taxes. After six years, however, the annual increase in the deficit is the entire program cost.

AMERICA'S INFRASTRUCTURE - A PLAN TO REBUILD

1. REFERENCE:

Associated General Contractors of America, 1983.

2. BACKGROUND/SUMMARY:

This report, conducted by the Associated General Contractors (AGC), was authorized by Congress and Special Foundation Grants. The AGC surveyed existing literature and studies on infrastructure needs and contacted over 100 organizations to develop a documented estimate of necessary investments to meet presently identified infrastructure needs. Since 1965, the percentage of the Gross National Product (GNP) devoted to spending by all levels of government on public works has dropped from 4.1 percent to 2.3 percent -- a 44 percent decline. Despite the growth in total government expenditures, spending on public construction has failed to keep pace with inflation in almost every year since 1968. The primary reason for this decline is deferred replacement of aging structures, which results in substantial deterioration of this nation's infrastructure.

3. ABSTRACT:

The AGC research reveals a minimum necessary capital investment of approximately $3.03 trillion. While the time frame for addressing such needs varies in the individual infrastructure categories, a weighted average indicates that most investment is projected to be necessary within the next 19 years. AGC makes the following general recommendations regarding infrastructure funding:

- Where a federal presence in infrastructure funding (both direct and federally-assisted) is justified, such federal funding must be adequate.
- All levels of government must realign funding priorities. The infrastructure crisis is of such magnitude and so integral to economic revival, growth, and employment that it must take precedence over social spending.
- The key element in infrastructure funding must be dedicated, long-term funding mechanisms for all infrastructure categories. The funding must be dedicated to avoid shifting capital investment spending, as occurred during the past 20 years. The funding must be long-term to provide stability in the infrastructure effort.

AMERICA'S INFRASTRUCTURE: PRESERVING OUR QUALITY OF LIFE

1. REFERENCE:

Rebuild America Coalition, 1989.

2. BACKGROUND/SUMMARY:

America's Infrastructure: Preserving Our Quality of Life is the second in a series of reports that addresses various elements of America's infrastructure problems and solutions to these problems. The Rebuild America Coalition is a broad coalition of public and private organizations committed to the infrastructure challenge.

The report purports that it is now widely recognized that the condition of America's infrastructure is at a crisis stage, endangering the public safety, lowering U.S. economic competitiveness, and diminishing the overall quality of life.

It is argued that only through investing in the nation's infrastructure can the quality of life so valued by this generation be in place for future generations. Over the past two decades, however, America has been neglecting its public works. Capital spending on public works investment has declined from 2.3 percent of GNP in 1960 to less than 1.1 percent in 1985. The U.S. now ranks fifty-fifth in the world in capital investment in infrastructure. This results in congestion and increasing frustration with the way communities function.

To provide a higher level of productive economic performance in the future, the Massachusetts Institute of Technology blue ribbon panel, The Commission of Industrial Productivity, recommends that the nation focus on four major types of investment, one of which is investment in infrastructure for productive performance.

3. ABSTRACT:

This report examines each area of the nation's infrastructure which "...reveals the threat to our quality of life and our standard of living on each front." The costs of repair and meeting the needs of growth are high but justified in each area. The infrastructure needs fall into two interrelated major concerns: ensuring a clean, safe environment and providing an efficient transportation network.

According to the Rebuild America Coalition, "Infrastructure must be a top national priority." In order to resolve the crisis of the nation's public works, investment in infrastructure must be increased and all levels of government must take steps to encourage innovative technology, financing, and public/private partnerships.

In addition, the following legislative goals are outlined:

- There should be no further funding restrictions in existing federal programs that address infrastructure needs;
- The existing federal infrastructure trust funds must be continued, adequately funded, and fully expended for their intended purposes;
- Federal restrictions on the use of tax-exempt financings for infrastructure purposes should be eliminated;
- A federal capital infrastructure program should be created to provide assistance to states and localities in meeting infrastructure needs; and
- A federal long-term multi-year capital budget should be established.

CHALLENGES AND OPPORTUNITIES FOR INNOVATION IN THE PUBLIC WORKS INFRASTRUCTURE

1. REFERENCE:

U.S. Army Corps of Engineers, Institute for Water Resources, June 1993.

2. BACKGROUND/SUMMARY:

This report was prepared by the U.S. Army Construction Engineering Research Laboratories (CERL) for the Federal Infrastructure Strategy Initiative, a 3-year program designed to explore the development of integrated federal infrastructure policies. The program was initiated as one of the President's budget items for Fiscal Year 1991 and approved by Congress for execution by the U.S. Army Corps of Engineers (USACE) Directorate of Civil Works.

As a preliminary task, an in-depth study and workshop on innovative approaches to managing the nation's public were conducted. The objective of this report was to document the results of the inquiry and to summarize the proceedings of the workshop "Public Works Infrastructure Innovation: Barriers, Opportunities, and Challenges." The report provides recommendations on enhancing the transfer of innovative technology and management practices to improve the declining condition of the nation's public works infrastructure. Study findings are presented in two volumes (IWR Reports 93-FIS-2 and 3), with the second volume presenting the results of the workshop.

3. ABSTRACT:

The report focuses on four critical areas of concern. First, it examines barriers to infrastructure innovations and innovation adoption processes. Second, a model for national strategy on Infrastructure Research and Development (R&D) and Technology Transfer -- the IRTT model -- is proposed for implementation. Third, based on short-term recommendations extracted from the IRTT model, the process of technology dissemination is examined in detail, with a review of models for technology transfer (or "innovation diffusion"). Finally, it recommends a mechanism for the transfer of currently available innovative approaches by incorporating and expanding three technology transfer models: The Rogers model, the Shaffer model, and the National Aeronautics and Space Administration (NASA) model.

From a survey of current literature and workshop discussion, a list of six major barriers to innovation was developed.

Lack of a Federal Initiative Responsible for Infrastructure Policy and Vision. The first was the lack of a federal initiative responsible for infrastructure policy and vision. If such an initiative is created, assigning responsibility for acting as a national catalyst for infrastructure R&D and technology transfer, many barriers could be overcome. This initiative should ensure a comprehensive and integrated approach to design and construction that eliminates the

antagonistic relationships caused by the present fragmented approach. It would also develop intergovernmental partnerships with state and local governments to develop improved fiscal and political tools for promoting innovation.

Inadequate Technology Transfer Mechanisms. A second barrier identified was the inadequacy of current technology transfer mechanisms. This barrier creates a vicious cycle: opposition to new ideas or technologies because of a reluctance to try innovative approaches that do not have a proven track record. Overcoming this barrier would require development and support of an effective technology transfer mechanism to bridge the gap between the public and private sectors. Such a mechanism could include, for example, a readily-accessible information clearinghouse and other support for diffusion of information among peers.

Lack of Public Awareness. Another key barrier is lack of public awareness of the impact of national infrastructure on the nation's economy and quality of life. This barrier could be overcome by partnerships with community groups, awareness committees, and support groups, and creation of a mechanism to address controversies that arise over innovative approaches.

Complexity of Regulations. An additional barrier is increasingly stringent government technical standards and regulation, which frequently result in complex, contradictory, or obsolete regulations that inhibit technological innovation.

Legal Liability. The reluctance to innovate due to a fear of potential legal liability was cited by much of the literature and by many of the workshop participants as a significant, but difficult to address, barrier to innovation.

Inadequate Organizational Management for Innovation Adoption. Organizations are currently not managed to promote and adopt innovative practices. To address this barrier, technology transfer task forces, and comprehensive user training programs should be established.

Based on the barriers that were identified, the report designed an approach to develop and implement a national R&D and technology transfer strategy for the U.S. public works infrastructure. Key elements of the strategy include:

Creation of a National Catalyst for Public Works Infrastructure and Technology Transfer. This initiative could be implemented in one of four ways:

- Existing institutions such as the Office of Science and Technology Policy (OSTP), the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), and the Office of Technology Assessment (OTA) could be used to manage, coordinate, and review the initiative.

- The existing framework of the Federal Laboratory Consortium could be used to identify regional R&D centers of expertise for the various infrastructure technologies within the federal laboratory community. These laboratories could be empowered to identify and prioritize R&D needs, and develop, evaluate, and demonstrate new infrastructure technologies.

- A central agency could be assigned to organize and manage the overall initiative. Three agencies with cross-cutting, multi-disciplinary infrastructure experience are the National Institute of Standards and Technology (NIST), the U.S. Army Corps of Engineers, and the National Science Foundation.

- Another alternative would be a partnership between government bodies, academia, and industry.

Establishment of an Independent Evaluation Center. This would provide an independent testing and evaluation capability, to promote the demonstration and independent evaluation of innovative technologies. It would be based on peer review by professional, scientific, technical, and engineering societies.

Creation of Dissemination Centers. These centers would be the cornerstone of a coordinated, aggressive effort to disseminate innovative technologies.

Communication with User Communities. The other key role in a national technology transfer process would be filled by the user communities that design, construct, maintain, and renew infrastructure. Users can communicate their needs to the independent evaluation center, and give feedback to dissemination centers on their effectiveness.

DELIVERING THE GOODS: PUBLIC WORKS TECHNOLOGIES, MANAGEMENT, AND FINANCING

1. REFERENCE:

U.S. Congress, Office of Technology Assessment, April 1991.

2. BACKGROUND/SUMMARY:

In 1988, following a number of studies calling for more investment in public works infrastructure, the Senate Committee on Environment and Public Works and the House Committee on Public Works and Transportation asked the Office of Technology Assessment (OTA) to identify ways to change federal policies and programs to mobilize management, financing, and technology efforts to make public works more productive and efficient. In addition, the Senate Committee on Commerce, Science, and Transportation and the Subcommittee on Appropriations both expressed their interest and concern by endorsing this study.

OTA identifies several immediate steps the federal government can take. First, new environmental standards, population shifts, and industrial changes have transformed the nature of many public works problems, and federal programs must be refocused to fit the new circumstances. Second, the nation must increase its investment in public works, despite budget dilemmas, in order to maintain economic health.

3. ABSTRACT:

Critical infrastructure, such as bridges, Interstate highways, sewage pipes, and water systems are breaking down or wearing out faster than we can repair or replace them. The toll on national productivity is already substantial and since infrastructure investment has been declining for at least a decade, the situation is likely to get worse before it can get better.

OTA makes the following general conclusions in *Delivering the Goods*:

- Changes to federal program management, investment policies, and R&D are needed now, if the opportunities that technology offers for public works are to be fully utilized. Immediate attention should be given to developing programs to determine the most promising new technologies for public works and long-term strategies for implementing them.

- The interlocking nature of federal, state, and local responsibilities for public works services makes a compelling case for strong federal leadership. It is time for the federal government to acknowledge the broad impacts of its role in public works and to work aggressively to create a policy framework that addresses current problems and shapes the future.

- Unless steps are taken to institutionalize an integrated, multimodal approach within DOT, the existing strongly segmented modal structure will prevail. Over the long term, DOT could be restructured in divisions by broad mode or by function. Separating any of the current modal responsibilities from DOT would be counterproductive to long-term national transportation policy goals.

- The fragmented congressional and executive branch responsibilities for public works impede setting policy goals that could lead to better investment decisions, more effective management, and better use of technologies.

- Federal investment in selected segments of public works must be increased to leverage state and local investment in growth areas and supplement resources in economically weak areas. Otherwise, the gap between local jurisdictions' ability to provide essential services and the need for the services will continue to grow, with potentially serious consequences for the national, state, and local economies.
- EPA had not dealt with compliance issues likely to occur because of the fiscal impacts of multiple new requirements on public works providers. In addition, widespread noncompliance with the new regulations is likely, especially among small systems and the nation's oldest and largest cities, unless state and federal financial and technical assistance is increased.

- The technologies offering the most potential for solving complex public works problems are management information and condition assessment tools, maintenance-related technologies, and techniques for increasing capacity where new construction is not feasible. These are top priorities for immediate attention as Congress considers how to reshape infrastructure programs.

- Better system management and making good use of public works managers can also help public works managers improve the efficiency and productivity of their operations.

- Cooperative, joint efforts between private sector suppliers and government to demonstrate and evaluate new technologies for safety, durability, and long-term costs are excellent ways to spread the risk and overcome some of the difficulties of the procurement process for new technologies.

FRAGILE FOUNDATIONS: A REPORT ON AMERICA'S PUBLIC WORKS FINAL REPORT TO THE PRESIDENT AND THE CONGRESS

1. REFERENCE:

National Council on Public Works Improvement, February 1988

2. BACKGROUND/SUMMARY:

Fragile Foundations: A Report on America's Public Works is a three-part report of an evaluation of the nation's public works by the National Council on Public Works Improvement (the "Council"). The Council was created by the Public Works Improvement Act of 1984, Public Law 98-501. The first part summarizes the Council's conclusions about the capacity our nation's infrastructure to sustain economic growth in the future. The Council includes an outline for strengthening public works facilities with a clear commitment to the future. The second part synthesizes the major themes of the research prepared for the Council from over 5,000 pages of material over a two-year period. All research findings were reviewed by many public works experts in working group meetings and other public forums. The third part contains an Appendix that analyzes the performance of eight major categories of public work and provides additional supporting information.

Fragile Foundations is the Council's final report to the President and the Congress. The first report, *The Nation's Public Works: Defining the Issues*, submitted to the President and the Congress in September 1986, provided an overview of current knowledge and provided a wide context for further research. The issues included public works needs, economics and finance, government roles, management and decision making, and technological innovation. The second report, submitted to the President and the Congress in May 1987, consisted of a series of study papers commissioned by the Council from independent consultants on nine categories of public works facilities and services: highways, streets, roads and bridges; airports and airways; mass transit; intermodal transportation; water resources; water supply; wastewater management; solid waste; and hazardous waste. Each paper addressed the main issues identified by the Council in the first report. In addition, consultants provided the Council with their views on major policy issues in categories of their expertise.

3. ABSTRACT:

The Council's major finding, based on two years of research, was "...that the quality of America's infrastructure is barely adequate to fulfill current requirements, and insufficient to meet the demands of future economic growth and development." As a result, the Council called for a national commitment, shared among all levels of government, the private sector, and the public, to vastly improve America's infrastructure. The Council stated that this commitment could require an increase of up to 100 percent in the amount of capital the nation invests each year in new and existing public works, which totaled approximately $45 billion in 1985.

While increasing capital spending, the Council also outlined a strategy to upgrade America's infrastructure, which includes:

- Clarification of the respective roles of the federal, state, and local governments in the construction and management of infrastructure to focus responsibility and increase accountability;

- Steps to improve the performance and efficiency of existing facilities;

- A rational capital budgeting process at all levels of government;

- Strong incentives to ensure adequate maintenance and, where appropriate, adopt new technologies; and

- More rigorous and widespread use of low capital techniques for delivering services and meeting service needs, such as demand management, coordinated land-use planning, and waste reduction recycling.

The Council assessed the current state of the nation's infrastructure and concluded that, "If our public works were graded on an academic scale, their recent performance would earn a scant 'C' - barely adequate to support current demands." The Council provided an overview of the performance of the eight categories of public works in the format of a report card, which identified policy concerns and opportunities for improvement.

The Council identified three public works spending patterns which are of particular concern when compared to other measures of economic activity:

- Total public spending on infrastructure has dropped from 3.6 percent of GNP in 1960 to 2.6 percent in 1985;

- While spending on operations and maintenance has remained a constant share of GNP, capital spending has dropped from 2.3 percent of GNP in 1960 to 1.1 percent as of 1988; and

- The relative share of public works spending at all levels of government has declined drastically from nearly 20 percent of total expenditures in 1950 to less than 7 percent in 1984.

FRAMING THE DIALOGUE: STRATEGIES, ISSUES, AND OPPORTUNITIES

1. REFERENCE:

U.S. Army Corps of Engineers, Institute for Water Resources, May 1993.

2. BACKGROUND/SUMMARY:

This report describes the progress to date of a federal interagency initiative known as the Federal Infrastructure Strategy (FIS) program. The FIS program is a three-year effort to explore opportunities for developing an integrated federal infrastructure policy. It addresses the roles of the various levels of government and the private sector in devising approaches and solutions for improving infrastructure performance and ensuring more efficient investments. The FIS is a more detailed follow-up to the work of the National Council on Public Works Improvement, the Congressional Budget Office, the Congressional Office of Technology Assessment, and other national studies. As such, the current effort constitutes the first examination of national infrastructure issues from the perspective of the responsible federal agencies.

This is the first of a series of interim reports on the results of the program. This report (IWR Report 93-FIS-1) documents the activities that took place in 1991 and 1992 during the first half of the program, including the results of the intergovernmental coordination facilitated by the Advisory Commission on Intergovernmental Relations.

3. ABSTRACT:

An integrated federal policy to address the nation's many infrastructure problems, including those associated with transportation facilities, water resource systems, and the management of waste, currently does not exist. The absence of an overarching policy limits the federal government's ability to effectively select and manage infrastructure programs. The first phase of interagency coordination working towards the development of a Federal Infrastructure Strategy identified the need for:

- Strategies for more efficient investment;
- The reduction of regulatory and administrative burdens;
- Accelerated technology transfer;
- Financing reforms; and
- Improved infrastructure management methods and practices.

A recurring theme within these issues is performance or outcome-based decisionmaking. While many federal policy discussions on infrastructure focus on the need for investment, fiscal

constraints at all levels of government highlight the need for the use of meaningful performance measures in making more efficient investment decisions.

Preliminary findings, based on the intergovernmental coordination and research completed to date include:

- National goals for infrastructure should make greater use of performance or outcome-based investment strategies. Needs studies should be more performance-oriented, including both physical and economic outputs, and directed toward achievement of clear strategic investment goals.

- Federal infrastructure investment decisions should be more consistently aimed at improving public works performance, and should be based on the uniform application of analyses, such as cost-benefit evaluations.

- Unintended federal regulatory and administrative burdens in providing infrastructure should be relieved, while flexibility in spending federal aid and in complying with federal and state mandates is needed.

- Regulatory procedures should be examined for opportunities for streamlining public works permitting to reduce investment costs and delays while protecting the environment.

- The potential for new federally developed technologies to address national infrastructure problems is great. However, significant cultural, administrative, legal, and management barriers currently impede the transfer of federally developed technology to other sectors.

- Several changes are needed to increase the effectiveness of federal technology transfer, including designating a centralized focus for a national infrastructure R&D policy with enhanced intergovernmental partnerships.

- Federal financing reforms are needed in order to improve the efficiency and equity of infrastructure investments. Emphasis should be placed on developing and using diversified revenue sources including: bond banks, revolving loan funds, tax-exempt bonds, pricing mechanisms, and intergovernmental funding, including having beneficiaries paying a greater share of infrastructure costs.

- Management methods and practices should focus more on the performance of services (as indicated by output measures) rather than on facilities and operations "inputs."

- Maintenance planning and deferred maintenance reporting practices should be considered to improve the management of existing infrastructure stock.

- Capital budgeting should be considered by all levels of government, and the use of low-capital techniques and performance incentives should receive greater attention.

HIGH PERFORMANCE PUBLIC WORKS: A NEW FEDERAL INVESTMENT STRATEGY FOR AMERICA

1. REFERENCE:

U.S. Advisory Commission on Intergovernmental Relations, November 1993.

2. BACKGROUND/SUMMARY:

In 1991, the U.S. Army Corps of Engineers was requested to facilitate a Federal Infrastructure Strategy Initiative, which provided an opportunity to follow up on the work of the National Council of Public Works Improvement. This report is the result of a series of consultations led by the U.S. Advisory Commission on Intergovernmental Relations (ACIR) with many other federal agencies, as well as with representatives of state and local governments and the private sector which took place between April and July of 1993. The main points from those consultations were synthesized into a four-point strategy and a detailed action agenda. The draft strategy and agenda, plus six task force statements, were considered further at a National Conference on High Performance Infrastructure, attended by about 160 experts on July 29-30, 1993 in Washington, D.C. Revisions were made in the draft report as a result of the conference. This report examines six key public works improvement topics:

- Improving the quality of infrastructure investments;
- Applying benefit-cost analysis to investment options;
- Improving the maintenance of infrastructure;
- Making federal regulation of infrastructure more effective, efficient, and equitable;
- Improving environmental decisionmaking for public works; and
- Improving the financing of infrastructure.

3. ABSTRACT:

The examination of the six key public works improvement topics resulted in recommendations which can be summarized in a four-point strategy to assure the President, the Congress, and the people of the United States that continued federal government investment in infrastructure will be used for the following:

- The highest quality investments that can yield maximum benefits compared to their costs;
- Cost-effective maintenance of existing facilities and equipment that will help avoid premature and costly repairs, rehabilitation, and replacement;

- Soundly and equitably regulated projects that can meet environmental and other performance requirements effectively in the setting where they are located; and

- Affordable facilities that can be supported financially now and in the future by those who are responsible for them.

In order to implement this strategy, an action agenda is presented for the federal government with three primary elements:

- **Leadership by the President**. The President is asked to issue an executive order requiring:

  (1) Improved investment analysis techniques;
  (2) Greater use of pricing and demand management techniques;
  (3) Improved maintenance management strategies;
  (4) Better regulatory analysis;
  (5) The integration of an environmental quality ethic into all public works agencies;
  (6) Integrated environmental review processes; and
  (7) Realistic financial plans that can support program goals.

  The President is also asked to establish a public works investment section in the executive budget funded fully or largely by stable trust funds that can be tapped only for soundly justified projects. The President should propose an infrastructure legislative program that includes:

  (1) "The Infrastructure Investment Act," designed to improve the quality of investment analysis that is applied to all projects proposed for funding;

  (2) "The Environmental Integration Act," designed to encourage analysis and management of environmental problems in an interrelated way that can make best use of limited resources to get the greatest health and eco-system improvements; and

  (3) "The Mandate Relief Act," designed to keep track of the cumulative effects of mandate costs on responsible parties and to keep these costs within the bounds of reasonable affordability.

  The President is also requested to convene a White House Conference on Infrastructure Investment to motivate action on this agenda.

- **The Congress is asked to:**

  (1) Take action on the President's infrastructure legislative program;

  (2) Reorganize its committees to make it easier to integrate infrastructure and environmental programs;

(3) Integrate sound investment criteria into infrastructure and environmental programs when they are authorized; and

(4) Revise the congressional budget and appropriations process to correspond with the President's public works investment budget.

- **Government-wide mechanisms to support the recommended improvements**. Support for these activities should be provided by a number of agencies, including but not limited to OMB, the Federal Accounting Standards Advisory Board, the Bureau of Economic Analysis, the Federal Geographic Data Committee, the Office of Science and Technology Policy, the Administrative Conference of the United States, the Advisory Commission on Intergovernmental Relations, and the General Accounting Office. The report specifically recommends that:

  (1) Detailed guidance be issued to help improve the practices of all the federal infrastructure and infrastructure-related agencies and the clients that they influence through their financial aid and regulatory activities. The detailed guidance would be supplied largely through the Office of Management and Budget circulars affecting the budget, legislative clearance, and regulatory review processes.

  (2) OMB should also allocate to federal infrastructure agencies some of the pilot projects under the Government Performance and Results Act of 1993.

  (3) An Infrastructure Research Board (IRB) should be established to sponsor interagency and intergovernmental committee work, training, education, conferences, national cooperative research, policy development, publications, and clearinghouse functions.

HOW FEDERAL SPENDING FOR INFRASTRUCTURE AND OTHER PUBLIC INVESTMENTS AFFECTS THE ECONOMY

1. REFERENCE:

U.S. Congressional Budget Office, July 1991.

2. BACKGROUND/SUMMARY:

Some analysts and policymakers have voiced concern in recent years that the nation needs to invest more in its transportation facilities, in the human capital that is embodied in its citizens, and in the research and development that may lead to tomorrow's economic advances. This study was undertaken at the request of the House Rules Committee in order to advance the economic effects of such categories of federal investment spending.

This report examines the effect on the economy of three broad classes of federal investment spending: physical infrastructure, including programs for transportation and environmental facilities; human capital, including programs that increase the skills and productive knowledge that people bring to their jobs, and intangible capital, such as research and development (R&D). Within each of these categories, the study examines trends in spending, discusses the rationales for that spending, and reviews evidence on the contribution of public investment to economic performance.

3. ABSTRACT:

Public transportation and environmental facilities, including highways, mass transit, railways, airports and airways, water resources and water supply, and wastewater treatment plants form a significant portion of the economy's total stock of capital. In 1987, non-military public infrastructure capital was valued at $1.2 trillion compared with private non-residential capital equal to $4.1 trillion. Adjusted for inflation, federal outlays for physical infrastructure rose rapidly between 1956 and 1965, then rose again between 1970 and 1980, and have fluctuated around a slight downward trend since then.

Carefully chosen federal investments in physical infrastructure such as highway and aviation projects would yield economic rates of return higher than the average return on private capital. As a rule, the highest economic benefits would result from maintaining existing infrastructure assets and from expanding capacity in highly congested facilities. Substantial economic benefits also can be achieved by using existing assets more efficiently. In many cases, price mechanisms can significantly increase the efficiency with which infrastructure is used.

The economic effects of some federal human resource programs, particularly job training programs, have been measured in terms of their impact on the participants' earnings. Overall, training programs appear to have led to modest gains in the average earnings of program participants.

Most human resource programs, however, were designed principally to further non-economic goals, and these programs generally have not been assessed for their economic returns. Evaluations of most social service and food and nutrition assistance programs, in particular, have focused on results less directly related to economic growth.

Over 60 percent of federal outlays for R&D support defense-related activities. Most defense work is devoted to developing new weapons, and about two-thirds of total federal R&D outlays also support development work. Adjusted for inflation, federal spending for R&D has been uneven. After quadrupling between 1953 and 1967, R&D spending fell for the next eight years. However, since 1976, R&D spending has grown at an annual rate of 3.6 percent.

Limited evidence suggests that federal funding of certain types of research and in certain areas offers significant economic benefits. Economic measures suggest generally high rates of return for basic research and academic research in science and engineering, for example, which accounts for about 25 percent of all federally funded R&D. Research in health and agriculture also appear to yield significant economic benefits.

INFRASTRUCTURE NEEDS STUDY: A CRITIQUE

1. REFERENCE:

National Council on Public Works Improvement, October 1986.

2. BACKGROUND/SUMMARY:

This report was presented by the Urban Institute to the National Council on Public Works Improvement to estimate the needs of infrastructure, both new facilities and maintenance of old ones.

It notes that the 1980s was a decade of concern for infrastructure, which began with needs studies to show that the United States needed to invest more in its public capital facilities if they were to be saved from deterioration. The track record of these needs studies have been decidedly mixed. Public awareness of infrastructure, however, is much greater now than it was at the outset of the 1980s. But the need for capital spending is not an objective magnitude, which all competent professionals can replicate to a fairly close approximation when addressing the same set of facts, causing much confusion.

3. ABSTRACT:

This study reports that no further national assessment of aggregate need is warranted. It is well known now that aggregate national "need" exceeds by a wide margin aggregate investment in civilian public works. The magnitude of the gap is uncertain. Further data collection will not help to close that gap, and further "needs" numbers are likely to divert the Nation from the more urgent tasks of establishing investment priorities and searching for sources of stable capital financing.

Federal functional needs studies offer the richest source of condition data. The Council should commission one or more special studies to show how more useful information can be extracted from existing studies and used to inform the infrastructure debate. The array of data now collected by federal agencies on capital stock condition, investment requirements, and service performance is more impressive than generally recognized.

The Council should consider recommending some broad guidelines on the future organization of federal sectoral needs studies. Recommendations should have guidelines which would guarantee that the large federal investment in needs assessment yields results of general as well as specialized interest. All studies should consider the following:

- The impact of not remedying deficiencies, as well as the cost of capital investment to remove the deficiencies;
- The sensitivity of cost estimates to alternative standards be estimated; and,

- The reports give explicit consideration to the significance of any gaps reported between "need" and available federal resources under existing budgets.

The Council should prepare and publish guidelines for state needs studies. State governments will bear the brunt of the capital management and capital financing burden in the decade ahead. The Council should consider commissioning a more thorough study of which states' needs assessments have had the most success and why, then prepare and publish guidelines for the conduct of state needs studies.

The Council should prepare and publish guidelines for local needs studies. Local governments have the most direct responsibility for capital management, and also have the most urgent need to establish policies regarding infrastructure management and investment.

INFRASTRUCTURE FOR THE 21ST CENTURY: FRAMEWORK FOR A RESEARCH AGENDA

1. REFERENCE:

National Council on Public Works Improvement, 1987.

2. BACKGROUND/SUMMARY:

This report was prepared at the request at the National Council on Public Works Improvement (NCPWI) by the National Research Council, Committee on Infrastructure Innovation. To help meet its Congressional mandate, the NCPWI asked the National Research Council to address three issues with regard to infrastructure technology:

- Promising research areas for the technological improvement of infrastructure;
- Factors governing the adoption or rejection of technological innovations; and
- The means for developing and carrying out a national research agenda to foster innovative research for infrastructure systems.

The study was organized as a cross-institutional activity. The membership of the study committee, the Committee on Infrastructure, was derived from nominees proposed by the applicable Research Council units including the Commission on Engineering and Technical Systems, the Transportation Research Board, and the Commission on Behavioral and Social Sciences and Education. The committee and panel members were selected for their special expertise and experience in all modes of infrastructure. The committee met three times over a five-month period as a full committee and several times in subgroups.

It recommends a two year implementation program for the development of a national strategy for infrastructure research and development. Efforts to strengthen and encourage existing modal research efforts are an essential complement to this activity.

The problems associated with improving our public works infrastructure deserve special attention. Various studies have been conducted which estimate the annual shortfall between investment requirements and available revenues to attain necessary system upgrades. Technology offers a partial solution to some of the problems that face the nation within the infrastructure systems

3. ABSTRACT:

The committee found that there were both opportunities for research and barriers to innovation that transcended the separate modes that together constitute the infrastructure system. In recommending the next step in constructing a broad and sustained research effort for the

infrastructure system, the committee considered existing modal research programs with their strengths and weaknesses. Substantial opportunities were found for research in several modes, including the management of solid wastes, water pollution control, and urban mobility. Therefore, the committee concludes that a framework for research on infrastructure systems should include efforts to build on existing modal efforts, by strengthening existing programs and initiating efforts where needed.

Overall, the committee found that research and development can contribute in significant ways to the performance of infrastructure services by providing managers and policymakers with a broader range of options. Current research and development on infrastructure is uneven across the various modes of infrastructure, with some commanding considerable resources while others are underfunded and facing significant challenges.

Such factors led to the committee's conclusion that a sustained institutional focus for a program of infrastructure research, development, and technology transfer was needed. To bring this program into existence, the committee recommends that a two-year implementation program be initiated immediately to explore with the many constituencies involved in the infrastructure system the prerequisites to creating an organization that would provide the stimulus, focus, and coherence for sustained effort in infrastructure research. The committee believes that the tasks of this two-year implementation program should include:

- Defining the managerial structure, financial mechanisms, and the limitations under which this organization should operate;
- Developing a national agenda of research and development for infrastructure systems that identifies the current gaps in research and notes research opportunities for addressing problems common to several modes;
- Bringing into the program the talent and expertise of the various existing modal research groups;
- Establishing minimum goals and criteria for research and implementation; and
- Informing federal agencies, the user and professional communities, and the public about the opportunities for research in building a more effective infrastructure system.

INFRASTRUCTURE POLICY: REPETITIVE STUDIES, UNEVEN RESPONSE, NEXT STEPS

1. REFERENCE:

Marshall Kaplan, *Urban Affairs Quarterly*, March 1990.

2. BACKGROUND/SUMMARY:

This article by a University of Colorado professor reviews studies of the nation's infrastructure needs over the last decade, and finds that most of the studies contain similar conclusions. The article examines the short-term outlook for major new national policy initiatives, and attempts to explain the "underwhelming" policy response to a wealth of infrastructure studies. It also predicts that more demonstration efforts, marginal changes in programs, and increased public-private partnerships are likely in the future.

3. ABSTRACT:

In the last dozen years, the word infrastructure has become familiar to the public. As the report states: "Periodically, often after a bridge collapses and loss of life occurs or a large pothole appears on a major interstate highway causing a multicar accident, media attention grants infrastructure a temporary seat at the nation's public policy table." As a result of this heightened interest, since the late 1970s, several assessments of national infrastructure needs have been completed by reputable national panels and/or individual analysts. Despite their different origins, varied audiences, and methodologies, most of the studies reached similar general conclusions.

Among the conclusions cited:

- The United States has failed to invest sufficient funds in its roads, bridges, transit systems, airports, water systems, and the like.
- Although state and local governments have picked up some of the slack in total infrastructure investment, the pattern between and among states has been uneven -- very few state governments and even fewer local governments have developed rational investment plans and strategies.
- The gap between current and anticipated infrastructure investments by the public sector and assumed needs is a relatively large but manageable one -- if the nation can mount a solid multiyear commitment.
- Efforts to initiate user fees, exactments, urban services fees, tax increment finance, public/private sector partnerships, and other unique or innovative forms of financing are noteworthy and growing. Many such techniques raise serious equity and efficiency questions.

- Without a national policy and an integrated approach to public capital investment, significant negative externalities will occur between and among regions, states, and cities.

- Although different regions of the country have different kinds of infrastructure needs, interregional differences often seem less important than differences internal to each region.

Although the studies vary in policy options, most suggest that some of the following are needed:

- More federal infrastructure funding, and more flexible administration of it;

- More state and local infrastructure funding;

- Better planning and management of infrastructure investment at all levels of government;

- Innovative financing techniques to deal with budget realities;

- New technology that can reduce funding needs for infrastructure;

- More funds for maintenance as opposed to construction; and

- More information and analytical tools for infrastructure decisionmaking.

The author cites a number of reasons for the lack of a policy response to infrastructure studies. First, the numbers are too large to be understandable. Second, it is difficult to jump from individual problems to address a national crisis. A further difficulty is the lack of agreement on the correct methodology for infrastructure studies -- scholars cannot agree on the questions to ask, the data to use, or the conclusions to draw.

In addition, the fact that "infrastructure lacks a strong, unified constituency," is also cited as a barrier to improvement. Finally, interjurisdictional problems are cited as making it difficult to reach agreement. The author concludes with several proposals:

- Refine needs assessment and information system techniques at state and local levels;

- Develop cost-benefit and rate-of-return methodologies;

- Reach a consensus concerning appropriate federal, state, and local government roles in infrastructure investment;

- Make federal tax and financial assistance programs flexible enough to address state and local infrastructure problems;

- Inventory, review, and disseminate case studies concerning collaborative public sector and public/private sector infrastructure roles; and

- Use more equitable and efficient means to finance infrastructure, especially user and beneficiary-pay systems.

INVESTING IN OUR FUTURE: REPORT OF THE PUBLIC INFRASTRUCTURE SUBCOUNCIL TO THE COMPETITIVENESS POLICY COUNCIL

1. REFERENCE:

Public Infrastructure Subcouncil, March 1993.

2. BACKGROUND/SUMMARY:

The Subcouncil on Public Infrastructure was convened by the Competitiveness Policy Council to produce recommendations for enhancing U.S. international competitiveness by improving the effectiveness and efficiency with which we move people, goods, and information.

The Subcouncil concluded that over the last 25 years, a massive under-investment in U.S. infrastructure has occurred. Net public infrastructure investment in highways, bridges, airports, water and sewers, has been cut in half -- from over two percent of GDP in 1959 to just one percent by 1984. From 1980 to 1990, federal outlays on infrastructure fell from 4.7 percent of all federal spending to 2.5 percent.

Although economists differ on the magnitude of the effect of infrastructure investment on economic growth, there is a general consensus that infrastructure investment and economic growth are intertwined, and that well-selected public investments can play an important role in furthering economic growth. Investment in infrastructure is important for enhancing U.S. productivity growth and for sustaining the long-term competitiveness of our national economy.

3. ABSTRACT:

The Subcouncil proposes a three-point strategy to ensure that U.S. infrastructure enhances, rather than impedes our competitive edge, which recommends:

- An aggressive program to maintain and improve transportation infrastructure;
- Adequate and sustained financing of infrastructure investment over time; and
- Decisive action to advance a new telecommunications infrastructure for the 21st century.

For the first goal of maintaining and improving the efficiency of the national transportation system, the Subcouncil believes that all levels of government must approach the national transportation system from a strategic perspective of competitiveness. Moreover, that strategy must encompass:

- An intermodal focus that provides seamless connections across modes of transport on air, land, and sea;

- An emphasis on efficiency and quality so that we get the most for our tax dollars;

- An understanding that the transportation system must serve the national interest in addition to being flexible enough to meet local needs;

- An accommodation of transportation and environmental interests, using creative thinking to actually solve environmental problems related to transportation; and

- A commitment to ensure that the transportation system reinforces rather than diminishes the economic vitality of the places it serves.

For the second goal of ensuing that investment in infrastructure is adequate, appropriately financed, and sustained over time, the Subcouncil strongly believes that the wisest course of action is to use a federal energy (carbon) tax or to raise the gasoline tax to levels necessary to meet current and future infrastructure needs. In addition to ensuring that adequate funds are available for infrastructure investment, financing mechanisms must be in place to rationalize the process of infrastructure investment over the long-term. One such mechanism the Subcouncil strongly recommends is a capital budget. Another proposed long-term mechanism for financing public investment is the concept of a National Infrastructure Bank.

For the third goal, seizing the historic opportunity to advance new telecommunications technologies to form the basis of infrastructure for the 21st century, the Subcouncil believes there is a primary need for a single, authoritative federal policy-maker on telecommunications rather than the current melange that includes the Federal Communications Commission, the National Telecommunications Information Administration, the Defense Department and Congress. Also, new legislation replacing the 1934 Communications Act will be needed to effect this change.

Another recommendation by the Subcouncil calls for the federal government to move swiftly to define a coherent regulatory framework for telecommunications that will end the current gridlock, promote equitable treatment of companies, and safeguard the public's access to reasonably-priced telecommunications services.

MOVING AMERICA: NEW DIRECTIONS, NEW OPPORTUNITIES A STATEMENT OF NATIONAL TRANSPORTATION POLICY STRATEGIES FOR ACTION

1. REFERENCE:

U.S. Department of Transportation, February 1990.

2. BACKGROUND/SUMMARY:

The Secretary of Transportation initiated a process to take a new look at our transportation policies, take stock of which policies are doing well, and set a course that will ensure a transportation system that supports national goals for the future. For this report, the Secretary sought the comments and expertise of users and providers of transportation, interest groups and private citizens, the academic community, and transportation professionals and public officials at all levels of government. The Secretary stated, "We must have a system that provides safe and efficient transportation for all people and communities, that carries passengers where they need to go and moves the vast quantities of goods we produce and consume." This policy statement addresses transportation goals, directions, and actions for all sectors of the Nation with a stake in transportation - state and local governments and the private sector, as well as officials and agencies throughout the federal Government.

3. ABSTRACT:

The U.S. Department of Transportation developed an agenda to fulfill both short- and long-term needs, in response to views expressed nationwide during the public outreach effort. This agenda revolves around six key themes:

- Maintain and expand the Nation's transportation system;
- Foster a sound financial base for transportation;
- Keep the transportation industry strong and competitive;
- Ensure that the transportation system supports public safety and national security;
- Protect the environment and the quality of life; and
- Advance U.S. transportation technology and expertise.

The Department's Short-Term 1990-1992 Action Agenda includes the following four items:

- Authorizations for redirected federal aviation, highway, highway safety, and urban mass transportation programs;

- Enactment of other legislation that will enhance modal competition and national security;
- Repeal of federal regulations and laws that impede the provision of efficient transportation service; and
- Program initiatives to carry out new policy directions.

The Department's Long-Term Agenda, or strategic focus for the future will be to ensure that the transportation system can perform its basic function efficiently and safely through efforts to:

- Remain flexible enough to adapt to changing circumstances;
- Foster a balanced and integrated transportation network; and
- Provide the means and incentives for funds and other resources to be targeted to projects and programs that offer the greatest benefits in the Nation's transportation system.

THE NATION'S PUBLIC WORKS: REPORT ON INTERMODAL TRANSPORTATION

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Joseph S. Revis and Curtis Tarnoff for the National Council on Public Works Improvement (the Council). The purpose of this study was to examine intermodal transportation as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's intermodal transportation. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

The study concluded that the major problem associated with intermodal transportation is the fact that intermodal impacts and considerations are not adequately taken into account when public infrastructure (or for that matter private) investment decisions are made. There is a significant gap in intermodal coordination at the urban and national levels in important issue areas in which national and regional growth and development objectives are affected.

3. ABSTRACT:

Intermodal transportation, when it works well, provides the basis for better integrating the transportation network through smoother, quicker and less frequent infrastructure. Federal participation is justified on the basis of two national objectives: (1) stimulating economic growth and development, and (2) (in more recent times) improving the United States' competitive position in world trade. Intermodal transportation contributes to these two objectives by providing greater efficiency and, thereby, reducing transportation costs.

Decreased transportation costs, in reasonably competitive markets, will be translated into a change (increase) in the relative utilization of the resources affected by the lower transport costs. The price-stimulated increase in the use of the relevant resources will generate new or expanded economic activity in the region and/or part of the Nation affected by the cost/price change. Through decreased transportation costs associated with intermodal technology, economic growth and efficiency are stimulated. Through expanded domestic economic growth and efficiency stimulated by intermodal-initiated decreased transportation costs, the international competitive position of the United States is also enhanced.

In terms of the intermodal process, almost every freight or passenger movement involves some form of interruption due to a change of mode. The underlying principle of intermodality is to

provide an uninterrupted movement of goods and people from origin to destination. Although never fully realizable, for each occasion an interruption is eliminated or a time delay is reduced, the operating time, accident and pilferage costs will be reduced. The difficulties of each intermodal transfer will depend on many different aspects of the movement ranging from a transfer within the same company on the same mode (on-line); a transfer between different companies and different modes (listed in order of difficulty of the intermodal movement).

None of these intermodal transfers can be made unless six major elements are present:

- Integrated and coordinated infrastructure;
- Integrated and standardized facilities and equipment;
- Coordinated communication;
- Coordinated management and administration;
- Coordinated paperwork (documentation); and
- Clarity of liability responsibility.

A "mismatch" in any of these intermodal requirements, will result in an increased cost. The objective of intermodal transportation is to eliminate as many of the "mismatches" as possible. From the environment of accelerated international and domestic intermodal transportation development, and the intermodal conflicts of urban congestion, emerge a number of issues and recommendations central to the continued expansion of intermodalism and realization of its benefits. Review of the relationship between transportation public works and intermodal transportation does not reveal any major investment requirements for intermodal transportation that need to be separated from each of the transport sectors as a whole.

NEW DIRECTIONS FOR THE NATION'S PUBLIC WORKS

1. REFERENCE:

U.S. Congressional Budget Office, September 1988.

2. BACKGROUND/SUMMARY:

New Directions for the Nation's Public Works fulfills the requirement of Public Law 98-501 that the Congressional Budget Office review the findings of the National Council on Public Works Improvement (the Council). With widespread concern over the condition of the nation's public works infrastructure, Senator Lawton Chiles, Chairman of the Senate Budget Committee, requested that this study assess federal programs for highways, mass transit, aviation, waterways, and wastewater treatment and discuss policies that the Congress might consider to improve the effectiveness of these programs.

This report examines methods to balance the need for sound public works with Congress's commitment to fiscal restraint. The body of this report considers some of the broader issues raised by the Council's final report, *Fragile Foundations: A Report on America's Public Works* while the appendix focuses more specifically on the Council's findings.

3. ABSTRACT:

The Congressional Budget Office concluded that the infrastructure programs share common achievements in two ways:

- Almost all have accomplished their goals to a great degree; and
- Together they have forced state and local governments to develop bureaucracies capable of planning, administering, and financing these areas of public life -- so much so that many states are now widely recognized as imaginative infrastructure managers.

At the same time, the various infrastructure modes confront similar sets of challenges:

- Transition from an era of construction to one of maintenance, rehabilitation, and replacement is evident in almost all modes;
- Current programs give state and local managers no incentives to solve infrastructure problems with "nonstructural" approaches, and often encourage them to select projects that create local, rather than national benefits; and
- A final challenge confronting all infrastructure programs is a changing institutional environment.

The Congressional Budget Office evaluated a wide range of options intended to make federal infrastructure policies more responsive to current challenges and more cost-effective. Most of these options stem from four approaches: pricing infrastructure services more efficiently; targeting federal assistance more effectively; assigning more infrastructure responsibilities to states and localities; and fostering greater competition among different forms of infrastructure for federal funds.

THE NEXT GENERATION IN THE MANAGEMENT OF PUBLIC WORKS: GETTING SOME OF IT TOGETHER

1. REFERENCE:

Royce Hanson, University of Minnesota, September 1986.

2. BACKGROUND/SUMMARY:

While public utilities have grown in the past, they are now in decline. Private utilities, once seen as a temporary expedient to bridge the time until they could be taken over by a public entity, are becoming more and more commonplace. Projects must now be financed in an unstable financial market, making financial planning difficult. This report explores how management of public works projects has evolved and changed over the years.

3. ABSTRACT:

Initially, managers, most of whom are engineers, had a free reign in terms of projects and their goals. But now their judgement is increasingly challenged by the public. The new generation of general managers needs to adapt to change. Reorienting public works managers to think about management ahead of construction will involve a considerable cultural shift. Engineers and public works directors think of themselves as builders, not as maintainers and managers. Replacing the "edifice complex" with a passion for management will require major changes in the education and acculturation of those who lead public works organizations and those who educate them.

Career paths for managers in public works are also slowly changing. First generation managers came almost entirely from the engineering profession. The largest number tend to rise from the ranks of their organizations and spend all or most of their careers in the same agency. Second generation managers were more likely to have some formal management training, but were also specialists in public works. The third generation of managers are more frequently generalists-managers with professional backgrounds in management, although many also have professional engineering backgrounds.

Getting it all together remains the imperative of management. In public works, the management profession has only begun to make significant inroads on the practices of the systems. In the next generation, a solid transformation of the way in which infrastructure is provided and produced and in the way it is managed may occur.

REBUILDING THE FOUNDATIONS: A SPECIAL REPORT ON STATE AND LOCAL PUBLIC WORKS FINANCING AND MANAGEMENT

1. REFERENCE:

U.S. Congress, Office of Technology Assessment, March 1990.

2. BACKGROUND/SUMMARY:

In 1988, prompted by the many national studies calling for more investment in public works infrastructure, the Senate Committee on Environment and Public Works and the House Committee on Public Works and Transportation requested that the Office of Technology Assessment (OTA) evaluate how technologies, management, and financing could improve public works and make them more efficient and productive.

Several issues quickly dominated OTA's discussions with state and local public works officials. This report documents the concerns on how to raise more money for upgrading and maintaining public works, how to enhance public works, and how to preserve the community environment and quality of life. Local officials focused on the complex tasks of resolving conflicts among these issues in a politically charged and controversial arena, whereas state representatives highlighted the steps they have already taken to increase support for localities. Moreover, this report outlines the roles of federal, state, and local governments and points to ways of strengthening the intergovernmental structure for managing and financing public works.

3. ABSTRACT:

OTA concludes that all levels of government will have to raise taxes or fees to cover their public works costs, or else they have no choice but to eliminate or reduce programs or services. OTA found widespread agreement on the need to maintain and upgrade public works and to increase support for infrastructure. In the near-term future, federal spending is expected to focus on social programs. Therefore, state and local governments must continue to finance a larger share of their public works needs with their own revenue, such as general and dedicated taxes, fees, and benefit charges and with private sector partners, if feasible. OTA has found that each of the revenue sources identified has political, fiscal, and policy trade-offs.

OTA states that user fees and benefit charges have socioeconomic trade-offs that pose complex practical and public policy issues, which include equity and administrative issues, revenue reliability in an economic slowdown, political backlash, or other hardship. OTA concludes that while issues related to benefit charges are difficult, they are not without solutions. Prior to instituting user fees as a major source of public works financing, decisionmakers must consider each choice carefully.

Nevertheless, OTA concludes that benefit charges and earmarked taxes have proven to be relatively reliable and politically acceptable revenue sources. In order to increase state and local tax revenue, strong and committed political and community leadership, persistence, and a good public information program are vital to its success.

OTA cites the growing need for environmental services in communities across the nation and that a stable federal revenue source would provide assistance to state and local governments struggling with environmental issues which often extend beyond jurisdictional boundaries. OTA concludes that a strong case can be made for a dedicated source of revenue to bolster local environmental program funding. This is important for the federal government to consider if localities are to meet its timetable for compliance with newly enacted standards.

OTA's research for this report indicates that state and local public works problems could be alleviated if the federal government developed and implemented a national transportation policy and restructured transportation and environmental management with congressional oversight.

TOWARD A FEDERAL INFRASTRUCTURE STRATEGY: ISSUES AND OPTIONS

1. REFERENCE:

Advisory Commission on Intergovernmental Relations, August 1992.

2. BACKGROUND/SUMMARY:

In 1991, an appropriation was made to the U.S. Army Corps of Engineers to develop a federal infrastructure strategy in consultation with other federal agencies, state and local governments, and private organizations. At the Corps' request, the Advisory Commission on Intergovernmental Relations (ACIR) facilitated the interagency consultation process by convening a series of workshops for government representatives, public works providers, and related groups. The findings of earlier reports provided a framework for the dialogue. Each group also responded to questionnaires covering basic financing, performance, and governing practices. The participants advised working toward specific actions to carry out the recommendations contained in earlier reports rather than conducting another study. This report documents the year-long consultation process and recommends that it continue, with a strong focus on developing specific opportunities for improvement.

3. ABSTRACT:

The past decade has brought significant changes in the federal government's infrastructure roles, in that its financing role has declined while its regulatory role has expanded. State and local governments and the private sector are assuming greater public works responsibilities, but the transition has not been smooth. State and local governments, like the federal government, have budget problems, and the private sector has been in a long economic recession.

In reassessing the appropriate size and form of the federal role, it is necessary to ask should state and local governments and the private sector take greater responsibility for the nation's infrastructure. It has not been determined whether it is practical to develop a comprehensive federal infrastructure strategy. Nevertheless, based on the consultations, a broad consensus emerged around five key infrastructure issue areas that should be addressed by the federal government: (1) rationales for federal investment, (2) regulations, (3) technology, (4) financing, and (5) management. Within each category, participants examined (in order of importance): strategic investment, regulatory and administrative relief, flexibility in federal funding, research and development plus technology transfer, intergovernmental funding, revenue diversification, and management improvement. The issues and strategies are summarized below.

Rationales for Federal Investment - Invest Strategically. Improved infrastructure is needed to sharpen America's competitive edge, economic productivity, and efficiency. Clear national goals for infrastructure should be articulated. Greater political commitment to support a healthy infrastructure and national needs studies should be directed toward effective achievement of clear strategic investment goals.

Regulation - Agree on Roles and Responsibilities. Regulatory and administrative burdens in providing infrastructure should be reduced. Flexibility in spending federal aid for infrastructure and in complying with federal and state mandates should be increased. The intergovernmental burdens and lack of flexibility that hamper the provision of infrastructure are symptoms of differing perceptions about appropriate federal, state, local and private roles. These differences should be narrowed by building closer partnerships. Also, special attention needs to be given to the compliance of small governments.

Technology - Develop and Apply New Technologies. The potential for new technologies, and other products of research, to help solve infrastructure problems is great; it should receive greater attention. Accelerated technology sharing programs should be an integral part of this effort. More effective federal strategies and greater resources are essential to the success of this effort.

Financing - Readjust Infrastructure Financing. The enormous changes in public revenue systems and expenditure patterns that have left infrastructure at a disadvantage. This situation requires significant adjustment in infrastructure financing methods. Specific adjustments that should be considered include: mechanisms that result in beneficiaries paying a greater share of costs; intergovernmental funding; tax-exempt funding; and revenue diversification.

Management - Improve Infrastructure Management. Management methods and practices should be reformed to focus on the performance of services (as indicated by output measures) rather than on facilities and operations. There should be incentives to stretch the safe and useful lives of public works through improved maintenance, to use the most cost-effective means of serving the public in each situation, and to lower arbitrary barriers to using low-capital techniques. Flexible funding and flexible regulations can help ensure successful performance management. Finally, capital improvement programming and prioritizing should be used more fully in appropriate final settings by all governments.

The Commission recommends that state and local governments, and federal infrastructure agencies work more closely together to make the nation's infrastructure more efficient, better coordinated, and more highly productive. The opportunities that should be considered in working towards these goals include:

a) Establishing programs to educate the general public, public officials, and public works professionals about the importance of public works to the nation and the innovations needed to keep America's infrastructure systems among the world's most productive;

b) Developing improved methods for preparing performance-based infrastructure needs studies reflecting strategic objectives;

c) Establishing infrastructure-specific guidelines for applying the Federalism Executive Order, the "small government" provisions of the *Regulatory Flexibility Act*, the *Administrative Dispute Resolution Act of 1990*, and the *Negotiated Rulemaking Act of 1990*;

d) Making greater use of the *National Environmental Policy Act* as an interagency focus to combine reviews and streamline the process for issuing environmentally sound infrastructure permits;

e) Pooling federal agency experiences in using performance-standard regulations and mandate reimbursement practices;

f) Developing a national cooperative infrastructure research program, including a strong technology transfer component;

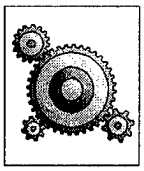
g) Removing or minimizing the barriers and risks confronted when innovating new technologies and practices;

h) Establishing principles and guidelines for public agency benefit, cost, and deferred maintenance accounting;

i) Evaluating the benefits and limitations of innovative financing techniques, including user fee systems, state revolving loan funds, tax exempt financing, and privatization techniques, and publicizing successful innovations;

j) Improving the methods and practices of capital improvement programming and benefit-cost analysis; and

k) Promoting geographic data coordination.



4. MISCELLANEOUS TOPICS

HOW DOES PUBLIC INFRASTRUCTURE AFFECT REGIONAL ECONOMIC PERFORMANCE?

1. REFERENCE:

Alicia H. Munnell, *New England Economic Review*, September/October 1990.

2. BACKGROUND/SUMMARY:

Infrastructure failures spur a debate on the nation's capital investment policies, accompanied by economists' claims that public capital investment makes a significant contribution to national output, productivity, growth and international competitiveness. Such conclusions have generally been based on observed patterns of national and international spending on public capital and various measures of economic performance. Critics have charged that the empirical work overstates the impact on productivity by ignoring other factors, that the direction of causation between public investment is unclear, and that even if the historical empirical relationships were estimated correctly, they provide no clear indications for current policy.

This paper does not respond to the criticisms but rather offers another dimension to the emerging picture of the relationship between public capital investment and private economic activity. It explores the impact of public capital on output, employment growth, and private investment at the state and regional level.

3. ABSTRACT:

The paper consists of four parts:

- Since no comprehensive measures of public or private capital are available at the state level, the first section explains the construction of such data and describes the distribution of these wealth measures by state and region.
- The second section uses these data to estimate an aggregate production function in order to determine whether the positive relationship between output and public capital, which has been documented at the national level, holds up for individual states and regions.
- The third section moves from the steady state to the adjustment process and explores the relationship between public investment and private investment, attempting to determine the direction and magnitude of the effect.
- The fourth section introduces the public capital data into a firm location model in order to see whether variations in public capital by state have had any impact on state-by-state employment growth.

Three exercises exploring the relationship between public capital and economic activity are described.

- The first looked at the role of productivity in the production process and found that public capital had a positive, statistically significant impact on private sector output.

- The second exercise involved investigating the role of public capital in private sector involvement. Here two opposing forces were at work. On the one hand, the evidence clearly indicated that public capital enhances the productivity of private capital and through this mechanism public capital would be expected to stimulate private sector investment. On the other hand, the results of a translog production function indicates that the bulk of state and local public capital is a substitute for private capital, which indicates that the more public capital on hand, the less private investment required. This exercise needs further investigation.
- The third exercise explored the relationship between public capital and employment growth in order to determine whether the stock of a state's physical infrastructure influenced firm location and subsequent growth. The empirical work provided convincing evidence that a state's investment in public capital had a significant positive impact on that state's private employment growth.

According to Munnell, "The conclusion that this country has underinvested in public capital and that public capital has a positive impact on economic activity does not mean that the United States should blindly double the amount of money it spends on public capital; nor does it mean that careful cost-benefit analyses are no longer needed for individual projects." Instead, Munnell concludes, "...the results indicate that more spending on public investment, which is clearly needed to remedy serious safety hazards and to improve the quality of life, may also produce greater productivity and growth."

INFRASTRUCTURE INVESTMENT: A REVIEW ESSAY

1. REFERENCE:

Edward M. Gramlich, *Journal of Economic Literature*, September 1994.

2. BACKGROUND/SUMMARY:

Although macroeconomists have long felt that the stock of public capital is an important factor input in the production of total output, analysis of the U.S. productivity slowdown beginning around 1973 completely ignored infrastructure investment for the first fifteen years, concentrating instead on energy prices, social regulation, the composition of the work force, research and development, different rates of obsolescence of public capital, and other factors. The public capital stock was hardly ever mentioned as a potential factor in the productivity slowdown.

David Aschauer wrote a series of papers that put these two movements together. Both in the U.S. and in some other developed countries, a downturn of infrastructure investment was followed soon thereafter by a downturn in aggregate productivity. This essay reviews the questions of how to identify a shortage of infrastructure investment, whether or not there was an overall shortage, and if so, was the shortage a factor in the decline of aggregate productivity. This essay then examines whether policies regarding infrastructure investment should be changed and, if so, which ones.

3. ABSTRACT:

There have been four ways of trying to determine if there is, or was, a shortage of infrastructure investment:

- Engineering assessments of infrastructure needs;
- Political measures based on voting outcomes;
- Economic measures of rates of return; and
- Econometric estimates of productivity impacts.

Engineering Assessments. Typically, engineering assessments relied on studies of the condition of, and need for, capital facilities. The studies specified some desired capital stock based on some arbitrary initial period when capital was assumed to be adequate, and then measured desired investment as the gap between this and the actual stock. There was almost no economic reasoning anywhere in the calculation -- fixed proportions were assumed, there was no adjustment for excessive or underutilized initial capital, and there was no recognition that citizens may want to trade off the benefits of greater capital against the costs.

Many of these engineering-type studies involved highways, the largest and most volatile component of the infrastructure capital stock. George Peterson's 1991 analysis of the 1980s

shows that these physical needs studies suggested smaller highway infrastructure gaps as time passed and as they were done more carefully. Other needs assessments for water and sewer systems, aviation, and mass transit also reflect the same story -- while one could make some case for a shortage of infrastructure capital, the shortages are not dramatic and it is far from clear that any step up in present rates of investment are required. Therefore, these needs assessments do not make a compelling case for an overall shortage of infrastructure capital.

Political Measures. State and local officials report that their biggest hurdle in building new infrastructure capital is in gaining the approval of voters. Approximately 20 percent of all new state and local construction must now be approved by referenda, which suggests that referenda voting might prove a good way to identify and measure infrastructure shortages. Peterson also analyzed the results of referendum voting in 1991. He constructed a model explaining the results of voter referenda on capital investment projects. To determine whether a large gap in infrastructure investment opened up in the 1980s, Peterson analyzed the results of bond voting over time. Over the entire period the approval share averaged 70 percent, well above half as Peterson predicted. As with the needs assessments, there is no clear evidence of an infrastructure shortage from these voting data.

Economic Measures. The economic approach to infrastructure investment involves computing all the benefits and costs of projects and then their rate of return. While the methodology for computing real rates of return and the implied present value of net program benefits has been around in one form or another for decades, few careful calculations of rates of return are available for infrastructure investment. Nevertheless, a mixed picture has emerged, which shows that it is hard to make an aggregate case that highway investment was too high or low.

Econometric Estimates. Although macroeconomic studies might seem to be one of the least efficient approaches for determining infrastructure gaps, these studies have commanded the most attention. The basic idea is simple -- expand an aggregate production function to include the public capital stock. The production function is written as: $Q = AF(K,L)$, where K is the stock of private capital, L is the labor force, and A is an index representing total factor productivity. Aschauer then makes A function of the services provided by the government capital stock (G), rewriting the function as $Q = A^*F(K,L,G)$, where A^* is total factor productivity purged of the influence of the government capital stock.

A number of logical econometric criticisms have been made of this macro time series approach. The logical considerations involve the definition of public capital, the high rates of return obtained from the econometric estimates, and a presumption that high rates of return in the present imply the same for the future. The econometric issues involve common trends in the data that may have different explanatory influences, missing variables in the model specification, and simultaneity bias.

Gramlich believes that it is more useful to ask what policies for infrastructure investment, if any, should be changed, rather than examining whether or not there was an infrastructure investment shortage. He discusses methods for general reform in federal grant programs for infrastructure investment, which include financing all grants from the trust funds and devoting most gas tax revenues to general revenue. Gramlich also cites several advantages to imposing user fees on infrastructure facilities.

In summary, the evidence presented in this essay is inconclusive as to whether an overall infrastructure shortage exists. Gramlich argues that a sensible approach to infrastructure investment is to set up institutional structures that permit state and local governments, the holders of almost all infrastructure capital, to find their own optimal stock by reforming the present system of financing infrastructure investment.

INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: A REVIEW OF THE ISSUES AND OUTLINE OF A STUDY OF THE IMPACTS OF FEDERAL INFRASTRUCTURE INVESTMENTS

1. REFERENCE:

U.S. Army Corps of Engineers, Institute for Water Resources, July 1993.

2. BACKGROUND/SUMMARY:

This study was conducted as an element of the Federal Infrastructure Strategy (FIS) Program, a collaborative interagency study effort facilitated by the U.S. Army Corps of Engineers Institute for Water Resources and designed to develop and stimulate implementation of effective national policies for managing and maintaining the nation's public works.

This study responds to the debate over the cause and effect relationships between infrastructure and the economy. The services which infrastructure provides, such as the improvement in mobility from a new bridge, can change economic output either by affecting suppliers of goods and services or by affecting total demand for those goods and services. In general, there is agreement that the services provided by infrastructure, broadly defined to include all types of public works, have a positive effect on measured output. While empirical results generally show that infrastructure's positive impact on production is greatest at the national level, the positive effects of infrastructure on output appear to become smaller because the impacts become increasingly difficult to detect as the level of analysis gets more specific.

3. ABSTRACT:

This report (IWR Report 93-FIS-4) describes the effort and the process by which the study's workplan was derived and covers the following three main topics:

- A discussion of what previous research does and does not tell federal policymakers about the economic impacts of infrastructure investments;
- A description of the findings of a series of interagency workshops with invited academic experts regarding the objectives of and methodological approaches for the current foundation of an economic policy study of infrastructure investments; and
- An outline of the goals and activities associated with this study.

Workshop participants struggled with a number of issues regarding appropriate study design and focus. However, at the conclusion of the three workshops, some general propositions about research needs and limitations became clear.

- The growing literature on public capital has spawned a number of surveys of that literature. These surveys are useful and there is no need for another one. Instead, these surveys should be built upon with new information and original research.

- Economic theory alone cannot provide answers to the questions of how and how much public capital matters. Economists have been guided by their theories to investigate particular aspects of the infrastructure problem. However, where theory provides some guidance, the limited evidence often raises more questions rather than confirmations.

- The federal government could use some directed research to address the question of where best to invest public capital. The existing literature provides almost no guidance on how to allocate non-military public capital. Although federal agencies have conducted some original research on their own, little comprehensive, systematic, or inter-program work has been accomplished.

The end result of the workshops was a workplan perceived to be relevant to federal policymaking needs and, hopefully, likely to result in some advance from the current state of knowledge. The workplan consists of four tasks designed to deal with some of the challenges faced in prior research which has kept guidance to federal policymakers fairly limited.

- **Organization of an Analytic Framework**: In order to confront the challenge of conducting a comprehensive analysis of the economic and non-economic impacts of the federal infrastructure system, the study should begin by developing an overall framework to account for all costs and benefits, broadly defined, of federal infrastructure investment. This framework will serve as a shell to be filled in as the study progresses, which will integrate economic and non-economic impacts of public works into a single conceptual view.

- **Data Collection**: The study seeks to improve understanding of the potential rates of return to future infrastructure investments. High quality capital stock data regarding appropriate and relevant phenomena is necessary to reach this goal. Given the interagency nature of this effort, the study will target the discovery of previously unpublished data to supplement available information on the quantity and quality of the services provided by federal capital stock.

- **Comparison**: An oversimplification of the infrastructure debate thus far might place cost-benefit approaches on one side, favoring no new large-scale increases in public capital investment, and production function approaches on the other side, favoring such large increases. To untangle some of the issues, the core of the effort is a controlled comparison, on comparable data, between broad benefit-cost analyses of investments in infrastructure modes and production or cost function analyses of the same investments.

- **Simulations**: The study seeks to be relevant to policymakers, particularly at the federal level, by focusing on federal programs and simulating the economic impacts of federal investments, employing a with/without analysis, and using prospective simulations of both benefit-cost and production function analysis.

INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: AN INTERIM REPORT

1. REFERENCE:

U.S. Army Corps of Engineers, Institute for Water Resources, Volumes 1-3, February 1994.

2. BACKGROUND/SUMMARY:

This study was conducted as an element of the Federal Infrastructure Strategy (FIS) Program, a collaborative interagency study effort facilitated by the U.S. Army Corps of Engineers Institute for Water Resources and designed to develop and stimulate implementation of effective national policies for managing and maintaining the nation's public works.

This interim report follows up the July 1993 publication *Infrastructure in the 21st Century Economy: A Review of the Issues and Outline of a Study of the Impacts of Federal Infrastructure Investments* (IWR Report 93-FIS-4). That report described the beginning of the effort in which the Corps presented a scope of work to three different panels composed of professional economists and other staff from federal agencies, Congress and academia, and solicited participation devising a concrete research plan. This report presents the results of the first phase of the study.

3. ABSTRACT:

This interim report is composed of three volumes. Volume 1, entitled *The Dimensions of Public Works' Effects on Growth and Industry* (IWR Report 94-FIS-7), contains an overview of the research effort to date, comprised of the three related research tracks to capture the different dimensions of infrastructure's effects on the economy. The three separate tracks describe how infrastructure investment affects economic structure, estimates those impacts numerically, and measures the long-run impact on the macroeconomy, and also describes the process which resulted in this research design. This volume also includes proceedings of the panel meeting, held in October 1993, in which the research design was analyzed and discussed.

Volume 2, entitled *Three Conceptual Papers Exploring the Link Between Capital and Productivity* (IWR Report 94-FIS-8), contains technical papers which developed and documented the research approaches which form this study. The first paper, "Public Capital and Economic Growth: The Micro-Macro Linkages," by Dr. Charles R. Hulten of the University of Maryland at College Park, describes the different theoretical ways in which public capital moves through the economy and suggests that a Computable General Equilibrium (CGE) model may be used to capture and delineate these effects.

The second paper, "Public Capital, Productivity, and Macroeconomic Performance: A Literature Review," by Dr. David A. Aschauer of Bates College, analyzes how public capital effects the overall economy in the long-run. Dr. Aschauer describes a dynamic endogenous growth model which will be used to capture these long-term effects and estimate the "optimal" long-run level

of public investment as well as how this optimum can be affected by different methods of financing, for example, deficit versus taxes.

The third paper, "Infrastructure Capital and Productivity Analysis: Cost- and Profit-Function Approaches," by Dr. M. Ishaq Nadiri of New York University, addresses the effect of public capital on specific industries and describes an econometric framework, using what are known as cost functions, for estimating infrastructure's impact on productivity within and across different sectors of the economy.

Volume 3, entitled *Data on Federal Capital Stock and Investment Flows* (IWR Report 94-FIS-9), contains the details of a database on public capital collected and developed by Apogee Research, Inc. These data and other information that is currently being collected will feed into all three research tasks to provide for consistency in each of those efforts in the data to be analyzed. The data which have been collected contain information on annual investment flows, and capital stocks, the accumulation of these annual investments, net of depreciation, for expenditures in the areas of transportation, water resources and supply, and waste management by all levels of government.

IS PUBLIC EXPENDITURE PRODUCTIVE?

1. REFERENCE:

David Alan Aschauer, *Journal of Monetary Economics*, March 1989.

2. BACKGROUND/SUMMARY:

This article was among the first to lay a theoretical framework for the relationship between public expenditure and productivity. The results of this paper proposed tentative answers to at least two questions of importance in the macroeconomic literature. First, by indicating the degree to which public expenditures are productive, it puts policymakers in a better position to judge the extent to which public expenditure policies induce excess aggregate demand pressures, raise interest rates, and stimulate production. Second, it allows an analysis of the role of government expenditures in explaining longer-term movements in productivity.

3. ABSTRACT:

This paper considers the extent to which productivity can be explained by public-sector capital accumulation as well as by the flow of government expenditures on goods and services. Traditional fiscal policy discussions focus on the effect of government deficits on the private economy, ranging from forcing up real interest rates and "crowding out" private investment in additional plant and equipment to raising wealth and stimulating household consumption demand.

In contrast, the equilibrium or new classical approach to fiscal policy presents a different analysis of the impact of fiscal decisions on the private sector. At the core of this perspective is the premise that financial policies of the government do not affect private sector outcomes, i.e., there is an equivalence between tax and debt. This equilibrium approach allows an important shift of emphasis to the public-sector decisions that are made regarding real variables. For instance, other scholars have emphasized the difference between transitory and permanent changes in the level of government purchases of goods and services for explaining movements in interest rates, output, and the trade balance.

The paper derives a formula for total factor productivity that accounts for a combination of units of labor, private capital inputs, and public capital inputs. It includes an empirical analysis, focusing on the period 1949 to 1985 utilizing annual data. The empirical study finds that a 1 percent increase in the ratio of public to private capital stocks raises total factor productivity by 0.39 percent.

The annual growth rate of total factor productivity in the private business economy slumped to 0.8 percent per year in the period 1971 to 1985 -- a significant drop from the 2.0 percent over the two decades from 1950 to 1970. The results of Aschauer's article suggest the importance of considering public capital expenditures in attempting to explain the productivity decline.

By deemphasizing the importance of public financial decisions, the new classical approach has opened up new areas of analysis. The role the government plays in the course of economic growth and productivity improvement must be recognized; significant weight should be attributed to individual public investment decisions. Dr. Aschauer believes it would be useful to extend the analysis to a cross-country comparison of public investment and productivity trends.

ISSUES IN DEFERRED MAINTENANCE

1. REFERENCE:

Harry P. Hatry and E. Blaine Liner, The Urban Institute, for the U.S. Army Corps of Engineers, Institute for Water Resources, November 1994.

2. BACKGROUND/SUMMARY:

This study was part of the Federal Infrastructure Strategy program. It was conducted by an Urban Institute study team in coordination with an intergovernmental advisory panel. The report (IWR Report 94-FIS-16) presents the findings from an examination of public agency practices (federal, state, and local) in analyzing and reporting deferred maintenance on their facilities, such as roads, bridges, buildings, water or sewer systems.

The team examined existing literature (the results of which are presented in detail in a separate report), and followed up on a small number of past and active federal, state, and local agency efforts (including field visits to review the activities in New York City and San Jose, California). The study team found a highly limited amount of literature or ongoing efforts by public agencies directly addressed to the analysis and reporting of deferred maintenance.

3. ABSTRACT:

The literature and field interviews make a strong case for reporting annually the amount of deferred maintenance. Such information is needed for proper stewardship of public assets and can provide needed information to public officials to help them make more informed judgements as to the allocation of scarce public resources. Public agencies should, each year, provide to their elected officials and the public information as to the implications of deferring maintenance on the assets managed by those agencies.

The following recommendations are presented as basic overall suggestions for governments and agencies:

- Public agencies at all levels of government (federal, state, and local) should develop a process for reporting annually their best estimates of the amount of deferred maintenance (i.e., maintenance backlog), expressed as the estimated costs to bring assets to a minimum acceptable condition level.

- Deferred maintenance should be categorized into at least two categories of degree of importance.

- Governments and agencies should be asked to provide information on the implications of continued deferral. To the extent feasible, this information should be provided both on

the amount of added cost that would be incurred and the impacts on service quality, health and safety of such deferrals.

- Governments with many different agencies, and agencies with many different programs and facilities should at the beginning of each year provide common ground-rules and guidelines to their various units on what is to be defined as deferred maintenance, what should be the standard for minimum-acceptable condition for major types of assets, and what information is requested on the likely implications of deferrals for each major category of deferred maintenance.

- Governments, their agencies, and the developers of the various maintenance management systems should build into these systems provisions for providing annual year-end estimates of the amount of deferred maintenance and the cost to bring that amount up to a minimum-acceptable condition level.

- Since the potential cost of condition assessment can be major if an agency attempts to cover annually 100 percent of its assets, agencies should consider a stratified sampling approach for condition assessment.

Suggestions for national research and development and information dissemination efforts include:

- A comprehensive survey and follow-up of federal, state, and local agencies (at least the larger local agencies) should be undertaken to identify the current status across the country in their use of procedures needed for estimating deferred maintenance.

- Maintenance management systems developed for national usage should be modified so as to be able to provide year-end estimates of the amount of deferred maintenance.

- A national is effort is desirable to identify ways to better estimate added costs from deferrals of maintenance for major categories of infrastructure and of deferrals' impacts on service quality, health and safety. The development work needs to be tailored to specific types of infrastructure.

MOVING AHEAD: 1991 SURFACE TRANSPORTATION LEGISLATION

1. REFERENCE:

U.S. Congress, Office of Technology Assessment, June 1991.

2. BACKGROUND/SUMMARY:

The Senate Committee on Environment and Public Works, in anticipation of heated debates on highway, transit, and related surface transportation issues, requested the Office of Technology Assessment (OTA) in May 1990 to use the information and background accumulated during its infrastructure studies, *Rebuilding the Foundations* and *Delivering the Goods*, to undertake a focused analysis of surface transportation policies, programs, and technologies. The Committee wanted to use this report to help identify changes and set new priorities for federal surface transportation assistance programs.

The categorical grant programs and apportionment formulas that are part of most current federal assistance to surface transportation are extremely complex and incorporate some of the most divisive and contentious aspects of legislative decisionmaking. In order to ensure that a spectrum of policy options is presented, *Moving Ahead* provides four illustrative, generic models with program components that can be mixed and matched. Other items discussed in this report include safety, research and development agendas, and motor carrier issues, with special attention to heavy trucks with multiple trailers.

3. ABSTRACT:

OTA's discussion of transportation system needs for the 1990s and beyond concludes the following:

- Addressing system rehabilitation and maintenance problems is the top priority for new highway legislation.
- The resiliency and long-term growth of the economy depends on an efficient and balanced transportation system; intermodal cooperation and the linkages between the modes will be the keys.
- New surface transportation legislation needs to establish processes that incorporate environmental issues as well as engineering and economic factors. Environmental considerations must be included in the early stages of policy and project planning.
- Federal policy could promote an intermodal model that integrates Interstates, other arterials, rural highways, waterways, freight and passenger rail lines and air corridors into a national transportation system.

- If Congress wishes to reduce federal program matches substantially to leverage more state and local spending, the impact on individual states must be assessed.

OTA's discussion of program goals, structure, and funding explains how the proposed 1991 Surface Transportation Assistance Act substantially restructures the existing program and reduces the federal share in almost all programs, although it maintains a highway focus and deemphasizes mass transit resources. To help Congress sort through the numerous options and tradeoffs associated with each, OTA developed four generic program models, A, B, C, and D, reflecting a spectrum of goals. Model A is the most similar to the existing program, while Model D represents fundamental changes in program structure. However, according to OTA, "...all models place higher priority on system preservation, operational improvements, and intermodal linkages than is currently given."

OTA's discussion of motor carrier issues outlines what is known about the most recent difficult issue -- long heavy trucks, knows as longer combination vehicles (LCVs) to assist Congress in its deliberations on the highway reauthorization. OTA concludes that Congress should require the Department of Transportation (DOT) to develop training standards and requirements for tractor-trailer and LCV drivers under the Commercial Drivers' License Program. Congress should also require DOT to develop and implement appropriate studies and in-service fleet testing of safety enhancing technologies on LCVs. OTA emphasizes that such test programs and development and implementation of federal standards must precede any changes to federal laws applicable to heavy vehicle operation to ensure nationwide highway safety.

NEW TRANSPORTATION CONCEPTS FOR A NEW CENTURY

1. REFERENCE:

American Association of State Highway and Transportation Officials, October 1989.

2. BACKGROUND/SUMMARY:

This report was prepared under the guidance of the AASHTO Task Force on a Consensus Transportation Program. Three earlier editions were published, the first in December 1988, the second in February 1989, and the third in July 1989, all of which were replaced by this Final Edition.

One purpose of this AASHTO report is to make recommendations on national transportation programs for consideration by other participants in the AASHTO-initiated Transportation 2020 program, including the Transportation Alternatives Group, and for the use of Congress and the states in developing new transportation legislation. In addition, the goals and recommendations contained in this report have been provided to the U.S. Department of Transportation (DOT), for consideration in the DOT's development of a National Transportation Policy.

As is required under the Association's procedure for publication of an AASHTO report with recommendations, through actions taken in 1988 and 1989 the content of the Final Edition was considered and approved by more than the necessary two-thirds majority of the Board of Directors/Policy Committee of the Association.

3. ABSTRACT:

According to AASHTO, "Efficient Transportation helps America compete." The intermodal approach to transportation promotes efficiency and will help America meet its transportation challenge. It is AASHTO's belief that each transportation system, or each mode, must become more efficient in order for the nation to reach its competitiveness goals.

The nation's transportation system is a complex, dynamic network of physical facilities, operations, and management practices. This system for moving people and goods is essential to domestic productivity, international competition, and quality of life. Transportation accounts for 15 percent of national employment and a substantial portion of the cost of consumer goods. Investments in the transportation system are enormous, totaling over $800 billion, nearly 20 percent of GNP. According to AASHTO, "This system must be maintained."

AASHTO concludes that the nation invests much less in transportation than it did over the past two decades and that the nation continues to invest less than what is needed even to maintain current services, let alone improve the quality of transportation. Moreover, the nation must invest significantly more in transportation if it is to keep pace with a growing America and if it is to help America regain its competitive edge in a world economy.

The individual chapters of this report detail AASHTO's transportation program recommendations for aviation; highways and public transportation; railroads; water; and research, development, and technology transfer. Implementation of these programs is vital, according to AASHTO, in order to give America the multimodal transportation network needed to match the challenge of the 21st century.

PERSPECTIVES ON URBAN INFRASTRUCTURE

1. REFERENCE:

Royce Hanson, National Research Council, Committee in National Urban Policy, 1984.

2. BACKGROUND/SUMMARY:

In November 1981, the National Academy of Engineering held a workshop on urban infrastructure and identified a long list of policy issues for further exploration. In June 1982, a second workshop, held by the Committee on National Urban Policy of the Commission on Behavioral and Social Sciences and Education, the Commission on Engineering and Technical Systems, and the Transportation Research Board, considered the problems of defining needs and setting priorities for urban infrastructure. Participants at that workshop felt that there was a need for an in-depth look at the Nation's infrastructure problems and urged the holding of a symposium to develop a specific research agenda for the National Research Council and other interested organizations.

In 1983, the National Research Council (NRC) held a Symposium on the Adequacy and Maintenance of Urban Public Facilities. Participants included a cross-section of the academic, political, administrative, and professional leadership of the country in urban public works and civil engineering systems. The objectives of the symposium were to lay out the basis for a research agenda on salient policy issues and to identify and discuss major policy concerns.

3. ABSTRACT:

This report serves to layout a basis for a research agenda on solvent policy issues and to identify and discuss major policy concerns. It is clear from an examination of the historical record that infrastructure has played a critical role in urban development in each of the periods surveyed. It is also apparent that infrastructure provision has been affected by a number of different demand and supply factors. Important on the demand side have been the activities of city boosters and the downtown business establishments, real estate developers, urban politicians, contractors, suppliers of materials, and various professional groups.

Traditional needs surveys can be classified as studies that determine projected needs based on whether facilities satisfy a given set of standards. These surveys are necessarily general, based on assumptions that, while reasonable at the abstract level, are of limited use at the specific facility level. The broader the survey in scope, the greater the potential of overgeneralizing the situation, because of the use of broad assumptions and the failure to eliminate marginal projects, which, while desirable, could be eliminated without undue burden on the public.

In developing financial programs, it is important to distinguish between new capital projects and maintenance spending. It is also important to separate the different kinds of maintenance, ranging from routine operating maintenance, to major repairs, to upgrading of facilities. It is important

not to use capital funds for the routine operations of a facility, but some of the things we generally regard as maintenance may be alternatives to new facilities. We must avoid the trap of letting facilities run down to the point that they need "capital" repairs because there is no money available for ongoing maintenance.

Both public works professionals and politicians must recognize the changes that have taken place in public expectations with respect to levels of service. These have to be reconciled with the fact that current resources do not permit a dramatic increase in services. Therefore, services levels will have to change. An important problem is how to bring more rationality to the process of making those trade-offs. This requires improved information, as well as an improved process by which the information is translated, so that department heads, political leaders, interest groups, and the general public can understand what the choices are.

Research has been a small item in agencies that are concerned with infrastructure, and in the industries that supply the materials and equipment used to build infrastructure. In industry, the amount spent on research and development is trivial. For transportation, for example, only 0.017% of the total capital expenditure is for research; even this percentage is falling. If we expect to improve the performance or durability of infrastructure, then a sustained research effort is needed.

THE PROSPECTS FOR PRIVATIZING INFRASTRUCTURE: LESSONS FROM U.S. ROADS AND SOLID WASTE

1. REFERENCE:

Jose A. Gomez-Ibanez, John R. Meyer, David E. Luberoff, *Journal of Transport Economics and Policy*, September 1991.

2. BACKGROUND/SUMMARY:

This article, written by three Harvard professors, explores the prospects for privatization by examining the U.S. experience of privatizing two categories of infrastructure: toll roads and solid waste disposal facilities. It discusses missing dimensions in the privatization debate, trends in the privatization of roads and solid waste, cost and financing, siting, pricing, and regulation. It also provides an overall assessment of the utility of privatization in meeting solid waste disposal and toll road needs.

3. ABSTRACT:

The privatization debate in the U.S. has focused on the potential cost advantages of private ownership or operation and related attempts to modify the tax code to allow private firms to compete on an equal footing with public ones. These concerns are relevant, but can divert attention from other considerations. Local neighborhood and environmental opposition to facilities is often as much of a barrier to infrastructure creation as cost. In addition, the traditional cost debates fail to distinguish between savings that are net efficiency gains to society as a whole and those that represent transfers from one sector of society to another. The discussion of tax code changes and financing costs, for example, generally focuses solely on the net return to investors, rather than the extent to which taxpayers win or lose under either public or private financing arrangements, or the cost to state or local taxpayers of the equity that is often contributed to public projects. The evolution of private sector involvement in highways and solid waste disposal facilities is reviewed. The relative advantages of the public and private sector are then compared. Finally, an overall assessment is offered of winners and losers under privatization, and circumstances that favor privatization are described.

In the United States, privately owned and operated toll roads have been a rare phenomenon for the last 100 years. A recent revival of U.S. interest in both tolls and private highways was stimulated by budgetary pressures. Proposals have emerged in a number of states to build and operate privately-owned toll roads. In contrast, solid waste disposal has had a strong history of private involvement. Initially, solid waste disposal in the U.S. was the responsibility of private citizens until the mid-1800s, when the emergence of large industrial cities greatly increased the problem of urban waste, and cities increasingly assumed a governmental responsibility for the collection and disposal of waste. This responsibility was often contracted out by cities, to avoid the high costs of collection equipment and the political difficulties of siting waste disposal facilities.

However, the rise of the environmental movement dramatically changed waste disposal practices and transformed the industry from a labor-intensive one made up of many small firms to a capital-intensive industry dominated by several large firms. As a result of the stricter standards in the Resource Conservation and Recovery Act (RCRA) more than 14,000 landfills operating in 1978 were closed by 1988, and EPA estimated that approximately 40 percent of the remaining 6,000 landfills would have to close by the mid-1990s. All of these changes have revolutionized the industry, required more political and technological sophistication and capital for firms that build and operate waste facilities.

Two arguments in favor of privatization are that private involvement increases the total infrastructure investment and improves the quality of the projects selected (since the projects have to be economically-sound to meet private investors' expectations). Another potential advantage is the lower cost of private sector building and operation. Some of these cost savings can be attributed to lower wages paid by private operators. Others are attributed to the fact that the private sector can generally plan, design, bid, and build facilities more rapidly. Finally, the private sector is better able to exploit economies of scale, scope, and experience than the public sector.

Another point of comparison between public and private projects is the cost of financing. Public entities have access to tax-exempt capital financing, which many proponents of privatization cite as a disadvantage for the private sector. Yet private entities can take advantage of tax laws allowing private companies to list interest payments as a deductible business expense on corporate income taxes.

Siting, pricing, and regulation are three final issues to consider in privatization. The private sector may have a slight advantage in managing siting of controversial facilities, because they may be able to avoid the public spotlight, have more flexibility than public agencies in the compensation they offer to objectors, and may be more skilled in marketing the benefits of projects. However the public may not trust the private firm to consider environmental and aesthetic issues.

Under most scenarios, organized labor loses under privatization due to lower wage rates and less protective work rules. Landowners may also lose if they have insufficient political power to extract compensation for harm from a facility sited nearby. Taxpayers generally gain from privatization, due to the individual and corporate income tax payments made by the facility and its investors, and from the gains in efficiency that may accrue from private operation. Investors may gain from privatization if they are able to capture the efficiency gains of privatization, instead of passing these on to facility users in the form of lower user charges or better services. Finally, facility users can either gain or lose from privatization, depending on whether higher private financing costs or efficiency savings are passed on to them.

The paper concludes that "Privatization, even if advantageous in other respects will probably do relatively little to alleviate the real or perceived shortfall in infrastructure spending that has come to be known as the 'infrastructure crisis'." The paper states that "some shortfalls in public investment may be well suited to a privatization solution while others may not; their suitability will depend on the competitiveness of the markets served, the realizable extent of any efficiency gains, the complexity of the environmental or externality issues involved, and the extent and character of any redistributions brought about."

PUBLIC PRIVATE PARTNERSHIPS FOR ENVIRONMENTAL FACILITIES: A SELF-HELP GUIDE FOR LOCAL GOVERNMENTS

1. REFERENCE:

U.S. Environmental Protection Agency, Office of Administration and Resources Management, May 1990.

2. BACKGROUND/SUMMARY:

This self-help guide for local governments was written by the U.S. Environmental Protection Agency to introduce local officials to the concept of public-private partnerships for environmental facilities, their benefits, and the steps that a community must take to enter into partnerships with the private sector. The report includes the following sections:

- Public-private partnerships: what and why;
- Building a public-private partnership: an action checklist; and
- Financing, procurement, and the service agreement.

3. ABSTRACT

The guide defines a public-private partnership as "a contractual relationship between a locality and a private company that commits both parties to providing an environmental service." Within this broad definition, public-private partnerships are unique, with each transaction designed to meet the particular needs of different communities. Despite these differences, however, five types of public-private partnerships are generally recognized: contract services; turnkey facility; developer financing; privatization; and merchant facility.

In a contract service arrangement, the private sector is contracted to provide a specific municipal service, such as garbage collection, or to maintain and operate a facility such as a wastewater treatment plant, which is owned by the public sector.

In a turnkey facility arrangement, the private sector designs, constructs, and operates an environmental facility that is owned by the public sector. Under developer financing, the private sector finances the construction or expansion of an environmental facility in return for the right to build houses, stores, or industrial facilities.

In privatization, the private sector owns, builds, and operates a facility. A merchant facility arrangement is the same as privatization, except that the private sector makes the decision to provide an environmental service to a community.

The report cites five basic reasons for state and local governments to enter into public-private partnerships for environmental facilities:

- Access to more sophisticated technology available from private partners;
- Cost-effective design, construction, and/or operation from the private partner;
- Flexible financing, including the use of private capital;
- Delegation of responsibility and risk; and
- Guaranteed cost.

Communities considering public-private partnerships need to evaluate service needs to determine current, short-term, and long-term requirements. Communities should then review available technologies for providing the environmental service to determine what technologies will be suitable in the long-term, and identify experts in planning, evaluating financial options, and evaluating private proposals. With expert assistance, communities can evaluate financing prospects, based on the available financing alternatives. Another important step is to identify community resources and generate public support for the partnership. In addition, communities should study laws and regulations to determine the tax implications, environmental compliance requirements, and procurement laws and procedures that will affect the partnership.

It is important to determine whether private vendors will be interested in providing service and whether the interested vendors are financially sound. Communities must also consider regional options to take advantage of economies of scale in providing services. The community should narrow down the type of partnership (privatization, contract operation, etc.) that will probably be selected. The final steps are to select and conduct the procurement process and develop a service agreement.

The major elements of a service agreement include: contract term; a description of the project and performance criteria; the method and timing of compensation; changing situations and risk allocation; contract termination and step-in rights; and insurance and bonding.

PUBLIC WORKS INFRASTRUCTURE: POLICY CONSIDERATIONS FOR THE 1980s

1. REFERENCE:

U.S. Congressional Budget Office, April 1983.

2. BACKGROUND/SUMMARY:

In the past several years, much attention--both public and Congressional--has been focused on the declining condition of public infrastructure systems and those systems' capacity to accommodate future economic and population growth. This study, undertaken at the request of the Senate Committee on the Budget, assesses the needs of seven infrastructure systems and the costs of meeting those needs.

The primary focus of the analysis is on the cost effectiveness of infrastructure investment, a concern made particularly pressing by the constraints now affecting the federal budget. In this context, the report considers how current federal policies and funding levels may or may not mesh with infrastructure needs anticipated over the coming decade, how possible policy changes might bring about improved cost effectiveness, and how changes at the federal level could affect state and local governments and private sector beneficiaries of infrastructure services. Infrastructure topics covered include transportation and water issues.

3. ABSTRACT:

The report states that from a federal perspective, the area of most pressing need is the heavily traveled Interstate System, which, though not complete at the time of this report, suffers from accelerating deterioration. By offering high federal matches to states and localities for construction investment, current policies promote states and localities to neglect repair. A redirection of policies to increased federal funding for non-reconstruction purposes/and/or to limit the federal role to those areas of clearest national importance would permit a reduction in federal highway taxes.

While local fiscal constraints have forced many transit authorities to neglect the worsening physical conditions of older-generation rail systems, high federal capital grants have induced some cities to start new capital-intensive systems, particularly rail. However, not enough of the $3.7 billion available for distribution as federal capital grants goes toward mounting repair and rehabilitation needs, although the overall sum appears ample to meet transit needs as estimated by CBO at $3.6 billion a year through 1990. Adjustment in federal policies to improve the cost effectiveness and targeting of spending could permit transit needs to be met within current federal spending, and might even allow a reduction in the 1% of the new tax on motor fuel that goes to transit.

Inadequate sewer pipes and sewage treatment, as well as insufficient system capacity to handle storm runoff, characterize many of the Nation's 15,000 wastewater treatment systems. The federal role in financing a major share of wastewater treatment has already begun to decline under recent legislation from 75% of capital costs since 1972 to 55% in 1985. To compensate for near-term losses and longer-term reduction of federal support prompted by budgetary strictures, local wastewater authorities, assisted by states, could step up efforts already under way to explore other public and/or private financing sources.

Needs for investment in water resources are divided roughly evenly between efforts that would prolong the useful lives of numerous dams and navigation works, and those that would provide new or replaced capacity. To meet total needs--about $4.1 billion a year--state and local governments would have to spend an additional $400 million a year. Adjustments in the current allocation of costs, entailing realignment of responsibilities among levels of government, intergovernmental grants or loans, and major increases in user fees, could help contain increases in federal costs, holding them at perhaps $3.1 billion a year, or about 35% above federal spending.

The air traffic control system, run by the Federal Aviation Administration, is in need of modernization. The Congress has approved the FAA's National Airspace System Plan, which, according to the FAA, could cost an estimated $10.7 billion to implement but could save $25 billion by the year 2000 by replacing antiquated equipment with modern microchip technology. Implementation of the Plan would depend critically on consolidation and closure of many facilities, which would entail major personnel reductions and would likely encounter strong opposition.

The dominant problem of U.S. airports is congestion: 90% of all air passenger volume funnels through just 2% (66) of the Nation's 3,159 public facilities. Over the 1970-1980 period, the federal share of airport capital costs was 38% or $15.3 billion. To meet expansion needs as estimated under current policy, federal outlays would have to increase nearly twofold. However, CBO's analysis concludes that these projected needs may be exaggerated. Nevertheless, general aviation is encouraged to use major airports instead of the numerous satellites ("reliever") that could accommodate them. Several measures could help redistribute this traffic among existing facilities and/or raise funds to pay for expansion.

Despite clear indications of physical and financial problems in the Nation's municipal water supply systems, the CBO analysis points to no need for any appreciable expansion of the now small federal role.

PUBLIC WORKS MANAGEMENT PRACTICES:

Volume I - A Public Works Perspective of the Roadblocks and Opportunities to Improve Performance; Volume II - Local Government Public Works Agencies: The Effect of Federal Mandates on Their Activities and Improving Their Performance.

1. REFERENCE:

The American Public Works Association and National Academy of Public Administration, for the U.S. Army Corps of Engineers, Institute for Water Resources, August 1994.

2. BACKGROUND/SUMMARY:

The U.S. Army Corps of Engineers, Institute for Water Resources (IWR), joined with the American Public Works Association (APWA) and the National Academy for Public Administration (NAPA) to investigate constraints and obstacles that limit the effectiveness of public works activities. The study was conducted as an element of the Federal Infrastructure Strategy (FIS) program. The results of the study are documented in two volumes, IWR Reports 94-FIS-14 and 15.

3. ABSTRACT:

The APWA and NAPA conducted twelve site visits to state, county, city, and town governments to evaluate the progress of public works departments in adopting improved management practices. The study team utilized APWA's newly developed *Public Works Management Practices Manual* as the vehicle for the assessment. The public works functions covered include: municipal engineering, design, construction, buildings, grounds, equipment, potable water, solid waste collection, solid waste processing and disposal, streets, snow and ice control, storm water and wastewater. Administrative practices associated with public works operations were also evaluated. These case studies of twelve public works agencies were conducted using an assessment process developed by APWA.

The objectives of this study were to obtain from public works professionals:

- Perceived federal, state, and local legislative, administrative, and technical impediments that hinder public works agencies from complying with the APWA management practices.
- Possible strategies which would improve the performance and operating efficiencies of public works agencies.

An extensive questionnaire was developed first to collect information about management practices that were most likely to face impediments and barriers. After sharing and discussing information from the questionnaire, teams of public works officials and APWA and NAPA investigators

concluded on-site assessments at twelve site assessment agencies from May 1993 through August 1993. During this period, team members interviewed agency personnel about barriers and impediments to complying with the public works management practices. Information was also sought on other problems encountered in the course of meeting their responsibilities, and on innovative steps taken to accomplish their work.

According to the APWA, the most significant federal mandates confronting the agencies included the following:

- The National Pollutant Discharge Elimination System (NPDES) stormwater regulations;
- The Resource Conservation and Recovery Act (RCRA) Subtitle D Municipal Solid Waste Landfill Criteria;
- The Safe Drinking Water Act (SDWA) Lead and Copper Rule; and
- The Americans with Disabilities Act (ADA).

The main concern with these federal mandates, as reported by the APWA, was that they would be applied inflexibly with little consideration for limited resources or time constraints. The resource issue is key to understanding the agencies' concern with unfunded mandates.

NAPA's central finding of these visits was that no federal mandate is an absolute roadblock to implementing any of the more than 400 public works management practices in the APWA manual. However, federal mandates have expanded the missions of local public works agencies, complicated their service operations and construction projects, shifted heavy costs to their local governments, and substituted federal priorities for local priorities in the allocation of resources.

Notwithstanding these impacts, local governments expressed clear support for the goals of mandates, especially for environmental programs. They were, however, very critical of aspects of Federal implementation strategies such as priorities, timetables, processes, and the administration and enforcement of the programs. Interview with local officials revealed the following:

- Local public works and government officials' overarching and foremost grievance is that mandates are imposing heavy financial burdens at a time when municipal finances are already sêverely restrained, and while federal grants are paying a decreasing share of the cost;
- As federal mandates have preempted local resources, infrastructure construction and maintenance are the expenditures cut most often by cities;
- The environmental protection mandates on clean water, safe drinking water, resource conservation and recovery, and clean air, and the Americans With Disabilities Act, are perceived to be the heaviest regulatory hits;

- Environmental protection mandates on asbestos, lead paint abatement, underground storage tanks, and endangered species also generate heavy costs in many communities;

- Local criticisms of the environmental programs are frequently aimed at federal standards which are considered to be unrealistically high, or for which the scientific underpinning is questionable, and the lack of flexibility to adapt their construction and operational plans to local conditions;

- In contrast to the environmental programs whose goals are generally supported by local officials, two other federal laws -- the Fair Labor Standards Act and the Davis-Bacon Act are considered by some local officials to be examples of intrusion by the federal government which drive up infrastructure costs; and

- For most local communities, the lion's share of the costs they would have to incur to comply with current mandates still lies in the future.

ROAD WORK AHEAD: HOW TO SOLVE THE INFRASTRUCTURE CRISIS

1. REFERENCE:

Clark Wieman, *Technology Review*, 1993.

2. BACKGROUND/SUMMARY:

The infrastructure crisis we face is solvable. Infrastructure spending can be done far more efficiently and cost-effectively than it is today. A multitude of ideas and techniques from within and outside government can move us toward a new vision of a well-run city. Roads can be smooth, bridges well-kept and long-lived, and mass transit comfortable and on time. Thoughtful planning and funding choices based on a long-term view can convert cities into far more pleasant places to live, while freeing up huge sums for other pressing social needs.

3. ABSTRACT:

Maintenance budgets in virtually all U.S. cities are inadequate; the playing field where politics and public works intersect is tilted toward new construction. Federal transportation bills, often generous toward new projects, routinely ignore maintenance. As a result, few politicians utilize preventative maintenance. Political leaders need to realize that the real cost of deferring maintenance can substantially, even dramatically, exceed the cost of simply doing the work.

Keeping infrastructure healthy demands regular cycles of replacement and repair. But these are impossible when public works are funded in very small amounts subject to the vagaries of annual city and state budgets. Whether provided through user fees, the creation of special districts and authorities or earmarked taxes, or a combination of these, dedicated funds are essential to well-maintained public works systems.

The private sector certainly has an important role to play in infrastructure investment and planning; most public works construction is contracted out to private firms, and public-private enterprises now successfully operate waste facilities across the country. But public employees can actually be more productive and efficient than contracted workers. Among other reasons, they tend to be more specialized than workers in general contracting firms, who might do road repair one week and building construction the next.

The basis for policy decisions should be system efficiency -- how quickly and inexpensively we can move the most people. The $155 billion Federal Intermodal Surface Transportation Efficiency Act has adopted this approach as a chief policy goal. Among other measures, it concentrates federal spending on the roads that are most important to interstate travel and that connect with mass transit, and it funds the development of promising efficiency-boosting technologies such as intelligent vehicle/highway systems and magnetically levitated trains.

TRANSPORTATION: KEY TO A BETTER FUTURE

1. REFERENCE:

American Association of State Highway and Transportation Officials, December 1990.

2. BACKGROUND/SUMMARY:

This report was prepared by Apogee Research, Inc., under the direction of the American Association of State Highway and Transportation Officials (AASHTO) Special Committee on Economic Expansion and Development, and was approved for publication by a mail ballot of the Committee on November 8, 1990.

The case studies in this report, which demonstrate the relationship of transportation investment and economic productivity are drawn from more than a hundred identified by a survey of the AASHTO member departments and the Federal Highway Administration.

The study concludes that less than one percent of the nation's economic resources, or 0.75 percent are invested in transportation each year, about half that of just 25 years ago. Recent findings indicate that it is probably not a coincidence that the nation's rate of growth as been cut in half at about the same time that the level of national resources devoted to investment in infrastructure has dropped sharply. Reversing the recent national trend toward disinvestment in public works appears likely to help solve far broader economic problems.

This low growth in U.S. productivity, coupled with persistently high consumption growth, helped to change America's position during the 1980s from the world's largest creditor to the world's largest debtor nation.

3. ABSTRACT:

New research indicates that public capital can be just as important as private capital in stimulating a more productive economy. Dr. David Aschauer, while with the Federal Reserve Bank of Chicago, and Dr. Alicia Munnell, Director of Research for the Federal Reserve Bank of Boston, have quantified the link between public infrastructure investment and long-term economic productivity. Their nationwide findings provide convincing statistical evidence that, "...the slowdown in public works investment over the past two decades may well be the most significant single force behind the relative decline in U.S. productivity." This research shows that:

- There is a robust, positive linkage between public capital, particularly infrastructure capital, and private sector productivity;
- There exists a positive linkage between public capital and private sector profitability; and

- There is a long-run positive relationship between public, nonmilitary investment and business investment.

While the statistical results vary depending on data used and specific assumptions, "...the effect is strong, with each one percent increase in public capital stock improving overall national productivity by between 0.15 percent and 0.35 percent.

Three major findings of the case studies are listed below:

- There is a clear interaction between high technology and transportation. Electronic communication plays just as important a role in an effective supply chain as does the timely movement of goods. Indeed, the case studies show that private firms have already taken the lead in using technology to maximize the gains from improved transportation;

- The success stories show a chain-reaction type of effect that links transport improvements to a series of productivity gains that can even affect the structure of how firms do business; and

- The large number of examples identified illustrate that the relationship between transportation and productivity is robust and widespread and covers most major industries, every region of the country, and all modes of transportation.

Four general types of changes in firm operations, listed below, to improve productivity can be induced by improvement in transportation facilities:

- Reducing bottlenecks in production and management;

- Adding flexibility to what gets produced and how this is accomplished;

- Improving access to labor; and

- Permitting greater specialization of corporate functions.

TRANSPORTATION ISSUES

1. REFERENCE:

U.S. General Accounting Office, December 1992.

2. BACKGROUND/SUMMARY:

A central theme of a 1988 GAO report on transportation issues was the need for a national transportation plan. In 1990, after extensive public hearings, the Secretary of Transportation issued the National Transportation Policy Strategy, which served as a foundation for transportation planning.

Transportation Issues is part of a transition series report requested by Congress to discuss major policy, management, and program issues facing the Congress and the new administration in the area of transportation. The issues include the following:

- Investing wisely to rebuild and enhance surface transportation infrastructure;
- Modernizing air traffic control and transportation infrastructure;
- Improving transportation safety;
- Increasing airline competition and access to international markets;
- Strengthening Coast Guard acquisition programs and environmental protection; and
- Consolidating financial system and revamping grant oversight.

3. ABSTRACT:

Congress enacted the Intermodal Surface Transportation Efficiency Act of 1991, which authorized $155 billion over 6 years to implement an integrated, multimodal solution to the nation's transportation problems. Nevertheless, the costs of meeting infrastructure needs are likely to far exceed available resources. The Department of Transportation estimates that maintaining highways and bridges nationwide at 1989 levels would cost about $250 billion over six years, while improvements would cost about $425 billion, exclusive of funds needed for mass transit and rail systems.

Since DOT is organized into separate modal agencies, the 1991 legislation created the Office of Intermodalism and the Bureau of Transportation Statistics in order to:

- Help define the federal role in transportation problem-solving;

- Provide technical assistance to states and localities; and

- Develop and disseminate transportation data.

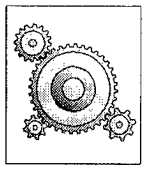
Depending on the success these new offices have in fostering the intermodal approach and assisting states and local governments as they decide on critical infrastructure investments, DOT may need to consider other organizational changes that coordinate the planning and financing arms of the separate modal administrations.

In order to secure the greatest return from the funds available to them, state and local governments need additional assistance from DOT. DOT could provide this assistance by developing a common basis for evaluating projects in various transportation modes. Subsequently, these projects would compete on their ability to meet critical objectives. A compelling need also exists for DOT to develop methodologies for data collection and analysis that state and local governments can use to compare projects.

The nation's air traffic control and airport systems must be upgraded to accommodate the growth in air travel that has occurred since the early 1980s and the forecasted future growth. Also, maintenance of the existing aviation infrastructure is needed to stem deterioration. Reflecting these needs, federal capital investments in air traffic control and airports increased from $600 million in 1982 to $4.3 billion in 1992. The Federal Aviation Administration needs to address key issues related to air traffic control modernization and to strengthen its approach to airport development in order to optimize these funds.

The challenge currently encountered by DOT is to help reduce the many thousands of lives lost on highways and to increase the margin of safety in other transportation modes. In order to meet this challenge, DOT must ensure that each modal administration effectively follows through on safety initiatives begun in recent years and that resources are targeted to areas of highest safety risk.

The Congress and DOT need to take actions to solve the underlying problems that threaten domestic competition and to facilitate U.S. airlines' competitiveness in international markets. GAO's research has revealed that the Coast Guard's acquisition process has systemic problems and that there is a continuing need for the Coast Guard to improve its oversight of the industry's efforts to prevent environmentally dangerous accidents. Finally, DOT needs to continue to improve its financial management systems and oversight mechanism for reducing the risk of fraud, waste, and abuse.



B. HIGHWAYS

ENHANCING U.S. COMPETITIVENESS THROUGH HIGHWAY INVESTMENT: A STRATEGY FOR ECONOMIC GROWTH

1. REFERENCE:

American Road and Transportation Builders Association, June 1990.

2. BACKGROUND/SUMMARY:

In January 1990, the American Road and Transportation Builders Association (ARTBA) commissioned Apogee Research, Inc. to conduct research to project the long-term economic impacts of ARTBA's proposed $40 billion per year Federal-aid Highway Program.

Research by Dr. David Aschauer of the Federal Reserve Bank of Chicago and Dr. Alicia Munnell of the Federal Reserve Bank of Boston provides evidence that the slowdown in public works investment in this country over the past twenty-five years, "...may well be the most significant single force behind the relative decline in U.S. productivity." This report utilizes Dr. Aschauer's work to quantify the potential economic effects of implementing the $25 billion per year increase in federal highway and bridge investment proposed by ARTBA.

3. ABSTRACT:

This report uses the results from Dr. Aschauer's most recent analytic efforts to simulate the long-term economic effects of the national highway program proposed by ARTBA. Therefore, its focus is on broad economic impacts, which includes overall economic productivity, private-sector profitability, and the level of private-sector investment.

The results of the econometric simulations are presented below.

- An increase in highway investment of this magnitude will lead to a $250 annual increase in productivity for each American worker within the program's first five years, and a $3,200 increase in annual output per worker within 20 years of the program's onset (in 1990 dollars).
- After 20 years of sustained highway investment at the proposed level, national labor productivity would be 7.7 percent higher than without the program.
- By the early 21st century, labor productivity would be growing at 2.75 percent per year versus an expected 2.2 percent per year, a 23 percent higher rate of growth.
- The productivity gains will lead to an improvement in corporate profit margins by up to 10 percent within 20 years.

- Annual corporate profits are likely to increase by more than $10 billion per year within five years following the increased highway investment, and nearly $30 billion per year within 20 years of the program's initiation.

- By 2012 there would be a $35 billion per year increase in annual private investment above the baseline projection.

The simulation results have two direct implications. First, they show the potential gains that can be obtained by redressing the two decades of underinvestment in the nation's highways and bridges. Second, they show that an effective transportation system has economic importance well beyond the immediate benefits of improved transportation services. Although the focus of this report is on the nation's highway system, the policy implications can be applied to infrastructure as well.

Moreover, the results of this report emphasize the need to analyze the links between public and private capital formation. Specifically, this report demonstrates the importance of public capital for the profitability of private firms.

THE FULL COSTS OF TRANSPORTATION: A REVIEW OF THE LITERATURE

1. REFERENCE:

Conservation Law Foundation, August 1993.

2. BACKGROUND/SUMMARY:

This literature review, prepared by Apogee Research, Inc., for the Conservation Law Foundation, concentrated more heavily on automobile transportation.

Research into the total costs of transportation has become a popular field of inquiry only in the past few years. Certain individual costs have been well-studied for decades, such as federal expenditures on road construction and maintenance, and personal expenditures on auto ownership. However, estimates of other costs, such as delay from congestion, remain somewhat speculative, and costs such as those of transportation's impact on water quality are not quantified. The earliest study which sought to aggregate those costs into one sum was a 1975 work by Keeler and Small, which is still frequently cited nearly twenty years later as the most authoritative work on various transportation costs. Other total cost studies date from the past three years and frequently draw from the same pool of source material.

3. ABSTRACT:

The review of studies on transportation costs found that the literature can be grouped into four major categories:

- User Cost Studies: Studies which report on the costs of ownership and operation of automobiles, and of fare for transit;
- Cost Allocation Studies: Studies of government expenditures for highways and the types of traffic responsible for those costs;
- Externality Studies: Studies estimating individual external costs of transportation, usually for automobiles; and
- Total Cost Studies: Studies which sum up all the costs for transportation, usually for automobiles.

The most visible component of the total cost of transportation is private user costs. These costs include all the personal expenses that are involved in getting from one place to another, which can be separated into two categories: purchased inter and intra-city transportation, and vehicle operating expenses. There are a number of sources of information on the user costs of

transportation, which fall into two categories: nationwide statistical data on transportation as a whole and generic estimates of the costs per mile of operating a vehicle.

Cost allocation studies attempt to allocate the capital and operating costs of roads to categories of users in proportion to the level of damage those users cause. Although the studies tend to be very thorough in determining the share of costs for which each size vehicle is responsible and in assessing the revenue collected from each size vehicle, they are rather restrictive in the universe of costs they consider. The Federal Highway Administration has conducted several cost allocation studies. Half the states likewise have undertaken allocation studies in recent years, and several update their analyses on a regular daily basis.

A large number of studies have examined the various external costs of transportation. A cost is external if it is not paid by the person who imposes it. Transportation imposes tremendous external costs since much of the expense of travel is paid by government agencies, such as road maintenance in excess of vehicle tax revenues, or by the community as a whole, such as delay from traffic congestion or loss of natural habitats, are not monetary and are not paid in cash like road repairs. Literature exists on most external costs of transportation, although few or no studies have been able to quantify monetary costs for several potentially significant externalities. The categories of transportation externalities for which substantial research can be found includes such costs as accidents, air pollution, and parking. Others, such as aesthetics and transportation-induced social deprivation, have been little researched.

A number of researchers have attempted to determine the aggregate costs of transportation, including both user and external costs. Total cost studies identify the universe of costs which must be considered in a comprehensive study, place transportation costs into a framework which makes it possible to categorize costs and to determine who pays them -- whether they are borne by the individual who imposes them, by other users of the transportation system, or are entirely external to the transportation system, and give dollar figures for individual cost categories and for the sum of transportation costs.

GUIDANCE FOR STATE IMPLEMENTATION OF ISTEA TOLL PROVISIONS IN CREATING PUBLIC-PRIVATE PARTNERSHIPS

1. REFERENCE:

U.S. Department of Transportation, Federal Highway Administration, November 1993.

2. BACKGROUND/SUMMARY:

This document is one of a series of undertakings by the Federal Highway Administration (FHWA) since 1991 designed to provide technical assistance in the area of public-private partnerships. It was prepared for the FHWA by Price Waterhouse's Transportation and Utilities Finance Group, located in Washington, DC. Price Waterhouse researched current and proposed legislation pertaining to the formation of public-private partnerships, and discussed potential areas of concern by the Transportation and Utilities Finance Group.

The report notes that the growth of transportation infrastructure needs in the United States has outpaced the growth in available funding. Expanded employment of direct user charges provides one mechanism to stretch available funding while a number of states have passed laws to allow and encourage private sector participation in the development, financing, operation, and even ownership of public-use transportation facilities. The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) provides new mechanisms for applying federal-aid funding to public-private partnership projects. Since the private sector requires a financial return on its investments, toll facilities are particularly good opportunities for public-private structures.

3. ABSTRACT:

This report is intended to serve as a guide for states seeking to make legislative changes to create a more hospitable environment for public-private toll partnerships. The advantages of direct user fees and private sector participation, the partnership and toll provisions of the 1991 ISTEA, and several specific models for structuring the public-private relationship are examined. Specific actions that can be taken while working on developing legislation are reviewed. Specific areas to be addressed in enabling legislation are provided along with examples that may be helpful to writers of new legislation. The steps involved in implementation are also discussed.

In order for states to take advantage of the expanded project eligibility and the ability to commingle federal and private funds under the provisions of ISTEA, they must first pass enabling legislation. There are several steps a state can take while seeking enabling legislation, which include developing a detailed toll road program concept, drafting and proposing legislation, identifying potential projects, and conducting technical analysis of potential projects.

A number of major issues should be covered in the enabling legislation for public-private toll partnerships. However, the level of detail needed in the legislation will vary. Some states may find highly detailed legislation to be too restrictive, while others may feel that such specificity

is necessary to ensure that projects can be carried out or that certain public interests are protected. In either case, the following major issues which should be addressed include legislative findings and framework, implementing ISTEA grant and loan provisions, state-private agreements, and supplemental sections.

The primary steps to be taken immediately following the enactment of legislation include identification of a single agency contact, development of the final project selection and negotiation process, issuing the final request for proposals and selection of the winning proposals, and negotiation of the public-private agreement. Final steps include execution of the negotiated franchise agreement for the facility and the ongoing oversight.

INTERMODAL FREIGHT TRANSPORTATION: COMBINED RAIL-TRUCK SERVICE OFFERS PUBLIC BENEFITS, BUT CHALLENGES REMAIN

1. REFERENCE:

U.S. General Accounting Office, December 1992.

2. BACKGROUND/SUMMARY:

In 1990, the nation's highways carried 32 percent more freight than in 1980 and 78 percent more than in 1970. The trucking industry has provided flexible, reliable, and economical service, but the growth of trucking has contributed to concerns about safety, congestion, pollution, and highway deterioration. Many highways in and near cities such as Chicago and Los Angeles carry over 15,000 tractor-trailers a day.

Due to congressional interest in a more integrated use of the various modes of transportation, the U.S. General Accounting Office (GAO) examined intermodal rail transportation to assess whether it could potentially reduce the nation's increasing reliance on highways for moving freight. Intermodal freight transportation encompasses the movement of goods in trailers or containers, without unpacking, by some combination of trucks, railroads, marine vessels, or aircraft. Intermodal rail transportation encompasses the movement of goods in trailers or containers, without unpacking, by some combination of trucks, railroads, marine vessels, or aircraft.

3. ABSTRACT:

The specific objectives of the GAO were to:

- Examine recent developments in intermodal rail transportation;
- Assess the prospects for more intermodal cooperation between the rail and trucking industries;
- Identify problems that limit intermodal effectiveness and benefits; and
- Consider whether any federal initiatives might be helpful in encouraging intermodal cooperation.

The GAO conducted its review from August 1991 through August 1992 and met with representatives from the Department of Transportation (DOT), three transportation-planning organizations, five industry associations, eight railroads, ten trucking companies, eight companies associated with the trucking or rail industries, and six ports.
The GAO observed intermodal rail and/or port operations in Los Angeles and Oakland California; Seattle and Tacoma, Washington; Chicago, Illinois; Baltimore, Maryland; Cincinnati, Ohio;

Norfolk, Virginia; Georgetown, Kentucky; and Ft. Wayne, Indiana, as well as trucking terminal operations in Akron, Ohio. GAO surveyed access routes to the ports of Los Angeles and Long Beach, California by helicopter and rode in the locomotive of a Santa Fe intermodal train from Chicago to Kansas City, Kansas. GAO also attended conferences of the International Intermodal Expo, the National Industrial Transportation League, the Pacific Multimodal Expo, and the Transportation Research Board.

The GAO found that shipment of highway trailers on rail flatcars grew slowly in the 1970s, and many railroads questioned its profitability. Intermodal rail operations expanded in the 1980s, stimulated by the deregulation of railroad freight rates and marketing practices under the Staggers Rail Act of 1980. With improved service and equipment, intermodal shipments grew from 3 million trailers and containers in 1980 to 6.2 million in 1991, and have grown at an 8 percent rate in 1992. The growth of intermodal transportation has also been stimulated in the 1990s by increasing rail and trucking company cooperation.

The success of intermodal trains between Chicago and the West Coast has presented a challenge in that it has increased truck traffic on the highways leading to and from Chicago's intermodal terminals, adding to that city's congestion and pollution. At the same time, intermodal rail service has had difficulty in the more fragmented, shorter-haul markets of the eastern United States and has provided only limited relief to the eastern highway network.

GAO recommends that the Secretary of Transportation ensure that the Office of Intermodalism has the resources and direction to assume an active role outside the Department of Transportation in addition to its coordinating role within the DOT. The Office should interact with industry, state, regional, and local officials to identify intermodal transportation problems and help achieve solutions. It should facilitate communication and encourage agreement between the various parties, help identify funding sources, and ensure that the large public interest is also taken into account.

GAO also recommends that the Secretary of Transportation determine whether intermodal freight facilities are eligible for federal funding under ISTEA, provided that they would relieve highway congestion and deterioration and help improve safety and air quality.

KEEPING AMERICA MOVING: THE BOTTOM LINE: A SUMMARY OF SURFACE TRANSPORTATION INVESTMENT REQUIREMENTS 1988-2020

1. REFERENCE:

American Association of State Highway and Transportation Officials, September 1988.

2. BACKGROUND/SUMMARY:

This report by the American Association of State Highway and Transportation Officials (AASHTO) was prepared under the guidance of the Task Force on a Consensus Transportation Program. *The Bottom Line* is part of *Transportation 2020*, an unprecedented effort initiated by AASHTO to develop a national consensus on a future national surface transportation program.

Included in this report are AASHTO's best estimates of combined federal, state and local government investment requirements for highways and public transportation. Also addressed for the first time are the investment requirements to provide access to other transportation links, such as air terminals, ports, and railways.

3. ABSTRACT:

This report examines several alternatives for the surface transportation system of the future, the implication for users, and the funding option each would require. It also addresses the serious consequences of inaction, in that the American public will either pay the bill for surface transportation or will ultimately pay many times that amount in increased operating costs.

This report also examines alternatives to capital investments, in recognition that meeting future needs will require maximum utilization of existing resources. In addition, a number of issues affecting or affected by surface transportation are discussed.

General conclusions of *The Bottom Line* are:

- America's surface transportation expenditures, at all levels of government, in 1987 totalled approximately $81 billion. Of this total, approximately $66 billion was for highways and $14.5 billion for public transportation.

- In order to maintain the physical characteristics of the nation's public sector surface transportation infrastructure and sustain "most" of the level of service provided at this time through the year 2020, an annualized investment of nearly $95 billion is required. Of this total, approximately $80 billion is needed for highways and $15 billion for financing public transportation, with transit capital increasing to $2.7 billion from $2.13 billion in 1987.

- This 20 percent overall increase in funding over 1987 just to attempt to maintain the most critical current levels of service reflects the fact that the nation had been unintentionally "disinvesting" in its surface transportation infrastructure since the 1960s. This disinvestment is the net result of the relative reduction in user fee revenues, due to more fuel efficient vehicles, coupled with the reduced purchasing power of those revenues because of inflation in construction costs.

- Surface travel demand is expected to at least double by 2020. If this nation is to attempt to keep up with this anticipated growth, then an investment of approximately $117 billion per year would be required. Of this 43 percent increase in overall funding for surface transportation over 1987, about $100 billion would be for highways and nearly $16 billion for transit, with transit capital increasing to $3.4 billion, a 60 percent increase over the 1987 level.

- The $16 billion for transit relates to currently operating transit systems. If the nation should decide to significantly increase transit service, a corresponding further increase in transit would be required.

- An additional $1 billion per year investment in highways and public transportation through 2020 would be required to adequately link surface transportation with airports, ports, and waterways and rail terminals.

- Future transportation investment requirements may be mitigated somewhat through improved materials and techniques, and through the implementation of alternative responses to travel demand, like demand management and operational improvements. Still, the impacts of doubling travel demand and the uncertainties of future levels of inflation, not reflected in figures presented in this report, will undoubtedly quickly erode any efficiencies gained through the implementation of improved construction, design, and operational techniques.

- If America is to maintain its economic leadership in the world economy and avoid negative and costly effects of inaction, it must commit the required funds to improve its transportation system.

THE NATION'S PUBLIC WORKS: REPORT ON HIGHWAYS, STREETS, ROADS, AND BRIDGES

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Alan E. Pisarski for the National Council on Public Works Improvement (the Council). The purpose of this study was to examine highways, streets, roads and bridges as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's highways, streets, roads and bridges. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

The 3.8 million miles of highways in the country are classified by function into a series of interconnected networks. The arterials at the high end of the hierarchy, such as the Interstate System, carry the predominant share of traffic volumes and interstate commerce and are the main focus of federal assistance and state matching funds.

The centerpiece of the highway development and revenue system is a user charge relationship between users and providers of highways that seeks to assure that users pay an equitable share of the costs they impose on the road systems and that their payments, in turn, are efficiently expended on programs dedicated to the needs of the user. This revenue generation system, primarily structured around fuel taxes, generated in excess of $60 billion per year, some of which is diverted from highway uses to other purposes. State revenues are the majority of these revenues, with federal and local revenues each amounting to a quarter of the revenue pie. Federal funds are almost entirely from user fees, while property taxes, general revenues, and distributions of state and federal user fees are the primary sources of local recipients.

The federal-aid program provides assistance to eligible amounts of mileage in each state, according to the functional classification of roads in the state, ranging from 75% of costs on most roads to 90% on the Interstate system. Current levels of federal aid are about $13 billion accounting for less than 25% of total highway expenditures. State programs emphasize support for the higher ends of the system hierarchy, while local jurisdictions have responsibility for the vast majority of local streets and roads which provide access to land uses and connect to higher levels of the road system.

With these rapid improvements, road operating costs have also begun to improve as a function of pavement quality. However, increasingly sophisticated needs analysis indicate a substantial amount of under-investment is still occurring. Beyond change in road surface, the system requires treatment of underlying structural deficiencies and expansions of capacity. These analyses would place the dollar scale of these investments on the order of an additional $20 billion per year.

A stronger, more responsive road development and revenue system can result from changes in the following broad areas:

- Shifts from a politically-based to a market-based system of decision making;
- Establishing a new focus for the federal role in the Nation's highway system;
- Seeking a more effective public roads management system; and
- Greater emphasis on state and local control in meeting needs and making decisions.

RURAL ROADS AND BRIDGES -- FEDERAL AND STATE FINANCING

1. REFERENCE:

U.S. Department of Agriculture, Office of Transportation, April 1989.

2. BACKGROUND/SUMMARY:

Much attention has been paid to the 43,844 miles of Interstate Highway System in recent years, but relatively little attention has been given to the 3,880,000 miles of roads maintained by state, county, and numerous local governments. Understanding the interrelationships among governments and responsibilities is difficult. In many instances, federal funds are provided to the states which, in turn, support local government projects. Tracing the funds to final use is difficult in the more complex programs. This report studies the condition of rural bridges and roads and how to finance their construction and repair.

3. ABSTRACT:

The federal highway aid system is an important part of financing rural roads and bridges. Counties are responsible for a large portion of the federal-aid secondary mileage, but states are responsible for more mileage than counties. Bridges are another important component of the Nation's local transportation system. Federal financial assistance is provided for bridges located on the federal-aid system, but more bridges are off the system than on. While the claim can be made that these bridges are smaller, with relatively low traffic, they are essential to the functioning of the local road network. Local resources available to rural townships and counties have been declining in some states.

Local governments are facing financial challenges as they struggle to maintain the roads and bridges mandated by local traffic demands. Financing needed improvements involves a combination of local revenues and state aid programs. Reliance on state highway user-taxes also varied widely among the states. The relative importance of this revenue source shifted markedly between 1977 and 1985. This was due to a heavier reliance upon these funds as federal aid dollars shrank. State highway spending is a combination of direct spending and grants-in-aid to local governments. States use a wide variety of methods to finance construction.

Federal highway aid is an important factor in the ability of states to finance highway construction. States control a majority of the federal-aid primary systems and almost half of the federal-aid secondary mileage. Between 1977 and 1986, federal support in real dollars increased by approximately 25 percent, due to the 1982 Federal Highway Act. Likewise, state highway spending increased less in real terms during this period. A closer inspection of changes in state highway spending, however, shows that direct highway spending on local roads was at the expense of grants-in-aid to local governments. Federal highway dollars sent to states could be shared with local governments in the same ratio as responsibility for road mileage or number of

bridges qualifying for aid. This is not currently required as funds are provided on a project basis.

State and local highway funding are so intertwined that it is difficult to determine where the funds are raised and ultimately spent. It would be useful to know the role which local versus state or the federal government is playing in overall highway finance. Numerous allocation methods are used by individual states to distribute funds. The wide diversity is among the most impressive findings. States also vary markedly in types of revenues collected to support local highways and bridges.

A statistically negative relationship between the number of county and township roads per 1,000 residents and aggregate spending was found. While this does not prove or disprove the efficiency of a particular government structure, it suggests that more governments do not necessarily have to increase spending on highways and actually may be able to lower expenditures.

TRANSPORTATION INFRASTRUCTURE: PRESERVING THE NATION'S INVESTMENT IN THE INTERSTATE HIGHWAY SYSTEM

1. REFERENCE:

U.S. General Accounting Office, August 1991.

2. BACKGROUND/SUMMARY:

The House Committee on Public Works and Transportation requested that GAO examine the condition of the Interstate system and the outlook for future preservation needs and the factors that influence Interstate pavement deterioration and federal and state efforts to ensure adequate maintenance of the Interstate Highway System.

Over the past 33 years, a central focus of the federal-aid highway program has been the construction of the Interstate Highway System. Although the Interstate represents only one percent of all roads, it carries 21 percent of the nation's vehicular traffic. As the Congress considers reauthorization of the federal-aid highway program, an important goal will be ensuring the preservation of this $130 billion capital investment.

3. ABSTRACT:

FHWA reports that over 40 percent of all Interstate pavement is rated in fair or poor condition. The outlook for future preservation of the Interstate is not encouraging. DOT projects that Interstate conditions are not expected to improve. Even if the Resurfacing, Restoration, Rehabilitation, and Reconstruction (4R) program funding levels are substantially increased, Interstate capacity-enhancement needs will increasingly compete with preservation needs. Moreover, DOT has not established goals for minimum acceptable Interstate pavement conditions or a strategy for achieving these goals.

State maintenance practices and FHWA oversight are not ensuring adequate maintenance of the Interstate Highway System. While numerous factors affect Interstate conditions, GAO found significant maintenance backlogs that could affect the integrity of Interstate roadways and structures and the safety of users in four of the seven states reviewed. FHWA certified that maintenance efforts in the four states were adequate. However, GAO questions the basis for such certifications because FHWA has not developed measurable standards defining what constitutes adequate maintenance.

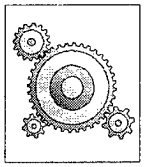
In reauthorizing the federal-aid highway program, the Congress may wish to reconsider:

- Directing the Secretary of Transportation to establish goals for the condition of the Interstate Highway System, monitor state progress in meeting those goals, and require minimum investment levels in Interstate preservation projects on a state-by-state basis where Interstate pavement conditions fall below DOT's condition goals;

- Expanding the eligibility parameters of the 4R Program to include preventive maintenance activities directed at preserving the life of Interstate pavement; and

- Directing the Secretary of Transportation to report to the Congress on Interstate maintenance investment requirements and expenditures nationwide and on progress in achieving adequate Interstate maintenance and preservation.

GAO recommends that the Secretary of Transportation direct the FHWA Administrator to work closely with the states to develop measurable standards by state for maintaining the Interstate Highway System. GAO also makes recommendations for improving FHWA inspection and oversight procedures.



C. AIR TRANSPORTATION

1993 AVIATION SYSTEM CAPACITY PLAN

1. REFERENCE:

U.S. Department of Transportation, Federal Aviation Administration, 1993.

2. BACKGROUND/SUMMARY:

Aircraft delays cost the airlines and their passengers many millions of dollars each year. The same 23 airports experienced over 20,000 hours of annual aircraft delays in 1992 as in 1991, despite an overall decline in air travel. The latest aviation activity forecasts, as of February 1993, project increasing growth in passenger enplanements and air carrier aircraft operations as the U.S. economic recovery gathers strength. As the number of aircraft operations increases, the level of delay will increase unless improvements are made to aviation system capacity.

The *Aviation System Capacity Plan* (the Plan) quantifies the magnitude of delay for the top 100 airports in the U.S. It is a comprehensive review of the Federal Aviation Administration's (FAA) program to improve the capacity of the National Air Transportation System. The Plan identifies the causes and extent of capacity and delay problems currently associated with air travel in the U.S. and outlines various planned and ongoing FAA projects that will reduce the severity of problems in the future. The major areas of discussion include airport development, airport and airspace capacity, technology for capacity improvement, and marketplace solutions.

3. ABSTRACT:

Having first identified forecast delay-problem airports, the Plan attempts to document planned or technologically feasible capacity development at those airports. The FAA is co-sponsoring airport capacity design teams at major airports to assess how airport development and new technology could "optimize" capacity on a site-specific basis. The Plan then identifies new terminal airspace procedures to increase capacity for existing or new runway configurations.

The Plan outlines the progress of programs with new technology, systems, and equipment designed to reduce delays attributable to weather conditions, provide more information to air traffic controllers, and to improve the efficiency of aircraft movement on the airport surface. Some of the technology programs are computer simulation tools to help in airfield and airspace analysis, while some programs are designed to "optimize" the aviation system through better planning and improved prediction capability.

The Plan outlines programs designed to increase en route airspace capacity. Airspace capacity design team projects have been established to analyze and optimize terminal airspace procedures. After optimizing existing airport capacity, terminal airspace procedures, and en route airspace capacity, the next step is to add "reliever" airports and "supplemental" airports for additional aviation system capacity. The addition of reliever airports may result in a significant reduction in flight delays if a percentage of small aircraft operations could be shifted to reliever airports.

However, some of the forecast delay-problem airports have a low percentage of small aircraft operations. Supplemental airports are existing commercial service airports that could act as reliever airports for delay-problem airports.

Although reliever and supplemental airports will be helpful, "...the largest capacity gains come from building new airports and new or extended runways at existing airports." The FAA is also pursuing initiatives for the joint civilian and military use of current military airfields and the conversion of former military air bases to civilian use for capacity enhancement to the overall aviation system.

THE NATION'S PUBLIC WORKS: REPORT ON AIRPORTS AND AIRWAYS

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Apogee Research for the National Council on Public Works Improvement (the Council). The purpose of the study was to assist the Council in examining airports and airways as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's airports and airways. This report responds to a standard research outline, developed by the Council to ensure thorough and systematic review of each public works category by an assigned contractor. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

The U.S. system of airports and airways supports what has been the fastest growing mode of public works infrastructure. By and large the system works well. Of our 16,300 airports (more than the rest of the world combined), 6,000 are for public use, mostly by general aviation aircraft (small planes owned by individuals and corporations). Of the 550 commercial service airports, 70 account for 90% of passenger traffic, and the top 27 handle two-thirds of airline passengers.

While there is some evidence that the rate of growth in commercial aviation may be slowing (airline revenue as a fraction of GNP has dropped since 1980), the FAA expects passenger traffic and aircraft operations (mostly by general aviation planes) to grow 4.5 percent a year through the end of the century. This will place added pressure on the physical capacity of the system.

Public spending totals some $8 billion annually: roughly 60 percent by the federal government, with most of the balance by local governments and the special districts that own and operate most commercial airports. One third of total public spending is for capital improvements, primarily for larger commercial airports. This public spending supports, in turn, about $75 billion a year in direct private expenditures on civil aviation services and equipment.

The Federal Aviation Administration (FAA) makes about $1 billion a year in airport capital grants, providing approximately one third of airport capital spending. These grants cover 20 percent of capital costs at larger commercial airports, and up to 90 percent at general aviation airports used to help relieve congestion. The FAA spends $4.8 billion a year to operate the air traffic control system, a network of radars, communications equipment, and air traffic controllers who direct and monitor air traffic at 399 airports and on long-distance trips.

Under the $16 billion National Airspace System (NAS) Plan, the FAA is modernizing air traffic control equipment and consolidating facilities. As originally conceived, the Plan was expected to have a benefit cost ratio of 2.3 to 1. With the recently revised cost estimates and the two-to-three year deal in implementing parts of the system, the overall benefit cost ratio may drop to 1.5 to 1. While still feasible, this makes it especially important that certain key assumptions are not violated -- most importantly the political ability of the Congress to close facilities.

The number one aviation problem is congestion, or in its long-term version, a lack of adequate capacity. Last year, the FAA counted more than 410,000 aircraft delays, enough to cost the airline industry $1.5 billion plus perhaps an equal amount in lost time for travelers. Congestion also has an impact on safety. Operational errors by controllers increased 18 percent and near mid-air collisions by 13 percent in the first quarter of 1986 (compared with 1985). The fastest growing part of airport capital needs is that for new capacity, which now totals some 72 percent of FAA's estimate of $24.3 billion in airport needs over the next ten years.

Long-term capacity of the airports and airways merely reflects the likelihood that delay problems will continue. Completion of the NAS Plan should go a long way toward solving the physical capacity problems of the airspace, leaving the most critical bottleneck on the ground.

Program instability is a problem for all infrastructure areas that depend on the federal government for a significant part of their resources. The efficient completion of long-term capital projects requires stable and secure sources of funding. In theory, the Airport and Airways Trust Fund should provide this. The federal budget crisis, as well as the more routine political interference in decision making, has made the system less effective than it could be. One result has been the growing state role in finance and administration.

Safety remains a long-term concern, particularly in congested areas over larger metropolitan regions. The level of federal funding appears more than adequate, particularly given the gains that the $16 billion NAS Plan will bring. Constant management attention needs to be paid, particularly in the area of the number of air traffic controllers and their level of training.

Noise is probably the second biggest public complaint (next to delays) about aviation. While a new generation of quieter planes will make major improvements, noise remains a problem, particularly in built-up areas. Local opposition to aircraft noise has a major effect on the ability to add new airports or expand existing ones. The public costs of purchasing noise easements or adding land use buffers are substantial.

Possible solutions to these problems include improvements to several broad areas, with implications for every level of government.

The current federal program funds many types of airports and a large number of uses. Two types of changes appear needed: re-targeting of the current program, and providing additional funds for the most-intensive capital needs.

Better pricing strategies represent a partial but very important part of solving airport capacity problems. They can improve the effectiveness with which we use our existing capacity, buying several years of additional time at many airports. In addition, they can help provide resources

to finance necessary capital improvements. At the busiest airports, better pricing will help alleviate short-term capacity problems, even though, in most cases, physical capacity will have to be increased eventually.

The report concludes that two levels of management changes may be appropriate. The first refers to organizational changes under which responsibility for parts of the national aviation system would be turned over to new agencies, either private or mixed in nature. Consideration of such a dramatic and potentially disruptive change appears warranted only in the case of the air traffic control system. Second, improved management practices can add to the effectiveness of National and local systems, as well as privatization and other hybrid controls.

REPORT TO CONGRESS: LONG-TERM AVAILABILITY OF ADEQUATE AIRPORT SYSTEM CAPACITY

1. REFERENCE:

U.S. Department of Transportation, Federal Aviation Administration, June 1992.

2. BACKGROUND/SUMMARY:

The report describes the magnitude of what airport congestion may be in the future, given current trends. The report documents a potential gap between runway capacity at the Nation's major airports and anticipated air traffic in the long-term.

The Federal Aviation Administration (FAA) first initiated a long-term system planning process back in 1986 when it asked the Transportation Research Board (TRB) of the National Research Council to consider the future needs for airports and to outline a program for further study of airport requirements. In 1988, the TRB issued a report which described a serious problem with sharply increasing congestion and delays increasing sharply not only at metropolitan airports throughout the air transportation system.

Concern about the long-term adequacy of the airport system led to a provision in the Airport and Airway Safety and Capacity Expansion Act of 1987 directing the Secretary of Transportation to prepare a plan to ensure the availability of adequate airport capacity through 2010, as required by Section 309 of Public Law 100-223. The FAA made an interim report in January 1989 which relied on the work of TRB. This is the second and final report of the Secretary of Transportation to the U.S. Congress as required by that legislation.

3. ABSTRACT:

This report is based on three separate analyses, each conducted by a different group employing a different analytical approach. For the first analysis, the FAA conducted a statistical analysis of air traffic delay trends and the prospects for increased airport capacity. The second study, conducted by the consulting team of Apogee Research, Inc. and Hickling, estimated the risk that capacity will be inadequate at the busiest air carrier airports from 2000 to 2030. The third analysis, conducted by the TRB at the request of the FAA, assembled an expert panel to provide advice on alternative strategies for meeting the future demand for air travel through 2040.

General Conclusions from this report include the following:

- Airport system capacity should be expanded and the pace of implementation should be increased to provide adequate facilities for the future.

- Airport system development should be conducted in accordance with the U.S. Department of Transportation's National Transportation Policy and should include consideration of other modes.

- Airport construction should remain with state and local government and private entrepreneurs, although the federal government should encourage the development of an adequate national air transportation system and coordinate efforts to use it more effectively.

- The gap between runway capacity and air traffic can be closed by a concerted effort on the part of federal, state, and local government involvement.

The 1991 FAA Strategic Plan provides specific capacity strategies to guide FAA actions over the next 20 years. These strategies include the following:

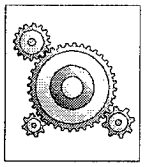
- Implement effective capital investment programs for expanding airspace and airport capacity to accommodate growth and to provide flexibility for future innovation;

- Preserve and enhance the capacity of, and access to, existing airspace and airports using effective management techniques and advanced technology;

- Encourage more efficient use of capacity through such measures as off-peak travel and reliever airports;

- Influence, coordinate, and provide leadership in development of an integrated transportation system; and

- Provide leadership to ensure coordinated airport system development among federal, state, and local governments.



D. MASS TRANSIT

BENEFITS OF MAGNETICALLY LEVITATED HIGH-SPEED TRANSPORTATION FOR THE UNITED STATES

1. REFERENCE:

U.S. Senate Committee on Environment and Public Works, June 1989.

2. BACKGROUND/SUMMARY:

This report to the United States Senate Committee on Environment and Public Works by The MAGLEV (Magnetic Levitation) Technology Advisory Committee (MTAC) and Grumman Corporation examines the technical and economic feasibility of running MagLev transport systems along U.S. Interstate highway rights of way. Such MagLev applications would substitute central station electric power for petroleum based fuels and would, potentially, require less energy per passenger mile than autos or airplanes. The report also notes that MagLev systems can carry extremely large passenger loads, while non-passenger loads can also be taken on to help offset costs during off-peak periods.

3. ABSTRACT:

MTAC recommends the following specific activities:

- An education campaign to explain the issues and options to the public, academia, government, and industry, with assistance from public and private media;
- A goal of constructing full-scale test and demonstration systems suitable for integration with highways within five years;
- Dedicated funding of $750 million over a period of six to seven years for developing, testing, and demonstrating several prototypes of alternative MagLev technologies;
- An agency to manage the project of comparing and down-selecting alternative systems and constructing full-scale tracks for the two or three most promising ones;
- A national "value capture" policy whereby highway easements and adjacent development rights can be franchised to private consortia;
- Federal legislation and encourage the passage of state enabling legislation, including tax incentives and measures for dealing with problems involving anti-trust laws, eminent domain authority, environmental impact, etc.; and
- An administrative structure that will act to implement MagLev systems in the U.S. and enforce quality and safety standards.

FINANCING URBAN TRANSPORTATION

1. REFERENCE:

Joseph M. Giglio, *Civil Engineering*, February 1989.

2. BACKGROUND/SUMMARY:

The effectiveness with which people move between home and work may be the single most important force determining the size and nature of our cities. While the national trend of rapid suburbanization makes traditional mass transit less effective in most parts of the country, older, denser cities that depend on public transportation are experiencing the effects of decades of financial neglect.

This report indicates that the National Council on Public Works Improvement (the Council) gave the mass transit system a grade of "C-" and urban highways a grade of "C+." Throughout the 1970s, mass transit received a considerable amount of financial support from the federal government. In the 1990s, better urban transportation will depend on local initiatives, in contrast.

3. ABSTRACT:

In an effort to address the financing needs of mass transit, the Council endorsed the principle that users should pay a greater share of the cost of infrastructure service and also recommends that federal user fees, paid in gas and other taxes, be used to maintain threshold service levels and to guarantee a minimum level of service where users cannot be identified or cannot afford maintenance costs.

One problem is that funds specifically dedicated to the upkeep and improvement of infrastructure are not being used for such purposes. Two options are presented to remedy this situation. A preliminary step might be to take the trust funds off the federal budget, which would reduce the "budget cutting" effect (by reducing a deficit) and force the government to spend taxes for the purposes intended. A simpler method would be to increase current spending levels. At this time, excise taxes and interest on the trust fund balances alone come to $19 billion annually, while spending levels lag behind.

In the financing of public works capital expenditures, federal dollars remain vital. More flexible block grants may allow localities to tailor resources to their needs. At the same time, states should work to develop comprehensive infrastructure finance strategies. Specifically, governors and state legislators should revise laws that hinder the infrastructure investments of local jurisdictions.

Cities are no longer dominated economically and politically by their downtowns. The dominant flow in commuting is now the suburb-to-suburb pattern which is now twice as large as the

"traditional" pattern of suburb-to-central city travel. This has forced a greater public reliance on auto travel and will require a unique solution in addressing this commuting pattern.

State and local subsidies for operations have more than quadrupled in real terms, from $2 billion in 1960 to $8.5 billion in 1984, with most of the increase absorbed by higher fuel, labor costs, and by declining productivity. Only 40 percent was used to expand service or reduce fares. Transit fares now cover approximately 40 percent of operating costs (considerably more in larger cities), down from 54 percent in 1975. At the same time, federal operating aid has dropped to below $900 million after reaching $1.5 billion in 1980. At its peak, federal operating assistance covered approximately twice as much as today.

MASS TRANSIT: NEEDS PROJECTIONS COULD BETTER REFLECT FUTURE COSTS

1. REFERENCE:

U.S. General Accounting Office, March 1993.

2. BACKGROUND/SUMMARY:

In order to make important policy and funding decisions to support public transit's role in the future, the Congress needs the best information available about how states and localities intend to use transit to achieve their transportation-related goals. These goals include increased mobility, reduced traffic congestion, improved air quality, and economic development. Since 1988, the Congress has been provided with four projections of overall transit needs that range from about $3 billion to $32 billion per year. The Federal Transit Administration (FTA), an agency of the Department of Transportation (DOT), has prepared two reports as required by law; the American Association of State Highway and Transportation Officials (AASHTO) and the American Public Transit Association (APTA) - two nonprofit associations representing state transportation and transit interests, respectively, have each prepared one projection to contribute to reauthorization discussions.

Because of long-standing concerns about existing needs projections, the Congress, in section 3028 (a) of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Public Law 102-240, requires GAO to study the extent to which current transportation needs are adequately addressed and estimate the future transit needs of the nation. GAO has identified why the projections of transit needs varied, what other factors could affect the accuracy of future projections, and any opportunities for improving future transit needs projections.

In fulfillment of these objectives, GAO reviewed the individual needs projections and other relevant transportation literature, interviewed officials at FTA headquarters and at a regional office, and interviewed state and local transportation officials in Massachusetts, New York, New Jersey, North Carolina, South Carolina, Alabama, Florida, and California. These areas were chosen to provide variation by geographic region and types of mass transit available.

3. ABSTRACT:

The four transit needs projections are different because they included different cost elements and make different assumptions to calculate costs. The key cost elements that determine transit's overall needs are operating, capital expansion, and capital maintenance and replacement. For example, FTA excluded all operating needs in both of its reports, whereas these costs were projected to be $14 billion per year and $16.3 billion per year by AASHTO and APTA, respectively.

New federal requirements, which were not finalized when the needs reports were prepared, will likely increase costs beyond the projections. Additionally, transit needs could potentially exceed all of the projections should states and localities choose to increase transit services to meet a broad range of transportation-related goals. New planning requirements for state and local transit plans could become the basis for a nationwide estimate of transit needs. These kinds of data are not being collected currently, but DOT has an opportunity to facilitate future data availability.

In order to better assist the Congress and others in the transportation community, GAO recommends that the Secretary of Transportation take actions to improve future FTA transit needs reports required by 49 U.S.C. Section 308 by:

- Including operating needs, which include current as well as expanded system needs for the nation's transit systems;

- Including vehicle replacement needs for the entire human service operator fleet, not just the vehicles DOT has funded;

- Including transit operators' cost estimates for ADA compliance as reported to FTA under 49 C.F.R. parts 27, 37, and 38;

- Developing new needs projection methods that are more reflective of potential costs, such as estimating the proportion of expanded ridership that will use rail versus bus service and projecting costs accordingly;

- Ensuring that standard data requirements for transit needs projections, such as planned transit expansions and transit systems' condition and maintenance information, are included in the new ISTEA transportation management regulations that are currently under development; and

- Considering transit needs data requirements, such as variables that influence the selection of transit over other alternative modes.

THE NATION'S PUBLIC WORKS: REPORT ON MASS TRANSIT

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by the Urban Institute for the National Council on Public Works Improvement (the Council). The purpose of the report was to examine mass transit as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's mass transit system. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

In urbanized areas (population over 50,000), mass transit in 1984 was a $14 billion industry. Only $4 billion came from fares and other transportation revenue; about $10 billion was provided in direct capital or operating assistance by federal, state, and local governments. A further $1.9 billion was expended on various forms of transit in non-urbanized areas (population under 50,000). Only $0.4 billion of these expenditures in non-urbanized areas came from fares and other transportation revenues; the remaining $1.5 billion came from federal, state, and local governments. With $11.5 billion in annual expenditures on mass transit, the various levels of government have a great deal of interest in the considerable evidence in the literature to suggest, however, that current forms of governmental regulation of, and assistance to, mass transit have led to inefficiencies and the consideration of potentially more efficient providers and service types.

The incentives created by the federal capital assistance program for public takeover of locally franchised private transit companies undoubtedly had a great deal to do with this decision. As the federal funding role declines, however, several state and local governments have begun to rethink traditional institutional and funding arrangements for mass transit, and to use state and local funding arrangements for mass transit, and to use state and local funds to support more competitive and diversified services tailored to their emerging urban development patterns. Given greater flexibility in federal funding procedures and requirements, state and local governments might well move further in these directions.

Over the past decade or so, the structure of the federal transit assistance program has been shifting gradually away from discretionary funding and toward formula funding. A program that began in 1964 as 100 percent discretionary capital assistance has shifted to roughly one-third discretionary and two-thirds formula, with the formula portion including a significant amount of

funding for operating assistance. And even the one-third discretionary portion has begun to include routine allocations to large cities like New York and Philadelphia for major rail rehabilitation projects, and other allocations for major but fairly predictable bus replacement requirements. Probably less than 20 percent of the total funding remains in the discretionary category for the late 1980s.

This shift reflects a growing recognition that, as mentioned earlier, the federal government has encouraged many cities to make major capital investments that they probably would never have made if they had received an equivalent amount of funding under a formula. A growing consensus on continuing this shift in the federal role toward formula funding appears to be emerging in recent studies and policy initiatives.

The gradual shift in federal transit funding over the last decade away from discretionary and toward formula funding seems to reflect accurately the limited ability of the federal government to serve as a manager of local transit investment and operating decisions. A consensus seems to be emerging for a continuation of this trend, preferably accompanied by a similar trend with regard to the federal role in the urban road system.

The federal role might evolve to one of financial support and technical assistance for locally-driven urban transportation decisions, linked to related local decisions on zoning and parking policies. Federal funding levels should explicitly reflect the costs of compliance with federal mandates, and future debate over the federal roles should focus on the appropriateness of these mandates as well as on funding levels. At the state and local levels, current interest in reforming institutional arrangements to promote more diverse services and competition in service provision is well-directed, and is likely to increase as greater funding responsibility is assumed by these levels of government. A reformed federal program designed to support and encourage these developments could make a much greater contribution to the expansion of efficient mass transit than a continuation of current arrangements.

In order to resolve the problems identified, the following policy changes are recommended:

- Federal discretionary funding for mass transit should be discontinued, as recommended by many studies and assessments of the federal transit program.

- Distinctions between federal capital and operating funds should also be discontinued, to eliminate the current bias toward public owned, capital-intensive transit.

- Federal funding for urban mass transit should be provided in the form of a block grant, in parallel with a similar program for highways. Eventually, the two programs might be partially or wholly integrated.

- The level of federal funding for transit should be determined in conjunction with a reassessment of the desirability and costs of the numerous mandates that have grown up around the federal transit program, and along with a reassessment of the federal role in the urban road system. The federal share of individual urban transit and highway projects should be relatively low, to avoid the distortions created by the current 75 to 90 percent federal share in certain transit and highway capital projects. If allocated evenly

over all urban transit and highway projects, current levels of federal funding would result in a relatively low federal share of 20 to 25 percent.

- If the wide variety of transit research needs is to be met, greater diversity in funding sources will be needed. Rather than relying so heavily on the federal government for transit research, states, local governments, and industry trade associations should find ways to pool their resources to fund and direct the research they believe is needed.

These reforms are based on the extensive studies and experience that have been accumulated over the two decades of federal transit assistance, and offer a more rational institutional, financial and research base for mass transit and related infrastructure programs. Many of the suggestions have been made before and have come close to implementation. Most represent a logical continuation of the direction of recent reforms. A fully formula-based transit program is the evolutionary path along which funding has been moving and along which it is desirable to proceed.

THE STATUS OF THE NATION'S HIGHWAYS, BRIDGES AND TRANSIT: CONDITIONS AND PERFORMANCE

1. REFERENCE:

U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, 1993.

2. BACKGROUND/SUMMARY:

The U.S.'s productivity and international competitiveness depends on fast and reliable transportation. As the 21st century approaches, the status of highways, bridges, and transit is of paramount importance to the vitality of our economy. The U.S. population now enjoys the greatest level of mobility in our history. While this level of mobility is of great direct benefit to us as individuals, the impact of increased travel on traffic congestion and environmental quality is of growing concern.

The Congressionally required report series, *The Status of the Nation's Highways, Bridges, and Transit*, provides decision makers with an ongoing appraisal of the current condition and performance of the U.S. highway and transit systems. These continual assessments provide valuable information on how highway and transit investment is used as well as the foundation for estimating investment levels needed to meet future demands of social and economic growth.

3. ABSTRACT:

This report summarizes the 1993 Congressional Report, starting with a "Report Card" for highways, bridges, and transit in 1991. For the first time, the report includes information on transit and environmental impacts. Moreover, the transit and highway investment assessment methodologies are linked. A portion of the forecasted increase in travel demand is accommodated not by the addition of new highway lane-miles but by an aggressive, coordinated demand management program that includes increased transit participation. Future reports will expand on integrating multi-modal and environmental transit issues in the surface transportation investment analysis.

The general report card findings are listed below by category.

Highway and Transit Characteristics

- Total public mileage reached almost 3.9 million miles in 1991 - an increase of approximately 13,000 miles over 1989.

- Total highway travel reached almost 2.2 trillion vehicle miles in 1991 - a total increase of 3 percent over 1989, consistent with the 3.5 percent average annual rate experienced since 1983.

- Transit passenger miles traveled increased by 8 percent from 1980 to 1990.

Highway and Transit Finance

- In 1991, disbursements for highway programs by all levels of government totalled $78.3 billion, with $3.8 billion spent for debt retirement and $74.5 billion for current operations. This expenditure for current operations equates to 3.4 cents per mile of travel, a decline in spending of more than 50 percent in constant dollars since 1960; however, in nominal dollars, 1991 spending for current operations increased more than $7 billion over 1989.

- Of the $74.5 billion for current operations, $36.1 billion were spent for highway and bridge capital improvements in 1991, compared to $33.1 billion in 1989; $38.3 billion were spent for noncapital purposes. The federal share of capital investment was 41 percent, down from a high of 56 percent in 1980.

- In 1990, the cost to operate mass transit service in the U.S. was approximately $14.7 billion; capital expenditures accounted for $4.3 billion, for a total of $19 billion. In 1990, fares and other revenue collected from direct transit customers covered about 43 percent of operating costs with state and local subsidies covering 51 percent and federal subsidy covering 6 percent. The federal share of total reported capital activity declined from 78 percent in 1980 to 60 percent in 1990.

Condition and Performance

- Pavement condition improved throughout the 1980s and continues to do so into the 1990s. However, approximately 234,500 miles are rated as poor or mediocre.

- Highway performance declined through most of the 1980s, especially in the larger urbanized areas. However, between 1989 and 1991, performance stabilized as a result of the reduced rate of urban travel growth caused by the 1989-1990 economic slowdown. In 1989, the total annual cost of congestion in the 50 largest urban areas exceeded $39 billion.

- In 1992, about 118,500 of the nation's 575,000 bridges were rated as structurally deficient.

- The fatalities rate on the nation's highways continues to decrease, dropping from 2.6 fatalities per 100 million vehicle miles of travel in 1983 to a low of 1.9 in 1991. Nevertheless, the total economic cost to the nation of motor vehicle crashes in 1990 was more than $137 billion.

Highway, Bridge, and Transit Investment Requirements

- The cost to eliminate all existing backlog highway deficiencies on all major highways as of December 31, 1991, was approximately $212 billion, $7 billion more than the backlog in 1989.

- The cost to eliminate all backlog bridge deficiencies is approximately $78 billion.

- The total annual investment needed to eliminate highway and bridge backlog deficiencies and to meet additional highway and bridge infrastructure requirements for developing urban and suburban areas is $67.3 billion through 2011. This would require an additional investment of 0.9 cents per mile of travel.

- The cost to systematically improve transit condition and performance by eliminating the backlog of bus and rail deficiencies and adding additional service to accommodate anticipated urban demand not included in either of the highway cost to maintain or improve assessments and increase transit's market share, is $6.6 billion annually through 2011.

- The cost to maintain transit condition and performance, including the cost to meet new statutory obligations to serve disabled Americans and improve vehicular emissions and continue recent growth, is estimated at $3.9 billion annually through 2011.

TRANSPORTATION INFRASTRUCTURE: BETTER TOOLS NEEDED FOR MAKING DECISIONS ON USING ISTEA FUNDS FLEXIBLY

1. REFERENCE:

U.S. General Accounting Office, October 1993.

2. BACKGROUND/SUMMARY:

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) offers states and localities unprecedented opportunities to use federal highway and mass transit capital funds across modal lines. About $80 billion of the $155 billion authorized by ISTEA for the 6-year period ending in fiscal year 1997 can be used to finance either highway, mass transit, or nontraditional projects such as high occupancy vehicle (HOV) lanes. Generally, states and localities select the projects that receive federal funds and provide 20 percent of the total cost of most projects. The flexibility ISTEA provides will be critical as states and localities address such challenges as highway congestion, air pollution, and substantial investment needs for highway and mass transit infrastructure.

In section 3028(b) of ISTEA, the Congress required GAO to examine issues related to the flexible use of ISTEA funds. GAO evaluated the extent to which states and localities have used ISTEA highway and mass transit capital funds flexibly to finance highway, mass transit, and nontraditional projects, the factors that have influenced or will influence the flexible use of ISTEA funds; and the adequacy of analytical tools for making transportation decisions. In reviewing the analytical tools, GAO followed up on recommendations made in their April 1992 report on the need for common measures to permit comparisons between highway, mass transit, and other types of projects. GAO also examined the models used to forecast travel demand and their use in evaluating the impacts of transportation projects on air quality.

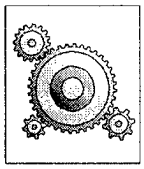
3. ABSTRACT:

States' and localities' use of ISTEA highway and mass transit capital funds to finance projects across modal lines have been limited. Although not necessarily a forecast of the future, in fiscal year 1992 states and localities invested about 97 percent of their flexible highway funds, which are funds also available for mass transit and nontraditional projects, in traditional highway projects such as roadway construction. Of the $11.2 billion in flexible highway funds obligated by states and localities in fiscal year 1992, less than 3 percent, or $319 million, was invested in mass transit or nontraditional projects.

Similarly, of the $1.1 billion in flexible mass transit capital funds obligated by states and localities in fiscal year 1993, none was invested in highway projects. However, about 3 percent, or $34 million was invested in nontraditional projects. Six months into fiscal year 1993, investment patterns remained essentially the same, with 3 percent or less of flexible highway and mass transit funds being invested in mass transit or nontraditional projects.

A variety of factors have influenced or will influence the flexible use of ISTEA highway and mass transit funds. Requirements of 1990 to improve air quality and the need to reduce congestion are two factors that have facilitated the flexible use of funds. Funding flexibility has been largely concentrated in the Federal Highway Administration's congestion mitigation and air quality improvement program, which is designed to address air quality issues.

On the other hand, several factors hinder the flexible use of ISTEA funds. First, in some cases, the use of revenue from state motor fuel taxes to finance the nonfederal portion of mass transit projects may be limited because some state laws restrict the use of such revenues to highway projects. Second, investment needs for highway and mass transit infrastructure continue to outstrip available resources. In addition, adapting to changes brought about by ISTEA will take time, since officials from four out of five states contacted by GAO reported that they have little involvement in mass transit programs and that they will need time to begin considering projects from other modes to solve transportation problems.



E. WATER SUPPLY

CAPITAL REQUIREMENTS FOR DRINKING WATER INFRASTRUCTURE

1. REFERENCE:

D.W. Schnare and J.E. Cromwell, Annual Conference of the American Water Works Association, June 1990.

2. BACKGROUND/SUMMARY:

This document was written as a joint conference paper by a U.S. EPA Office of Drinking Water employee and a private contractor for a capital financing seminar at the annual conference of the American Water Works Association. It assesses the impact estimates made in conjunction with the reauthorization of the Safe Drinking Water Act (SDWA) in relation to the baseline trends of water industry capital expenditures and the size of the customer base over which the costs will ultimately be spread.

3. ABSTRACT:

The 1986 amendments to the SDWA set forth requirements for improvements in drinking water treatment that will require at least a doubling of the current level of investment devoted to water treatment. Currently, the largest share of the capital cost of water supply is related to providing water quantity, rather than quality. Throughout the 1960s and 1970s, expenditures on treatment plant construction averaged about 18 percent of total capital outlays for construction, while the remaining 82 percent was dedicated to investment in distribution systems. Of the 18 percent devoted to treatment plant construction, only about 20 percent was expended for the actual treatment equipment. The SDWA requirements will change this cost structure for both large and small water systems.

It is estimated that implementing the SDWA will cost on the order of $10 billion. Over 90 percent of the $10 billion total is attributable to compliance costs for four rules: the Surface Water Treatment Rule, the Lead and Corrosion Control Rule, the Ground Water Disinfection Rule, and the Radionuclides regulations. The largest share of SDWA costs are attributable to microbiological control and corrosion control, rather than exotic contaminants.

If compliance schedules were rigorously adhered to, a surge of more than $2 billion in capital expenditures for water treatment would be required in 1994 alone. According to the article, "it seems far more likely that the $10 billion expenditure will be spread out over most of the decade of the 1990s." This will represent a doubling of capital expenditures for water quality (as opposed to water quantity), and about a 15 percent increase in total capital expenditures by the water industry. The $10 billion estimate does not, however, represent the full costs of compliance with the SDWA. Additional requirements that have not yet completed the rulemaking process, including lead service line removal and disinfection by-products regulations could together impose another $10 billion in capital costs. On the basis of this analysis, it appears that

the impact of the SDWA will be a 15 percent increase over baseline capital demands of the water industry over the next 20 years.

The impacts of many SDWA compliance requirements are likely to be unevenly distributed among water systems. Surface water systems will be primarily concerned with compliance with the Surface Water Treatment Rule, the Lead and Corrosion Control Rule, and the Disinfection By-Products Regulations. Groundwater systems will be primarily concerned with the Groundwater Disinfection Rule, the Lead and Corrosion Control Rule, and radon removal. The report states that "for most small groundwater systems, the cost of the more fundamental water treatment improvements mandated by the SDWA is by itself sufficient to make affordability a question mark. Of the $10 billion of SDWA capital needs projected to be pending in the 1990s, fully half is attributable to systems having less than half an MGD of capacity which are predominantly groundwater systems....In a great many small water systems, costs...would represent at least a doubling of the existing water service charges."

One of the major assumptions underlying this analysis of capital needs is the set of unit costs attributable to each treatment train. These unit costs may well be higher for smaller treatment systems. In addition, small systems may need to undergo fundamental restructuring in order to be self-sustaining. Restructuring could take many forms, including: regionalization, interconnection, circuit rider operation, big-brother arrangements, mergers and acquisitions, various privatization strategies, and various forms of financial assistance. In larger water systems, capacity planning and demand management strategies will need to be addressed in response to the SDWA.

The report concludes that state infrastructure financing mechanisms may need to be created to assist water systems in financing compliance. According to the report, "the most important challenge that states will face is the need to coordinate the actions of state financing authorities with those of state regulatory authorities. The capacity to finance compliance will be greatest if the state pursues a deliberate, coordinated strategy to use its combined financial and regulatory leverage to turn marginal small systems into financially viable entities."

THE NATION'S PUBLIC WORKS: REPORT ON WATER SUPPLY

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Wade Miller Associates, Inc. for National Council on Public Works Improvement (the Council). The purpose of this study was to examine water supply as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's water supply. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

A National water supply "infrastructure gap" of a magnitude that would require a substantial federal subsidy does not exist. Water utilities experiencing revenue shortfalls generally do not charge rates which cover full costs of the utility. While there is an infrastructure problem of considerable magnitude in some (primarily northeastern) cities, urban water supply systems as a whole do not constitute a National problem.

A National problem does exist for small water systems. The majority of small water systems are poorly managed because of:

- A lack of understanding of the water supply function;
- A lack of technical training;
- Inappropriate rates structures;
- A lack of access to capital; and
- No economies of scale.

Proper implementation of the Safe Drinking Water Act Amendments will have significant impacts on both water utilities and state public water supply supervision programs. The primary costs and workload impacts will be felt by medium and smaller systems. There appears to be sufficient water available in western states, but due to allocation practices, water resources are not disturbed efficiently. Contamination and depletion of groundwater supplies is a major problem facing the

water industry. Additional costs can be expected to result from groundwater protection and reclamation activities.

The study's recommendations are outlined below.

- **Full-Cost Pricing**. There should be a National mandate to require water utilities to be financially self sufficient through water rates. This could be achieved through amendments to the Safe Drinking Water Act.

- **Expanded Emphasis on Regionalization**. At the federal level, leadership in managing regional water resources must be re-directed somewhat from the traditional emphasis on source development and focused instead on the problem of efficient allocation. At the state level, many opportunities to promote regional management exist; these opportunities should be explored.

- **Expanded Research and Technical Transfer Agendas**. The research and technology transfer programs of the Environmental Protection Agency and the American Water Works Association Research Foundation should be expanded to encompass a broader range of subject matter more relevant to the needs of small water systems and covering routine system management functions as well as sophisticated technologies.

- **Short-term Emphasis on Technical Assistance at the National Level**. Currently, the National Rural Water Association operates a technical assistance program in 34 states. Given the severity of small system problems, the NRWA program should be expanded to 50 states. The program should be coordinated closely with the state drinking water programs, however, to achieve maximum benefits and to ensure that truly needy systems are targeted.

- **Expanded Public Education**. The Environmental Protection Agency, the state primacy agents, and local utilities should initiate a program of 'public outreach' to ensure that the citizenry is cognizant of important developments in the drinking water field.

SERVICE EFFORTS AND ACCOMPLISHMENTS REPORTING: ITS TIME HAS COME -- WATER AND WASTEWATER TREATMENT

1. REFERENCE:

Priscilla Burnaby and Susan Herhold, Governmental Accounting Standards Board (GASB), December 1990.

2. BACKGROUND/SUMMARY:

Accountability in drinking water, wastewater treatment, and storm drainage is of the utmost importance if Americans are to maintain their current standard of living. Water is a scarce resource that has been misused. In FY 1985-1986, total state and local direct expenditures for water supply exceeded $16 billion and wastewater treatment expenditures surpassed $13 billion. Together, the two services constituted over four percent of total state and local government direct expenditures. Expenditures for water and wastewater treatment services are growing rapidly as new anti-pollution standards are enacted. Service Effort and Accomplishment (SEA) indicators are an important part of accountability efforts because they help elected officials and citizens evaluate what results they are receiving for their money. This report, one of thirteen studies to be published as part of the GASB research on SEA indicators, examines SEA measurement and reporting for drinking water, wastewater treatment, and storm drainage.

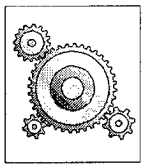
3. ABSTRACT:

The maintenance of the current infrastructure is an important aspect of providing an adequate supply of water. Indicators of outcomes of the effectiveness of the maintenance program include the number of leaks, breaks, and customer complaints. The safety and quality of drinking water would be disclosed through the outcome indicator, "number of days did not meet federal or state regulations."

Input indicators selected include total cost of operations, cost per-capita of wastewater treated, miles of infrastructure, and number of employee hours. These indicators should provide information about the costs of the system and allow comparisons of systems of similar size.

Output indicators considered are the number of miles of sewer pipe maintained, repaired, and inspected; miles of new sewer constructed; and number of new services connected

Information on total cost is needed to evaluate cost-effectiveness. This set of indicators includes the total cost of operations, maintenance costs, and number of employee hours. These would be disclosed in terms of both actual and budget costs for the current year and actual costs for the two previous years. To assess the level of performance in the area of stormwater removal, the following three indicators were selected: number of complaints received, reported incidents of flooding, and percentage of complaints resolved within a goal period of time.



F. WASTEWATER TREATMENT

AMERICA'S ENVIRONMENTAL INFRASTRUCTURE: A WATER AND WASTEWATER INVESTMENT STUDY

1. REFERENCE:

Clean Water Council, December 1990.

2. BACKGROUND/SUMMARY:

America's Environmental Infrastructure is the result of a research project prepared by Apogee Research, Inc. for the Clean Water Council. This report presents new insights into the extent to which water and wastewater treatment infrastructure supports economic growth and productivity throughout the nation. It documents recent underinvestment in water and wastewater facilities, relevant to independent assessment of "needs" in greater detail on a state-by-state basis. In addition, this report presents several options to address the projected shortfall in the level of investment in water and wastewater infrastructure.

3. ABSTRACT:

While the importance of a safe drinking water supply and an adequate system of wastewater treatment to individual health, public welfare, and the environment is obvious, the role of these services to the nation's economy is sometimes overlooked. The data reveals a substantial gap between capital needs and the funds that are expected for investment under current policies. Current projections indicate a shortfall of $79 billion, in which capital needed to prevent wastewater pollution from residential, industrial, and commercial discharges exceeds that required to ensure safe drinking water.

An aggregate national shortfall does not necessarily mean that all states will experience their proportional share of funding problems, relative to needs. Some states have demonstrated by their past rates of investment that a future shortfall is unlikely; however, most states have needs beyond their projected expenditure level. Moreover, in a few states, the anticipated funding gap is dramatic. At the same time, aggregate data may mask severe shortfalls that characterize smaller, poorer communities which could already be in violation of compliance standards. Similarly, many of the public health benefits of purity standards for drinking water envisioned in the Federal Safe Drinking Water Act have not been attained. This is due in part to slower-than-expected implementation of regulations and failure to comply with those currently in place.

The funding shortfalls could be addressed by a number of policy options. Communities could choose to increase user fees or taxes in amounts necessary to support almost a doubling in wastewater investment and an increase of one-third in drinking water investment, assuming that there is no new national effort to finance these necessary facilities. Whether or not communities face the regulatory and economic incentives to do so, or whether there exists sufficient political commitment for such increases is not always known.

This report analyzes two other funding options that would require a commitment from all levels of government as well as individual citizens which are not mutually exclusive. Actually, balancing the cost of building needed drinking water and wastewater facilities equitably suggests that both be considered in an overall funding package.

The first option, reauthorization of Titles II and VI of the Clean Water Act would extend the federal commitment to funding clean water beyond 1994, the year in which federal authority will end under current policy. Title II, the Construction Grants Program, could be reauthorized at modest levels to target means-tested federal grants to needy communities. Title VI, the State Revolving Loan Fund Program, could similarly be extended at modest levels, with federal capitalization grants to states linked to outstanding need and the potential to leverage federal funds.

The second option, the establishment of a new water and wastewater treatment fund, will have the strongest impact on reducing the investment "gaps." This new institution would act much like existing federal transportation trust funds and would finance local construction of water and wastewater infrastructure from the collection of federal fees imposed on water and sewer bills. A modest increase in water and/or sewer rates should provide substantial funding to meet the future water and wastewater needs of the nation.

THE NATION'S PUBLIC WORKS: REPORT ON WASTEWATER MANAGEMENT

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Apogee Research, Inc. for the National Council on Public Works Improvement (the Council). The purpose of this study was to examine wastewater management as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's wastewater management. This report responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

About $12 billion annually is spent to construct, operate, and maintain municipal wastewater treatment facilities. In 1986, the Nation's approximate 16,000 wastewater treatment facilities served the public by removing over 85% of the pollutants from wastewater generated by 70% of the U.S. population and about 160,000 industries before discharging the treated wastewater into waterways. Reducing wastewater discharges protects public health and the environment. Localities that can provide adequate wastewater treatment capacity attract development and associated economic growth.

Significant wastewater management issues include:

- Significant Costs Remain to Provide Needed Wastewater Treatment. Financing the new construction and expansion of the thousands of facilities necessary to meet national goals will impose new financial burdens on states, local governments, and ultimately on users.

- Many Wastewater Treatment Facilities do not Charge Full Cost for Service. Wastewater treatment services priced below cost promotes excess demand, inflated needs estimates, and may not provide a sufficient stream of revenue to support new debt or to set aside retained earnings for later investment in improved plant or equipment.

- Wastewater Management Regulations Could be More Flexible. Additional flexibility in local water quality control strategies could continue the progress in cleaning up the Nation's waterways, but at less cost.

- Area-Wide Planning Needs. A lack of coordinated area-wide water and economic planning could lead to inefficient wastewater management.

- Pretreatment Program Critical to Controlling Toxic Wastes. The pretreatment program administered by the EPA and the states has not been fully implemented, and, as a result, some U.S. waterways receive high amounts of toxic wastes.

- Research, Development, and Operating Innovations Have Been Slow. The Nation has not yet committed to an ongoing research program targeted to low-cost technologies, or the large and growing costs to operate and maintain wastewater treatment plants.

- Promote Improved Financial Management. A greater number of facilities could be operated on a utility basis (operated on their revenues) to encourage greater local financial responsibility by localities.

- Develop More Flexible Limits for Wastewater Discharges. Innovative permits could reduce the cost to the Nation of removing pollutants from wastewater.

- Incorporate Water Quality, Water Supply, and Economic Development Into Area-Wide Planning and Management. Area-wide planning and management agencies, which consider all water uses and regional growth, could provide more economical wastewater treatment services.

- Accelerate the Pretreatment Program to Control Toxic Substances. Expanded program implementation, and additional technical guidance and information on pollutant sources, could improve the control of toxic substances discharged into waterways.

- Improve Wastewater Treatment Technology, Operations, Cost Control, and Research and Development. Regional or statewide technical and financial assistance programs could provide research on low-technology treatment, train operators, and encourage the use of numerous strategies to save in plant operating costs.

PRIVATIZATION OF MUNICIPAL WASTEWATER TREATMENT

1. REFERENCE:

Randall G. Holcombe, *Public Budgeting and Finance*, Fall 1991.

2. BACKGROUND/SUMMARY:

Although privatization has been relatively unimportant as a source of financing wastewater treatment, study of the privatization option is still worthwhile. One reason is that EPA endorses privatization as an option for building treatment facilities. A second reason is that federal funding for wastewater is likely to become much more scarce after 1994, which will prompt municipalities to consider other options that include privatization. The EPA is phasing out its grant program and awarding states capitalization grants to establish state revolving funds (SRF) for wastewater treatment. However, the SRF capitalization grants are scheduled to terminate after 1994, which means that local governments will have to find alternative sources of funding.

3. ABSTRACT:

This article begins by providing some background on privatization in wastewater treatment, followed by an analysis of the terms of several privatization agreements. A comparison of the costs of privatized versus municipally owned and operated facilities is then undertaken, followed by an assessment of the differences between the ideal model of privatization and the privatization that has actually occurred in wastewater treatment.

In summary, privatization offers a way to take advantage of the increased efficiency of the private sector in producing services traditionally provided through the public sector. Privatization of wastewater treatment can allow municipalities to receive efficient service at a competitive price and without having to exert the oversight necessary for municipal ownership and operation. By allowing private firms to bid for the right to the privatization contract, competitive terms can be agreed to ahead of time, and the firm that exchanges a service for an agreed-upon fee has an incentive to produce the service efficiently.

In addition, because the firm bears the cost of inefficient operation, the municipality does not need to engage in extensive oversight of the privatized facilities. In practice, privatization agreements are written that allow the privatizing firm to pass many of the costs of production on to the municipality. This eliminates most of the theoretical advantages of privatization, because when costs are passed through, there is no meaningful price competition at the bidding stage, the firm has less incentive to keep costs down since they can be passed through, and the municipality must engage in extensive oversight of the privatizing firm to make sure that the costs it is passing through are not excessive.

WATER POLLUTION: STATE REVOLVING FUNDS INSUFFICIENT TO MEET WASTEWATER TREATMENT NEEDS

1. REFERENCE:

U.S. General Accounting Office, January 1992.

2. BACKGROUND/SUMMARY:

Through the 1987 Amendments to the Clean Water Act, Congress dramatically changed the federal role in financing wastewater treatment, shifting responsibility for financing more than $83.5 billion in wastewater treatment needs to the states and, in exchange, authorizing the federal government to provide more than $8.4 billion in capitalization grants for state revolving funds (SRFs) over 6 years.

Given the importance to public health and the environment of meeting the nation's wastewater treatment needs, the Chairman of the House Committee on Public Works and Transportation asked GAO, among other things, to assess whether statutory or regulatory changes are necessary to increase the efficiency and effectiveness of the program, and whether SRFs can meet the nation's wastewater treatment needs. GAO surveyed state officials responsible for SRFs and visited five states, and consulted with financial experts.

3. ABSTRACT:

Several changes could improve the ability of states to meet local wastewater treatment needs through SRFs. For example, the Clean Water Act prohibits the use of SRFs to purchase land unless the land itself is used directly in the waste treatment process. Under this definition, wetlands used to filter wastewater as part of the treatment process are eligible for SRF assistance. However, other land that may be necessary for treatment operations, such as land upon which a treatment plant can be built and easements and rights of way needed for wastewater collection systems, cannot be purchased with SRF assistance. To obtain funds for such purchases, communities must often borrow in the private financial markets at higher interest rates, and, as a result, their costs increase. Forty-two states responding to GAO's survey maintained that the costs of acquiring land necessary for treatment operations should be eligible for SRF assistance.

According to EPA officials, the agency's objectives are to ensure statutory compliance and to provide financial advice to states. These responsibilities require a mix of skills, including expertise in engineering, accounting, and financial analysis. However, most of EPA's regional staff, charged with oversight and providing guidance to states on the SRF Program, are engineers who lack training in financial analysis and banking. While EPA recognizes the need, few EPA regions have staff with this experience.

Finally, the statute prohibits states from offering loan terms beyond 20 years, although the design life of some treatment facilities is greater than 20 years. Small communities are

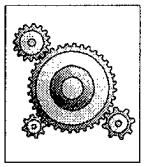
disproportionately affected by this restriction. Most states maintained that they should be allowed to extend loan terms when the design life of the plant and equipment exceeds 20 years.

Even if the modifications GAO recommends were implemented, states expect to meet only about 31 percent of the nation's wastewater treatment needs through SRFs by the year 2001. This estimate assumes current levels of federal capitalization, state matching funds, and proceeds from leveraging. However, the percentage of overall wastewater treatment needs that states will meet is actually much lower because EPA does not include in its needs survey many of the needs that are eligible for SRF assistance, including needs for nonpoint source pollution control and estuary protection.

It will be particularly difficult for the SRF to meet the needs of small communities. Per capita costs for wastewater treatment plants are often relatively high in small communities because they cannot take advantage of economies of scale. When these high per capita costs are combined with low per capita income, debt may be unsupportable at any interest rate. In addition, some of the statutory requirements described above increase costs disproportionately for small communities, making it more difficult for them to qualify for SRF assistance.

The report concludes with a suggestion that congress consider amending the Clean Water Act to authorize EPA to allow states to determine what land can be financed through the SRF for each project and to allow states to equate loan terms with the design life of the plant and equipment being financed. In addition, GAO recommends that the EPA Administrator develop:

- A plan to improve the mix of skills of EPA's personnel in the regions so that they can provide financial advice to states;
- Models to estimate needs comprehensively, including needs associated with nonpoint source pollution control and estuary protection; and
- A long-term strategy to help states and local governments close the gap between needs and available resources to meet water quality goals set forth in the Clean Water Act.



G. WATER RESOURCES

APPROACHES TO COMBINED SEWER OVERFLOW PROGRAM DEVELOPMENT: A CSO ASSESSMENT REPORT

1. REFERENCE:

Association of Metropolitan Sewerage Agencies, November 1994.

2. BACKGROUND/SUMMARY:

Under the overall direction of its Wet Weather Issues Committee, and with assistance from its Members and Subscribers, AMSA has developed this comprehensive report on combined sewer overflows (CSO) control programs in twenty-one communities. This information is intended to assist in effectively characterizing the site-specific nature of CSOs, placing CSOs in context with other water quality issues and understanding water quality goals and the processes used to establish the basis for CSO control programs. The report examines options for CSO controls and associated costs for programs by factually describing effective CSO control efforts that are completed or underway nationally.

The report concludes that considerable progress toward water quality improvement and the restoration of ecosystems has been made through the implementation of the environmental protection measures contained in the Clean Water Act. Nevertheless, the wet weather phenomenon of CSOs presents a water quality challenge that must be met. CSOs represent one of a number of water quality problems that must be considered as part of a broader, comprehensive analysis addressing an array of complex and diverse sources of pollution that are costly to remediate.

3. ABSTRACT:

There are approximately 1,100 cities in the United States with some or all of their population currently served by combined sewers. Combined sewers are single pipes which convey both storm runoff and sewage. Approximately 80 large municipalities, with populations greater than 100,000, have extensive combined sewer systems. These large municipalities represent approximately 29 million people or 70 percent of the nation's population served by combined sewers.

The twenty-one cities and sewerage agencies presented in this report serve a total population of 32,708,000 people. The service area populations range from 175,000 in Columbus, GA to 7,300,000 in New York City. The population serve by combined sewers in the twenty-one cities is 19,961,000. There are 2,106 combined sewer outfalls in the twenty-one cities and prior to CSO improvements, these cities overflowed nearly 146 billion gallons of untreated combined sewage each year. This 146 billion gallons represents approximately 30-45 million gallons of untreated sanitary sewage and industrial wastewater. The remainder is stormwater.

In the programs presented in this report, the primary environmental protection requirement for CSO control is the reduction of fecal coliform concentrations and sewage debris. Conventional pollutants discharged from these agencies' CSOs have little impact on water quality. Dissolved oxygen impacts are typically negligible. Measured or modeled nutrient loads from CSOs are small when compared to the total nutrient loads in the watershed. In many of the cities, basement flooding during wet weather is also a problem that influences CSO improvements and frequently impacts the selected control strategy.

Nine of the agencies are currently developing long-term CSO facilities plans. Many of these agencies have made significant improvements to their systems and are now assessing the effectiveness of those improvements and are evaluating more comprehensive solutions. Water pollution control agencies in Atlanta, GA; Chicago, IL; Columbus, GA; Milwaukee, WI; Minneapolis-St. Paul, MN; Portland, OR; Richmond, VA; San Francisco, CA; and Wayne County, MI have completed their comprehensive CSO planning and are either designing, constructing, or have completed their facilities.

The control approaches taken by the municipalities in the study reflect the site specific nature of CSO solutions. Many of the cities have utilized a combination of technologies focusing on improving water quality and reducing the volume and frequency of overflow events. The primary approaches taken by municipalities are:

- Inflow reduction, including total or partial sewer separation;
- Flow-through or direct treatment;
- Wet weather storage;
- Sedimentation treatment; and
- Collection system optimization.

Seventeen of the twenty-one agencies in the study have completed enough planning work to estimate the anticipated cost of their CSO control programs. The seventeen agencies plan to spend in excess of $11.5 billion dollars for CSO control. This estimate does not include efforts in Boston, MA; the City of Cincinnati, OH; the City of Louisville, KY or the City of Detroit, MI. Adding the cost of CSO programs from these agencies will likely increase the total estimated capital costs to more than $15 billion.

THE NATION'S PUBLIC WORKS: REPORT ON WATER RESOURCES

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by a federal interagency task force (Schilling, et.al.) for the National Council on Public Works Improvement (the Council). The purpose of this study was to examine water resources as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's water resources. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

Water resources consist of services that support domestic and foreign commerce (ports and waterways); prevent or contain hazards affecting land, property, and lives (flood control, urban drainage, dam safety, shoreline and streambank protection); enhance crop production (irrigation and agricultural drainage); provide water-related recreation; and enhance fish and wildlife habitat areas. The facilities that provide these services include a vast number of ports, locks, dams, levees, channels, breakwaters, storm sewers, and other drainage facilities.

A system of shared responsibilities to plan, construct, finance, operate, maintain, and repair physical facilities has evolved over more than a century, with programs existing at all levels of government and in the private sector. In terms of financial expenditures, public spending peaked in 1968 at $9.1 billion, in 1984 dollars. By 1984, spending had decreased by 23 percent to about $7 billion. Annual capital spending for water resources construction by all government peaked at just over $5 billion in the late 1960s and had decreased by 60 percent to about $2 billion in 1984. Conversely, operating expenditures have increased. Federal operating outlays tripled between 1960 and 1984, while state and local operating outlays doubled. However, data on spending should be used cautiously, as sources are often unclear about inclusion of some categories, such as urban drainage, and there may be double-counting.

There is need to establish an intergovernmental coordinating forum, initiated at the federal level, for information and technology transfer. The thrust of this effort would be to accelerate adaptation from new development towards management of existing systems. This forum should lead in developing procedures to consider benefits and costs, risk and alternative performance levels for existing structures. These procedures will supplement similar ones which exist for new development and lead to improved future needs assessments.

Institutional changes should be pursued by each level of government to improve management and financial decision making of existing service facilities. All levels should establish capital budgeting procedures which provide long-term programmatic and financial planning, set priorities within budget constraints, and improve rate setting and revenue generation practices.

An assessment of condition of levees and floodwalls should be conducted by federal and state entities. Safety concerns are similar to those for dam safety; design, maintenance, and rehabilitation practices are believed to vary as widely as they do for dams.

Improved data should be developed to determine the extent of urban drainage/stormwater management needs. Each level of government has a role to play in fostering and implementing management practices, as well as developing complementary stormwater and flood control practices.

Conditions under which projects were originally built change, as do perceptions of priority of services they provide. Some changes may be anticipated, others are inherently less predictable, such as global climate change which may drastically alter future supplies of water resources and services needed. Federal and non-federal interests should collaborate to improve procedures for adjusting to and anticipating uncertainties that may affect physical structures.

NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT: THE REPORT TO THE U.S. CONGRESS

1. REFERENCE:

U.S. Army Corps of Engineers, Institute for Water Resources, September 1994.

2. BACKGROUND/SUMMARY:

In response to the droughts of 1988, Congress funded a four year National Study of Water Management During Drought, led by U.S. Army Corps of Engineers. The primary objective was to find a better way to manage water during drought in the United States.

This report is one of 17 reports produced under the National Study of Water Management During Drought, including the main technical summary of the innovative approaches developed and used during the National Drought Study, "Managing Water For Drought." This study was conducted under the authority of Sections 707 and 729 of the Water Resources Development Act of 1986.

3. ABSTRACT:

The Corps concluded after the first year of the Drought Study, as did many other reviewers, that the problems in water management during drought are manifestations of problems in water management in general. These droughts revealed weaknesses in water management systems which were hidden in the years when water was plentiful. In the U.S., water management problems come not from limited overall supply, but from problems in regional availability, management, and usage. There is broad agreement among water scholars that the primary flaws in American water management include inefficiency and lack of holistic management, the practice of pricing water below its real value, and the failure to involve stakeholders in water management.

The Drought Study Team developed an innovative, integrated, and collaborative approach to drought management and tested and improved it in four Drought Preparedness Studies. The DPS planning approach is based on the principles of multiobjective water management derived from the Harvard Water Program of the late 1950s and early 1960s and codified in "Principles and Guidelines" for federal water planning. The features that distinguish the Drought Preparedness Study method from traditional federal planning studies are that a DPS study:

- Is built on the assumption that regional and national objectives must be defined and addressed through negotiation;
- Accommodates non-structural solutions more readily;

- Uses collaboratively built *shared vision* computer models to bridge the gap between the information specialized water models can provide and the way people negotiate water decisions;

- Involves stakeholders in a way that balances the benefits of broad participation with the problems of managing a large study group;

- Is designed to reduce impacts, not just allocate water shortages;

- Integrates drought response with long term water resources management;

- Lets regional managers benefit from expertise and experience from around the country; and,

- Assembles planning teams from existing organizations, linking them in a way that addresses the fragmentation of responsibilities among agencies without creating new bureaucracies.

To reinforce the changes that are anticipated to occur in Corps and non-Corps practices through review of the study documents and discussion of these techniques in professional circles, the Corps recommends three Congressional initiatives to secure the lessons and benefits derived from the National Drought Study:

- Promote the use of DPS methods in future comprehensive, intergovernmental river basin and watershed management studies conducted with federal funding;

- Promote the use of the DPS method as part of conventional reconnaissance and feasibility, project-specific studies, especially as part of drought contingency planning and reallocation studies for Corps reservoirs; and

- Support the use of the DPS method in international water conflicts in which the national interests of the U.S. are at stake.

SHARING THE CHALLENGE: FLOODPLAIN MANAGEMENT IN THE 21ST CENTURY

1. REFERENCE:

Interagency Floodplain Management Review Committee, June 1994.

2. BACKGROUND/SUMMARY:

During the decade ending in 1993, average annual flood damages in the United States exceeded $3 billion. Flood damages are a national problem. Although human activities in the floodplains of the Midwest over the last three centuries placed people and property at risk, the nation learned that effective floodplain management can reduce vulnerability to damages and create a balance among natural and human uses of floodplains and their related watersheds to meet both social and environmental goals. The nation, however, has not taken full advantage of this knowledge. The United States has simply lacked the focus and incentive to engage itself seriously in floodplain management. The 1993 flood managed to focus attention on the floodplain and provided the incentive for action.

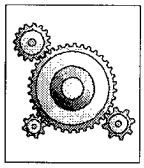
In January 1994, the Review Committee was asked to delineate the major causes and consequences of the 1993 Midwest flooding and to evaluate the performance of existing floodplain management and related watershed management programs. The Review Committee was also requested to make recommendations to the Task Force on changes in current policies, programs, and activities of the federal government that most effectively would achieve risk reduction, economic efficiency, and environmental enhancement in the floodplain and related watersheds.

3. ABSTRACT:

The Interagency Floodplain Management Review Committee proposes a better way to manage the nation's floodplains. It begins by establishing that all levels of government, all businesses and all citizens have a stake in properly managing the floodplain. The Review Committee supports a floodplain management strategy of, sequentially, avoiding inappropriate use of the floodplain, minimizing vulnerability to damage through both structural and nonstructural means, and mitigating flood damages when they do occur.

By controlling runoff, managing ecosystems for all their benefits, planning the use of land and identifying those areas at risk, many hazards can be avoided. To ensure a long-term, nationwide approach to floodplain management, the Review Committee proposes legislation to develop and fund a national Floodplain Management Program with principal responsibility and accountability at the state level. It also proposes revitalization of the federal Water Resources Council to better coordinate federal activities, limited restoration of some basin commissions for basin-wide planning, and issuance of a Presidential Executive Order requiring federal agencies to follow floodplain management principles in the execution of their programs.

The Review Committee also proposes a plan for the upper Mississippi River Basin to identify and evaluate the needs of the basin, to ensure the integrity of a flood damage reevaluation system that meets the needs of the basin, and to restore the natural floodplain functions on appropriate lands.



H. SOLID WASTE

CONFRONTING THE GARBAGE CRISIS: INCREASED FEDERAL INVOLVEMENT AS A MEANS OF ADDRESSING MUNICIPAL SOLID WASTE DISPOSAL

1. REFERENCE:

Jonathan Phillip Meyers, *Georgetown Law Journal*, February 1991.

2. BACKGROUND/SUMMARY:

In 1989, Americans generated approximately 160 million tons of municipal solid waste. The amount of garbage generated annually in the U.S. has risen eighty percent since 1960. The current projection is that Americans will produce 190 million tons of garbage in the year 2000. While the garbage crisis has been around for years, until now it has not received the attention it deserves. Americans have grown accustomed to throwing away so many things that we have become almost unaware that our garbage does not disappear once the trash collector picks it up. Some kind of change is necessary as our current disposal facilities are inadequate to handle the growing amount of waste generated.

3. ABSTRACT:

This law journal note argues that the only politically viable means of handling America's garbage crisis is to amend the Resource Conservation and Recovery Act of 1976 (RCRA), which establishes guidelines governing state handling of hazardous and nonhazardous waste disposal. It examines the widespread problem of municipal solid waste disposal, analyzes the nation's dependence upon landfills for the disposal of municipal solid waste, the difficulties inherent in developing new landfills for the disposal of municipal solid waste, and the consequent decision of many states to ship their garbage out of the state.

The note proposes amendments to RCRA that would parallel the federal statutory framework for hazardous waste disposal and federally mandate a response from those states that ignore the demands of RCRA and recommends a federal response similar to the approach that Alabama took with respect to its hazardous waste landfill. Alabama, with the nation's largest hazardous waste landfill, has been accepting hazardous waste from other states. The amount of waste imported into Alabama has increased from 100,000 tons in 1978 to an estimated 800 million tons in 1989. In 1990, the Alabama legislature decided that, "...Alabama would no longer serve as the nation's 'dumping ground,' and enacted a law that banned the importation of hazardous waste from any state which had not met the CERCLA Capital Assurance Plan requirements for the disposal of hazardous waste." The ban initially affected twenty-two states and the District of Columbia. In addition, Alabama has also refused to enter into any interstate agreements with states that do not offer some form of reciprocal in-state hazardous waste disposal facility.

The note proposes that Congress require states to come up with acceptable CAPs for municipal solid waste disposal, just as it has done for hazardous waste disposal. Congress should require that the CAPs submitted by the states be realistic and legitimate. Also, states should not be

permitted to meet the CAP requirement by simply listing the other states that currently accept their municipal solid waste. To prevent states from turning in unrealistic CAP proposals and attempting to "piggyback" on other states via interstate agreements, Congress should mandate the reciprocity approach that Alabama attempted to use for its hazardous solid waste landfill, which is to allow states to contingently ban the importation of municipal solid waste from states that do not meet the CAP requirements.

CURBING WASTE IN A THROWAWAY WORLD: REPORT ON THE TASK FORCE ON SOLID WASTE MANAGEMENT

1. REFERENCE:

National Governors' Association, Task Force on Solid Waste Management, May 1990.

2. BACKGROUND/SUMMARY:

Although public and political views about waste management are changing, the evidence reveals that the problem has not been handled effectively thus far. Approximately 73 percent of the trash thrown away ends up in landfills, which is inefficient and sometimes environmentally unsound. Roughly 13 percent of U.S. waste is recycled. Various toxic items, such as batteries, cleaning solvents, and pesticides, are discarded. These toxic constituents can pose a serious environmental threat in the waste stream.

This report of the Task Force on Solid Waste Management, funded in part by the U.S. Environmental Protection Agency, identifies goals and solutions on how to manage solid waste. The task force solicited advice from business, local government, the environment, and experts in academia and focused on solutions which involve individuals, industry, and government.

3. ABSTRACT:

The task force believes that successful waste management efforts must begin with aggressive but realistic goals for source reduction, recycling, and comprehensive waste management planning. Such goals must be accompanied by workable strategies that tap the resources of industry, the public, and government. Accordingly, the task force recommends the following national goals and strategies.

- Goal 1: Minimize the total amount of municipal solid waste requiring treatment or disposal through a combination of source reduction and recycling.
- Goal 2: Reverse the growth in per capita waste generation and reduce the toxicity of consumer products.
  - Implement a national cooperative among industry, government, and citizen groups to develop specific source reduction guidelines for producers of packaging and household products.
  - Develop source reduction components in state comprehensive waste management plans to provide incentives for source reduction among citizens and to further reduce unique regional waste stream components that are not addressed by the voluntary national effort.

- Initiate government and industry educational programs to encourage practices in the home and workplace that reduce the amount of waste we produce.

- Goal 3: Over the long term, the nation should aspire to reach a recycling goal of 50 percent. In order to reach this goal, the nation should recycle 30 percent of all municipal solid waste by 1995 and 40 percent by the year 2000.

  - Establish policies at the federal, state, and local level to promote the collection, reuse, and purchase of recycled materials in government operations.

  - Establish a national cooperative effort among industry, government, and citizen groups to develop voluntary recycled content standards for industry.

  - Establish comprehensive recycling goals and programs at the state and local level appropriate to population density and desired waste management practices.

  - Provide federal assistance for state recycling programs by providing technical assistance, supporting research and development, and developing safety and quality standards for recycled products.

  - Educate the public on the value of using recycled materials and the choices available.

- Goal 4: Each state, alone or in cooperation with other states, should manage the waste produced within its borders in an environmentally sound manner.

  - Permit states to establish differential fees on waste imports to encourage exporting states to develop their own capacity.

  - Conduct appropriate state planning to meet the waste management needs of citizens and provide treatment and disposal capacity that meets or exceeds federal environmental protection criteria.

  - Pursue and support voluntary, regional, and interstate efforts to develop and share management capacity where it is mutually beneficial to do so.

  - Ensure strong state enforcement of transportation regulations to protect the public's health and safety.

THE NATION'S PUBLIC WORKS: REPORT ON SOLID WASTE

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by R.W. Beck and Associates for National Council on Public Works Improvement (the Council). The purpose of this report was to examine solid waste as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's solid waste. This document responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

The extent of the waste disposal problem in this country cannot be overemphasized. Approximately 450,000 tons of waste are being generated every day, 95 percent of which is disposed in landfills that are rapidly reaching the end of their disposal capacity.

The development of a National policy regarding solid waste management is needed if a disposal crisis is to be averted and effective management of wastes is to occur in the United States. The management approach under this policy will entail a series of solutions, all of which may vary in different communities across the Nation. The basic priorities, however, should be as follows:

- Reduction in the amount of waste generated, or waste minimization;
- Recovery of material and/or energy; and
- Treatment and/or disposal of residuals.

Efforts to implement the first priority, by reducing the amount of solid waste being generated, will require the implementation of a National policy outside the public works area since it requires basic changes in the way materials are manufactured and packaged for sale. The second and third priorities involve undertaking policies that will be capital intensive and much more expensive to operate than the current method of solid waste management. It will involve a major investment by both the public works and the private sector in highly engineered landfills and waste-to-energy facilities. The recycling of materials will require specific legislation, special tax, and direct subsidy considerations to ensure that materials are recovered and reused.

Presented below is a listing of recommendations for the major policy issues raised in this report:

- The major operational problem in solid waste management today rests in the final disposal of municipal solid waste, and it is in this area where the greatest amount of attention needs to be focused.

- A National policy should be adopted that is aimed at reducing the amount of material requiring ultimate disposal, and such a program should include the following components:

  - Reduce the amount of solid waste generated by manufacturers;

  - Recycle the maximum amount of material possible;

  - Reduce and reuse the remaining portion of the waste stream through some form of resource recovery, such as composting or incineration; and

  - To the greatest extent possible, minimize the amount of material which must ultimately be placed in a landfill.

- The primary role of the federal government should be in the following areas:

  - Establishment of national standards;

  - Oversight and enforcement of state regulatory programs;

  - Research and development;

  - Data gathering and development of a data base; and

  - Training and technical assistance.

- The primary role of the state government should be: to provide oversight and enforcement of local regulatory programs, and act as a facilitator for the development of environmentally sound waste disposal facilities; to act as a regulator to assure that the requirements of the various permits are met; to act as a monitor to assure that environmental requirements are met; and to provide training and technical assistance.

- The local government's primary role should be in the management of solid waste facilities and service, the ownership and operation of solid waste management, and the regulation and control of contract services.

- The private sector plays a critical role in the collection and disposal of solid waste, and it should be anticipated that the private sector will continue to play a key role in research and development, the provision of services to local government, and the provision of services to industry.

SANITATION COLLECTION AND DISPOSAL

1. REFERENCE:

Marc Rubin, Government Accounting Standards Board (GASB), March 1991.

2. BACKGROUND/SUMMARY:

This report, one of thirteen studies to be published as part of the GASB research on Service Efforts and Accomplishments (SEA), looks at production and reporting of SEA indicators relating to the government's provision of sanitation collection and disposal services. It documents that local spending on sanitation services totaled over $7.3 billion in 1987. The cost trend for these services suggests that in the future, per capita costs for solid waste collection and disposal will continue to rise at a relatively rapid rate.

3. ABSTRACT:

Rising costs, environmental problems, and the considerable amount of media attention given to solid waste collection and disposal all point to concern over these issues and the need for SEA indicators relating to these services. Any discussion of reporting SEA indicators should consider the differences in types of services offered by providers. Some governments use a public works department to collect solid waste; others contract with private companies; and some leave it to individuals to dispose of solid waste.

Outcome indicators recommended for consideration include percentage of missed collections, percentage of collections not completed on schedule, percentage of streets rated acceptably clean, and customer satisfaction. The first three indicators attempt to quantify the success of reaching service goals; the final indicator attempts to capture customer satisfaction with this effort.

Regarding landfills, the most important outcome indicators are those that measure the impact of the landfill on the environment. These include the number of days that surface water, groundwater, and noxious gas standards have been violated by operations of the landfill. An additional indicator concerning environmental impact is the amount of toxic material deposited in the landfill. Although these indicators appear costly, they should be calculated in most cases. An additional outcome indicator that should be reported is the amount of revenue received from landfill customers.

THE SOLID WASTE DILEMMA: AN AGENDA FOR ACTION

1. REFERENCE:

U.S. Environmental Protection Agency, Office of Solid Waste, February 1989.

2. BACKGROUND/SUMMARY:

The United States generates more and more solid waste each year. In fact, the U.S. generates more solid waste per capita than any other nation. As more waste is generated, there are increasingly fewer places to dispose of it. Landfill capacity in some places is almost filled to saturation, and solid waste facilities, materials recovery facilities and recycling centers continue to be difficult to site because of public resistance, often referred to as the "Not in My Backyard" (NIMBY) syndrome.

Although solid waste management is primarily a local responsibility, the problem is national in scope, and a national strategy is needed to solve it. In response to this growing problem, EPA created a Municipal Solid Waste Task Force in February 1988 and directed it to design a strategy for improving the nation's management of municipal solid waste. This report was developed after extensive public input and consultation with a variety of knowledgeable groups and individuals.

The Agenda for Action offers a number of concrete suggestions for action by not only EPA, but also government at all levels, industry, and private citizens. It calls for a "systems" approach to managing municipal solid waste, or the complementary use of source reduction, recycling, combustion and landfills to comprehensively manage municipal solid waste. In addition, it underscores the need for a fundamental change in the nation's approach to producing, packaging, and disposing of consumer goods.

3. ABSTRACT:

The Task Force identified six objectives for a national agenda for action to solve the municipal solid waste dilemma:

- Increase the waste planning and management information (technical and educational) available to states, local communities, waste handlers, citizens and industry, and increase data collection for research and development;
- Increase effective planning by waste handlers, local communities, and states;
- Increase source reduction activities by the manufacturing industry, government, and citizens;
- Increase recycling by government, individuals, and corporate citizens;

- Reduce risks from municipal solid waste combustion to protect human health and the environment; and

- Reduce risks from landfills to protect human health and the environment.

The following agenda for action is structured within the framework of these six objectives.

- **Increase available information.** Technical assistance, education, and research and development are important ways to encourage informed participation in achieving waste management goals. Educational materials increase awareness of good waste management "ethics" while technical assistance ensures that all types of waste handlers, such as individuals, government, and industry, have all the information that they need to manage wastes safely and effectively. Data collection and research and development expand the boundaries of our knowledge which gives new information, new technologies, and new solutions.

- **Increase planning**. Planning by any level of government and the waste management industry is vital for managing all municipal solid waste in a safe and effective way. Planning ensures that future capacity needs are taken into account when establishing programs. Planning also ensures that orphan wastes such as tires and lead-acid batteries are handled comprehensively, rather than with the current piecemeal approach.

- **Increase source reduction activities**. Source reduction, or minimizing toxics and volume in products and extending their useful life, is a key component for meeting national and local goals. Removal of toxics enhances the safety of recycling, landfilling, and combustion. Although there are many players in source reduction, the design and manufacturing industry can provide a leadership role in instigating change and increasing source reduction activities.

- **Increase recycling**. Recycling waste materials diverts potentially large volumes of wastes from landfills and combustors. Therefore, recycling is absolutely vital to achieving local and national goals. Recycling is also important because it stops unnecessary depletion of valuable natural resources. Finally, recycling is an excellent educational tool to raise awareness in individuals of all types of waste management, because everyone must become conscious of what they do and do not discard.

- **Reduce risks of combustion**. Combustion of municipal waste can be a viable waste management alternative for many communities. In order to increase the viability of this option, it is important to ensure that combustors are designed, operated, and controlled to minimize the risks to human health and the environment from both air emissions and ash. Options for improving the safety of combustion include upgrading combustor performance standards, increasing education and technical assistance, establishing operator training and certification programs, and evaluating potential bans on combustion of some types of waste.

- **Reduce risks of landfills**. Municipal solid waste landfills are used to dispose of the majority of our nation's municipal solid waste, and will continue to be essential in the

future. Although increased source reduction and recycling will reduce the volumes of waste going to landfills, and may make some waste more benign, the safety of landfills must be increased to ensure protection of human health and of the environment. Operator certification, minimum design and operation standards, education and technical assistance, and studies on potential bans of some wastes from landfills all contribute to reaching the goal of increased safety and reduced volumes of waste needing landfilling.

SOLID WASTE DISPOSAL: PUBLIC OR PRIVATE?

1. REFERENCE:

Jose A. Gomez-Ibanez, John R. Meyer, and David E. Luberoff, *CHEMTECH*, February 1992.

2. BACKGROUND/SUMMARY:

Interest in the private provision of infrastructure has been increasing in recent years, driven by a number of factors. A primary motivation is the belief that the private sector is inherently more efficient than the public sector and can build and operate facilities at less cost. Also, the public sector, facing increased taxpayer resistance, may be unable to finance facilities that the private sector would be willing and able to undertake for a profit.

This article explores prospects for the privatization of infrastructure by examining solid waste disposal facilities, a capital-intensive activity in which the private sector has historically been a major owner and operator of landfills, and more recently, resource recovery plants, and by comparing solid waste disposal with the nascent private toll-road industry.

3. ABSTRACT:

Two arguments favoring privatization are that privatization will help alleviate the infrastructure crisis by increasing both the investment in infrastructure and the quality of the projects. Although private involvement might increase total investment in infrastructure, it is more likely to do so by displacing other worthwhile private investment than would public sector funding. This occurs because privatization does not increase the pool of private savings from which private capital markets draw from, whereas publicly provided infrastructure could increase total investments made by society to the extent that public programs would be funded by current user charges or by taxes. Private investment is no guarantee against economically unsound infrastructure projects, because private investors may be willing to invest in unsound projects if their construction is linked with implicit or explicit public subsidies.

The most commonly cited advantage of private operators is that they can build and operate infrastructure facilities at lower cost than their public sector counterparts. Numerous studies of the relative costs of public and private services suggest that private operators do cost less, as long as there is competition to ensure that the private operators remain efficient.

Private firms may have some advantages over public agencies in resolving siting problems and may also have more flexibility than public agencies in the compensation they offer objectors or may be more skilled both in marketing the benefits and minimizing the risks of proposed projects. Yet, such potential siting advantages may be offset by disadvantages, such as public apprehensions that private firms will not take their environmental and other community responsibilities seriously. Also, public agencies may have an advantage simply because they have

more established institutions and proceedings for dealing with the types of equity issues involved in siting, whereas the private sector has to rely on bargaining to resolve conflicting interests.

A related issue in the privatization debate is whether public firms are more likely to charge users of their facilities the socially appropriate or desirable prices, and, if not, whether public oversight or regulation of their rates is required and what the consequences of that regulation might be. One argument in favor of the private firm is that it may be more likely to price its services at marginal cost rather than at average or historic costs. However, the key potential disadvantage of a private firm is that it may be more tempted than a public agency to exploit any monopoly or market power it might enjoy by pricing its services well above marginal costs. Nevertheless, the ability of private waste disposal firms to maintain charges above costs is probably limited in the long run.

Any assessment of the efficiency advantages of privatization must balance a variety of conflicting considerations and arguments. In the case of solid waste, however, the technological sophistication and complexity of modern disposal facilities make the potential efficiency gains from both private construction and management large.

TOWARD SUSTAINABLE WASTE MANAGEMENT

1. REFERENCE:

Deborah D. Anderson and Laurie Burnham, *Issues in Science and Technology*, Fall 1992.

2. BACKGROUND/SUMMARY:

This article reviews current waste management methodologies and recommends effective policies for restructuring waste management by corporations, governments, and consumers. Written by two industry professionals, the article concludes that "by avoiding simplistic legislated solutions and allowing market forces to operate, the United States can ease its garbage woes."

3. ABSTRACT:

A comprehensive strategy for reducing the volume of municipal solid waste involves the optimum integration of four components: source reduction; reuse, recycling, and composting; waste-to-energy (w-t-e) incineration; and landfilling. Each of these is discussed in detail.

Source reduction. This strategy involves redesigning an item or process to use less raw material or less packaging. A 1990 study commissioned by the Council for Solid Waste Solutions found that packaging accounted for an impressive 34 percent of landfill waste by volume. Paper and paperboard packaging make up 16 percent of landfill waste, and plastic packaging makes up 9 percent. A number of companies are making waste reduction an essential criterion in product and packaging decisions.

Reuse, recycling, and composting. These processes direct garbage away from w-t-e and landfill disposal and channels it toward new purposes. Over the past five years, recycling has become a way of life in the United States; roughly 3,900 communities in 48 states have established curbside pickup programs for recyclable materials. The EPA estimates that 17 percent of U.S. waste was recycled in 1990, up from 13 percent in 1988. State-of-the-art composting plants can process yard waste (which accounts for nearly 12 percent of U.S. municipal waste by volume); paper disposables such as diapers, soiled paper, and other types of paper that cannot be recycled economically (roughly 20 percent); and food waste (10 percent). A well-designed composting program will divert from 30 to 70 percent of the waste stream away from landfills. Nineteen municipal composting facilities are currently operating in eight states, five are under construction, and another 24 (in 21 states) have entered the advanced planning stage.

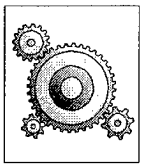
Waste-to-energy incinerators and landfills. Once integrated waste management is fully implemented, less than 20 percent of the nation's waste will be shunted to landfills. The percentage that is incinerated will be determined by the individual communities.

Several barriers must be overcome before integrated waste management is fully implemented. Industry can adopt the following policies to encourage integrated waste management:

- Integrate environmentalism into corporate philosophy;
- Create market pull for recycled material;
- Introduce consumers to recycled and resource-reduced products;
- Assess the environmental impact of products;
- Include environmental information on products and advertisements;
- Provide seed money and technical assistance to communities; and
- Form alliances with like-minded companies.

Government can play a key role in setting standards, strengthening markets, educating consumers, and creating the conditions necessary for the development of a national waste management infrastructure:

- Create market-driven incentives;
- Adopt procurement guidelines that specify use of recycled or reused materials;
- Develop demonstration sites for recycling and composting;
- Educate the public; and
- Increase funding for research and development.



I. HAZARDOUS WASTE

CLEANING UP THE MESS: IMPLEMENTATION STRATEGIES IN SUPERFUND

1. REFERENCE:

Thomas W. Church and Robert T. Takamura, The Brookings Institution, 1993.

2. BACKGROUND/SUMMARY:

Although Superfund is up and running in a programmatic sense, the policy environment remains in flux, as evident in Congress' hurried four year extension of the program was accompanied by the extensive reexamination that had been expected. At the same time, numerous reports have surfaced which severely criticize various aspects of the program. The authors' objectives of this book was to learn about the strategies used by the U.S. Environmental Protection Agency (EPA) to get individuals, corporations, and units of state and local government to pay millions of dollars to clean up environmental messes that these parties had a role in creating. The authors present a series of case studies of Superfund cleanups in order to examine the decisionmaking at actual hazardous waste sites which provide the empirical basis for their subsequent analysis. The authors describe how the statutory and organizational framework of Superfund operates and provides some advice on how it might function more effectively.

3. ABSTRACT:

Superfund has a broad objective that raises little controversy, the cleanup of inactive hazardous waste sites. However, under close analysis, this statutory mission reveals several potentially inconsistent underlying objectives. These cross-purposes underscore the need for more precise standards by which to assess the various approaches to implementation of the Superfund statute. The four objectives of a successful cleanup should involve: an appropriate and cost-effective remedy; the least possible expense to taxpayers; an expeditious cleanup; and minimal transaction costs.

These criteria are obviously in conflict with one another. The EPA must sort out the conflicting goals established in this uniquely complex program. Interviews within and outside the EPA reveal that the following three approaches to Superfund's liability provisions have been used at various times in the history of the program.

- **Prosecution**. The essential characteristic of the prosecution approach is an emphasis on coercion and a reliance upon the legal power of the government to command compliance. The EPA's goal in the prosecution strategy, "...is to compel 'responsible' behavior on the part of the potentially responsible parties who would not clean up sites unless the costs of noncompliance exceeded the costs of compliance."

- **Accommodation**. The accommodation approach to Superfund implementation stresses the mutual, rather than conflicting, interests of the EPA and potentially responsible party

(PRP) in site cleanup. The strategy assumes that PRPs recognize their liability and the agency's potential to use its coercive tools. Given the appropriate circumstances and behaviors, accommodation leaves both parties better off than if they had pursued more confrontational strategies.

- **Public Works**. The essence of the public works approach is the segmentation of tasks, clean up first and recover costs second. It places a priority on action, focusing on those tasks that are likely to be completed quickly, and postpones the more difficult process of negotiating with PRPs and allocating costs.

The general lessons which can be derived from the case studies includes a tentative set of conclusions regarding what works, what might work, and what does not seem to work in the Superfund program.

- At a basic level, all strategies "work" in that they eventually bring about some form of cleanup. But each strategy seeks to maximize one objective of the program, to the potential detriment of the others. Thus, each approach can lay claim to success on one dimension, but each is also subject to criticism for failure in comparison to its alternatives.

- All superfund sites require government effort and the assumption of some of the costs associated with cleanup. Despite punitive rhetoric, it is not believed that the experience of Superfund suggests that all the costs and risks associated with cleanups will be borne by private parties.

- The government and private parties involved with Superfund sites typically are concerned with minimizing different kinds of costs. The potential exists for trade-offs that will result in net benefits to both sides.

- Just as different implementation strategies promote different general notions of program success, so each may be more or less appropriate to the situation at a particular site.

HAZARDOUS WASTE MANAGEMENT IN THE STATES: A REVIEW OF THE CAPACITY ASSURANCE PROCESS

1. REFERENCE:

National Governors' Association, Center for Policy Research, 1992.

2. BACKGROUND/SUMMARY:

In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA), continuing the landmark federal program begun in 1980 to clean up abandoned toxic waste sites and uncontrolled hazardous releases. The 1986 Act also addressed public opposition to new hazardous waste disposal capacity by adding a new provision requiring each state to assure the EPA that it could treat or dispose of all waste created within its borders over the next twenty years. The first state plans to assure capacity were due by October 17, 1989.

This report describes the information contained in these first plans, including the amount of hazardous waste generated, projected future volumes, and interstate shipments. It also describes a concerted effort between the states and EPA to address problems encountered in the 1989 plans and improve procedures for use in the first major plan revision scheduled for 1993. Also, the law itself is critiqued. Funding for this report was provided through a cooperative agreement with the U.S. Environmental Protection Agency's Office of Solid Waste and Emergency Response.

3. ABSTRACT:

All states submitted a capacity assurance plan (CAP) for 1989. The 1989 plans reported that approximately 236 million tons of hazardous waste were generated in 1987. Most of the waste, more than 97 percent was handled by the company producing the waste, either at the site of waste generation or in another facility owned by the company. The remainder, about 2.4 percent, was sent to commercial waste handlers. Only a small portion of waste, 1.6 percent, was transferred across state borders for disposal. However, all states were affected by this, since thirty-six states were net exporters of waste and fourteen states were net recipients.

A number of state officials criticized the first CAP process, with the most frequently cited problems listed below.

- Differing federal and state data systems made it difficult to prepare uniform, comparable information from all states.
- Waste projection estimates could not be trusted because of uncertain future regulations and shortcomings in methodology.
- The plans did not present a credible picture of future waste flows among states.

- The capacity assurance process did not ensure that treatment and disposal capacity would be built when needed.

- The CAPs did not resolve issues arising from the interstate disposal of waste.

EPA recognized the problems encountered in the first CAPs and sought recommendations on how to improve the process. EPA requested the National Governors' Association to assemble an advisory group of state officials to suggest changes. The advisory group offered the following recommendations, assuming current continuation of the law.

- Make the data collection and analysis more accurate and simpler by using a standardized source and by requiring detailed projections to just five years after plan submittal.

- Focus waste reporting to just those wastes that leave plant property for disposal, which eliminates the great majority of waste consistently handled by companies that produce it.

- Make the CAPs and regional agreements more meaningful through a clear and consistent enforcement policy that encourages states to take the planning process more seriously.

- Urge EPA to enforce implementation of the CAPs, including the promise to meet capacity milestones to prompt a serious review of the law.

EPA adopted most of the recommendations as part of its guidance for the 1993 CAPs, the first major revision since 1989. Notwithstanding the changes previously mentioned, the main finding of the advisory group was that the capacity assurance process was conceptually flawed, and that the law should be revised or repealed. Many believed it did not resolve the main issue it was supposed to address, the failure by some states to meet the waste management needs of their industries.

THE NATION'S PUBLIC WORKS: REPORT ON HAZARDOUS WASTE MANAGEMENT

1. REFERENCE:

National Council on Public Works Improvement, May 1987.

2. BACKGROUND/SUMMARY:

This report was prepared by Apogee Research for the National Council on Public Works Improvement (the Council). The purpose of this report was to examine hazardous waste management as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's management of hazardous waste. This report responds to a standard research outline developed by the Council to ensure thorough and systematic review of each category of public works. The contractor was assisted by a working group of experts. One or more members of the Council attended each working group meeting and participated in discussions of the initial outlines and drafts prepared by the contractor.

3. ABSTRACT:

The goal of the U.S. policy in hazardous waste control programs is to protect human health and the environment at the lowest cost to the Nation. Two national programs help achieve this goal: the regulation of currently generated industrial hazardous wastes under the 1976 Resource Conservation and Recovery Act, and the cleanup of accidental spills and past mismanagement of hazardous wastes on the land under the 1980 Superfund statute.

The scope of each program is substantial -- U.S. industries generate more than two tons of hazardous waste each year for every person in the country, and the estimates of the cost to clean up abandoned and contaminated waste disposal sites run as high as $100 billion.

Both programs were recently overhauled to take account of disappointing progress made in their early years. Protecting the Nation from the health and environmental risks of hazardous waste will require more rigorous application of current control programs and the introduction of several new ones. The Nation faces the following general problems in this regard:

- The Nation has missed the opportunity to reduce the generation of hazardous waste. Regulatory strategies have focused on controlling hazardous waste once it has been generated. As a result, industry has responded mostly with end-of-pipe waste treatment and disposal compliance strategies;

- The Congress has set ambitious regulatory schedules to implement waste control programs. If the EPA misses these deadlines, as they have in the past, the public perception of government's ability to manage the Nation's hazardous waste problem will be further eroded;

- Adequate future capacity of waste management facilities is not assured. Although the data are not complete and much uncertainty obfuscates estimates of demand, it appears that treatment shortfalls could arise;

- The Nation has not found the institutional solution to site needed new waste management facilities. Faced with strong local opposition to waste management facilities, the states face the formidable task of assuring the proper management of hazardous waste in the future; and

- While effects on the economy have been small, the cost of hazardous waste control is growing. Many expect marginal businesses to close, industries to consolidate, and production to shift overseas.

The Council's recommendations for improvements include:

- Strengthening the roles of government by setting realistic regulatory milestones, meet them, and enforce programs rigorously;

- Promoting waste reduction with economic incentives, improving information on waste generation and technological opportunities to reduce waste, and government-supported research and development on operating procedures as well as new technologies to reduce waste;

- Improving facility siting processes by establishing the federal role in siting, including local governments in new waste management planning activities, and promoting public/private partnerships for waste control;

- Advancing control technologies through research and development supported by waste-end taxes, government grants, or commercialization guarantees;

- Improving the economic efficiency of regulatory programs with risk/cost or benefit/cost analyses in rule making, alternative regulatory compliance strategies, accounting for future land use in Superfund cleanup decisions, local waste control planning, and increased reliance on performance standards; and,

- Relieving financing and financial assurance constraints, especially for small businesses with public financial support to promote waste reduction in small plants, promoting centralized waste collection and recycling treatment facilities, and forming a joint public/private study group to reassess EPA's financial assurance policies and state environmental impairment survey programs.

NATIONAL SURVEY OF HAZARDOUS WASTE GENERATORS AND TREATMENT, DISPOSAL, AND RECYCLING FACILITIES IN 1986

1. REFERENCE:

U.S. Environmental Protection Agency, Office of Solid Waste, October 1991.

2. BACKGROUND/SUMMARY:

This report presents the findings of two extensive national surveys conducted by mail over a three-year period to obtain detailed information concerning hazardous waste generation and management practices occurring in calendar year 1986. The two surveys, the National Survey of Hazardous Waste Generators (Generator Survey) and the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR Survey), focused on hazardous waste handlers regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), as amended in 1984 by the Hazardous and Solid Waste Amendments.

3. ABSTRACT:

The Generator and TSDR Surveys were an effort to develop comprehensive hazardous waste information for use by the Office of Solid Waste (OSW) and other EPA offices, the regulated community, Congress, and the general public for rulemaking and related analyses. The 1986 Generator and TSDR Surveys comprise EPA's third effort to develop reliable national information describing hazardous waste generation and management activities in the United States.

EPA's April 1984 report, *National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Under RCRA in 1981* (1981 Mail Survey), presented the first picture of the hazardous waste system that RCRA was enacted to control, based on an extensive mail survey conducted directly by EPA. EPA's March 1989 report, *1985 National Biennial Report of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated Under RCRA* (1985 National Biennial Report), updated the 1981 Mail Survey based on EPA's compilation of data reported by generators and facilities to states and EPA regional offices through the RCRA Biennial Reporting System.

Based on the survey procedures and methodologies of this report, EPA estimates that 12,478 generators produced 747.4 million tons of hazardous waste in 1986. The 747.4 million ton quantity of hazardous waste generated in 1986 is considerably greater than previous estimates for 1981 and 1985 because it includes the large volumes of hazardous waste that are managed outside the scope of the RCRA-permitting system in TSDR units that qualify for RCRA-permitting exemptions.

A small percentage of the 12,478 generators accounted for most of the hazardous waste generation in 1986. The top 10 percent of generators produced 96.1 percent of the total quantity of hazardous waste generated, or 718.2 million tons.

Only 289.5 million tons, or 39 percent of the 747.4 million tons of hazardous waste generated in 1986 were managed in RCRA TSDR units. An additional 197.5 million tons, or 26 percent of hazardous waste were managed in non-RCRA TSDR units at facilities with RCRA units. The remaining 260.4 tons, or 35 percent of hazardous waste generated in 1986 were managed in non-RCRA TSDR units at facilities with no RCRA units

WASTE MANAGEMENT: THE LONG VIEW

1. REFERENCE:

Steven Rice, *CHEMTECH*, Vol. 21, No.9, September 1991.

2. BACKGROUND/SUMMARY:

In order to secure long-term viability and competitiveness, industrial firms have to view waste management, particularly waste reduction, as an integral component of their strategic business planning. This article examines planning by industrial producers to manage waste generated by their facilities and discusses the issues, trends, and company-specific factors, and also suggests how to develop a strategic plan.

The report notes that direct disposal costs for industry have escalated, and costs to remediate former disposal sites now exceed $1 billion annually. In addition, reporting and recordkeeping activities associated with managing wastes can drain resources and add to overhead costs at time of tighter margins resulting from market globalization and increased competition. The basic premise of strategic waste management planning is that in the future, only industrial organizations with a workable strategic plan for properly managing their waste can achieve long-term commercial viability and competitive advantage. Waste minimization is an essential element of any plan.

3. ABSTRACT:

Successful strategies will take into account both short-term waste disposal costs and long-term site remediation liabilities. The total cost of waste management consists of four main components:

- Disposal (including taxes and fees);
- Transportation;
- Administration; and
- Present value for future liability.

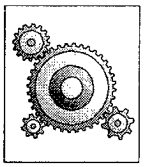
Waste management issues and trends must be combined with realistic company factors to develop practical, achievable strategies. Capital spending plans, the company's business plan, and the future use of a company's site are essential to estimating future waste generation. Benefits that may be obtained by a long-term strategic plan include:

- Waste minimization;
- Site/business interactions;
- Economies of scale; and
- Internal waste exchange.

One methodology to develop a comprehensive strategy is presented below. Each company's history, organizational structure, and culture may necessitate customization.

- Establish the company's basic waste management principles and the desired hierarchy of waste management techniques.
- Obtain the directive and commitment of senior management to conduct such an effort and support its activities.
- Obtain a thorough understanding of the company, its activities, direction and operating climate.
- Identify and quantify current residues, and identify and estimate future residues.
- Develop strategies to implement.
- Document the effort.
- Review the documentation with those involved.
- Continue the effort and follow up on initiatives.

Planning ahead for waste management is the key to long-term viability and competitive advantage. However, such planning must take into account current environmental issues and trends, as well as traditional elements such as capital and business planning and site utilization, and may require significant changes in the financial structure of most businesses.



SECTION III: BIBLIOGRAPHY

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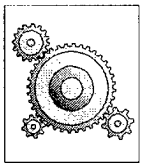

1. GENERAL

1. Aaron, Henry J.; Schultze, Charles L. **SETTING DOMESTIC PRIORITIES: WHAT CAN GOVERNMENT DO?** xii+318p. 1992.

   This book investigates whether new or improved government interventions can address social policy more effectively in the areas of: homelessness, crime, families, young children, research, and infrastructure.
   GENERAL.

2. Adams, Charles F.; Merget, Astrid E. **EARMARKING REVENUES FOR PUBLIC WORKS PROJECTS**. Washington, DC: National Council on Public Works Improvement. 1987.

   Drawing on information from scholarly journals, professional reports, government statistics, and a series of interviews with state and local officials, this report examines the theory and practice of earmarking revenues from several perspectives.
   GENERAL.

3. Administrative Conference of the United States, Office of the Chairman. **NEGOTIATED RULEMAKING SOURCEBOOK**. Washington, DC: 1990.

   This document reviews the methods of Negotiated Rulemaking, the idea that in certain situations it is possible to bring together representatives of an agency and various interest groups to negotiate the text of a proposed regulation.
   GENERAL.

4. Altshuler, Alan A.; Gomez-Ibanez, Jose A. **REGULATION FOR REVENUE: THE POLITICAL ECONOMY OF LAND USE EXACTIONS**. Washington, DC/Cambridge, MA: Brookings Institution/Lincoln Institute of Land Policy. 1993.

   Examines the political economy of land use exactions--government-mandated expenditures that real estate developers must make for the provision of public facilities or services as a condition for receiving permits. Identifies broad developments contributing to the recent surge in exaction usage in the United States. Examines the evolution in exaction use and current practice. Considers the political forces encouraging the use of exactions as well as the legal constraints on their use.
   GENERAL.

5. American Association of State Highway and Transportation Officials. **A STUDY ON FUTURE DIRECTIONS OF PUBLIC TRANSPORTATION IN THE UNITED STATES**. Washington, DC: 1985.

   This is a comprehensive study of the current problems facing public transportation. It examines innovative actions being adopted throughout the U.S. to solve these problems, and identifies the key components of a national and state public transportation strategy.
   GENERAL.

6. American Association of State Highway and Transportation Officials. **AASHTO TRANSPORTATION POLICY BOOK**. Washington, DC: 1993.

   The AASHTO 1993 Transportation Policy Book contains all of the existing transportation policies officially adopted by the American Association of State Highway and Transportation

Officials through October 1992. Policy Position Statements on each of the major transportation modes are included.
GENERAL.

7. American Association of State Highway and Transportation Officials. **GOING AND GROWING: AN OVERVIEW OF THE RELATIONSHIP BETWEEN TRANSPORTATION AND GROWTH IN AMERICA**. Washington, DC: 1990.

   This overview summary is intended to show the linkage between transportation and economic growth.
   GENERAL.

8. American Association of State Highway and Transportation Officials. **INNOVATION: A STRATEGY FOR RESEARCH, DEVELOPMENT, AND TECHNOLOGY TRANSFER**. Washington, DC: 1989.

   The report addresses three major objectives: to evaluate the issues that will affect the future of highway and transportation research; to recommend positions for consideration by AASHTO; and to consider current and prospective programs of research and provide AASHTO with the information needed to determine priorities.
   GENERAL.

9. American Association of State Highway and Transportation Officials. **NEW TRANSPORTATION CONCEPTS FOR A NEW CENTURY**. Washington, DC: 1989.

   This report summarizes recommended improvements to the national transportation system by the American Association of State and Transportation Officials. The report concludes that the nation invests much less in transportation than it did over the past two decades and that the nation continues to invest less than what is needed to maintain current services.
   GENERAL*

10. American Association of State Highway and Transportation Officials. **TRANSPORTATION: KEY TO A BETTER FUTURE. THE RELATIONSHIP OF TRANSPORTATION INVESTMENTS TO ECONOMIC GROWTH: A SPECIAL COMMITTEE REPORT**. Washington, DC: 1990.

    This report examines the relationship between transportation and economic growth in America. It points out that less than one percent of the nation's economic resources are invested in transportation each year, about half that of just 25 years ago, and that recent findings show it is probably not a coincidence that the nation's rate of growth in productivity has been cut in half at about the same time that the level of national resources devoted to investment in infrastructure has dropped sharply.
    GENERAL*

11. American Planning Association. **SYMPOSIUM: DEVELOPMENT IMPACT FEES**. Journal of the American Planning Association; 54:3-90 Winter 1988.

    Issues surrounding fees assessed on developers to finance infrastructure improvement.
    GENERAL.

12. Angell, Cynthia; Shorter, Charles A. **IMPACT FEES: PRIVATE SECTOR PARTICIPATION IN INFRASTRUCTURE FINANCING.** Government Finance Review; 4:19-21. October 1988.

Reprinted from Real Estate Report, vol. 17, no. 1. this report presents findings from a survey of programs. It covers 43 U.S. communities: focusing on San Francisco, Palm Beach County, Florida, Montgomery County, Maryland, and Boston.
GENERAL.

13. Apogee Research, Inc. **FINANCING INFRASTRUCTURE: INNOVATIONS AT THE LOCAL LEVEL**. Washington, DC: National League of Cities. 1987.

This study examined 24 case studies of locally financed infrastructure development. The case studies were selected to illustrate a range of financing techniques suited to infrastructure expansion and rejuvenation.
GENERAL*

14. Apogee Research, Inc. **PUBLIC WORKS ISSUES PAPER: GOVERNMENT ROLES**. National Council on Public Works. 1987.

This paper, prepared for the National Council on Public Works Improvement, reviews the principles for government role assignment including evidence of the effectiveness of financing mechanisms.
GENERAL*

15. Aschauer, David Alan. **INFRASTRUCTURE: AMERICA'S THIRD DEFICIT**. Challenge; 34:39-45. March 1991.

This article contends that declining U.S. public investment is a major cause of the economy's faltering productivity, profitability, and private sector capital formation.
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16. Aschauer, David Alan. **INFRASTRUCTURE ENHANCES NATIONAL COMPETITIVENESS**. Constructor (Associated General Contractors of America). Washington, DC: Associated General Contractors of America. 1989.

This article examines factors that might account for U.S. competitiveness problems and what role the government might play in promoting international competitiveness. A potential "supply-side" avenue by which public policy may be able to exert influence on the process of economic expansion in the U.S. is public investment in a basic infrastructure of roads, highways, mass transit, airports, port facilities, and similar structures.
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17. Aschauer, David Alan. **IS PUBLIC EXPENDITURE PRODUCTIVE?** Journal of Monetary Economics; 23(2), pages 177-200. March 1989.

This paper considers the relationship between aggregate productivity and stock and flow government-spending variables.
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18. Associated General Contractors of America. **AMERICA'S INFRASTRUCTURE: EFFECTS OF CONSTRUCTION SPENDING**. 1984.

This report examines the effects a significant (16%) increase in public construction would have on the federal budget and the U.S. economy as well as industrial production and employment.
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19. Associated General Contractors of America. **AMERICA'S INFRASTRUCTURE - A PLAN TO REBUILD**. Washington, DC: 1983.

The Associated General Contractors of America research reveals a minimum necessary capital investment of approximately $3.03 trillion. While the time frame for addressing such needs varies in the individual infrastructure categories, a weighted average indicates that most investment is projected to be necessary within the next 19 years.
GENERAL*

20. Ausubel, J. H.; Herman, R. **CITIES AND THEIR VITAL SYSTEMS INFRASTRUCTURE. PAST, PRESENT AND FUTURE**. Washington, DC: National Academy of Engineering. 1988.

The subject of the book is infrastructure, the built environment in which society lives, the way it is used, and how it may evolve in the future. The chapters in the book show vividly that the overall problems of the physical infrastructure and the human activity associated with it present both an overwhelming and an inviting task for researchers and practicing engineers.
GENERAL.

21. Azad, Bizhan; Jacobs, Michael Department of Urban Studies and Planning. **INFRASTRUCTURE FINANCE AND INSTITUTIONS, A REVIEW OF INTERNATIONAL EXPERIENCE**. Massachusetts Institute of Technology.

This report reviews the international experiences in financial mechanisms and institutional arrangements that offer innovative solutions to infrastructure problems in the United States. It stresses the importance of using a demand rather than a needs approach to assess infrastructure projects and financing tools.
GENERAL*

22. Bell, J. M. (ed).; Bates, M. H.; Selton, S. P. **ENVIRONMENTAL ENGINEERING INFRASTRUCTURE: PROBLEMS AND NEEDS**. PROCEEDINGS OF THE 41st INDUSTRIAL WASTE CONFERENCE. Stillwater, OK: School of Civil Engineering, Oklahoma State University. 1987.

Environmental infrastructure includes a wide variety of public services such as water supply, water and wastewater treatment, air pollution control, and solid and hazardous waste treatment and disposal. The failure of any environmental infrastructure is potentially harmful to a wide segment of society and may have far reaching ramifications. A contributing factor to the failure of many ancient societies was their inability to deal with the byproducts of their growth; for example, often disease occurred because of improper use of the land, improper use of the water, or both.
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23. Berry, John M. **INFRASTRUCTURE NEEDS WORK, BUT CRISIS TALK IS EXCESSIVE.** Financier; 13:7-11. March 1989.

Discusses the extent of deterioration of U.S. infrastructure, particularly in the context of transportation needs: highways, railways, and airports.
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24. Blaesser, Brian W.; Kentopp, Christine M. **IMPACT FEES: THE "SECOND GENERATION".** Washington University Journal of Urban and Contemporary Law; 38:55-113. September 1990.

Discusses the experiences in several U.S. states since the 1980s. Examines original and new legislation, court decisions, and implementation issues of local government techniques for funding capital facilities needed to serve new development.
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25. Blodgett, John E. **ECONOMIC AND ENVIRONMENTAL POLICYMAKING: TWO-STEPPING TO A WALTZ**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

This report summarizes the costs of pollution control mandates and explores interactions of economic and environmental policies and programs.
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26. Blodgett, John E. **MUNICIPAL ENVIRONMENTAL SERVICES**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

Reviews environmental services provided by local governments, including drinking water supply, wastewater treatment, and trash collection.
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27. Bourey, James M. **MANAGING GROWTH AND INFRASTRUCTURE DEVELOPMENT**. Capital Projects: New Strategies for Planning, Management, and Finance. Washington, DC: International City Management Association. 1989.
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28. Brain, SM. **AMERICA'S INFRASTRUCTURE: THE KEY TO OUR QUALITY OF LIFE.** Constructor (Associated General Contractors of America). 1989

This article examines what has caused the decline in infrastructure investment and, consequently, in our quality of life. The detailed discussion covers water pollution and wastewater treatment project needs; disposal of solid waste and hazardous waste; the deterioration of public buildings; and the U.S. transportation network deterioration from aging and underinvestment, including statistics on the nation's deteriorating highways, deficient bridges, and airport congestion, and the need for expansion and modernization of the nation's ports and waterways.
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29. Bridges, Sara VanMeter. **A LOCAL GOVERNMENT PERSPECTIVE ON FINANCING INFRASTRUCTURE.** Journal of Planning Literature; 6:202-9. November 1991.

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30. Bumgarner, Mary; Martinez, Vazquez Jorge; Sjoquist, David L. **MUNICIPAL CAPITAL MAINTENANCE AND FISCAL DISTRESS**. Review of Economics and Statistics; 73(1), pages 33-39. February 1991.

This paper formalizes and empirically tests the hypothesis that deficient maintenance of public infrastructure is caused by fiscal distress. The authors utilize a production-decision framework in which public officials combine maintenance and new capital to produce a desired level of capital services.
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31. Burwell, David. **MOVING INTO THE FUTURE: YOU CAN'T GET THERE FROM HERE BY FOLLOWING THE PRESIDENT'S PROPOSAL FOR REAUTHORIZATION OF THE SURFACE TRANSPORTATION ASSISTANCE ACT: BUT THERE IS AN ALTERNATE ROUTE.** Environmental Forum; 8:12-17. July 1991.

Critiques the present transportation infrastructure and examines areas for reform. Emphasizes the lack of adequate mass transit and overspending on highway system.
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32. Bush, George. **EXECUTIVE ORDER 12803: INFRASTRUCTURE PRIVATIZATION, APRIL 30, 1992.** Weekly Compilation of Presidential Documents; 28:733-5. May 4, 1992.

Eases restrictions on the sale or lease of federally financed assets owned by state or local governments.
GENERAL.

33. Busson, Terry; Hackett Judith. **STATE ASSISTANCE FOR LOCAL PUBLIC WORKS**. The Council of State Governments. 1987.

This report examines the role of the state in providing public assistance to local governments for public works and provides a wealth of facts, figures and insights about state assistance for local public works. It gives an authoritative picture of the diversity of the states and regions, the evolving state role in infrastructure assistance, and timely information about innovative state approaches.
GENERAL*

34. Campbell, Harrison S. Jr; Giertz, J. Fred. **IMPACT FEES FOR DEVELOPING INFRASTRUCTURE.** Policy Forum; 3:[1-4] no 1. 1990.

One-time charges applied by local governments to new developments are examined. Their use, distribution, effect on economic development, and relation to other sources of revenue are discussed.
GENERAL.

35. Chase, Robert A. **"FRAGILE FOUNDATIONS": PUBLIC INFRASTRUCTURE AND ECONOMIC DEVELOPMENT.** Pacific Northwest Executive; 7:9-15. April 1991.

Discussion of public works investment as an economic stimulant in the U.S. Pacific Northwest.
GENERAL.

36. Choate, Pat; Walter, Susan. **AMERICA IN RUINS: THE DECAYING INFRASTRUCTURE.** 1983.

America's public facilities are wearing out faster than they are being replaced. The deteriorated condition of basic facilities that underpin the economy will prove a critical bottleneck to national economic renewal during this decade unless we can find ways to finance public works.
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37. Civil Engineering Research Foundation. **FEDERAL RESEARCH: OPPORTUNITIES FOR THE DESIGN AND CONSTRUCTION INDUSTRY**. Washington, DC: 1992.

This study examined existing methods for transfer of technology from the federal laboratories; examples of promising technologies with significant potential for the designing and construction industry; mechanisms for improving transfer of federal technology to the design and construction industry.
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38. Civil Engineering Research Foundation. **SETTING A NATIONAL RESEARCH AGENDA FOR THE CIVIL ENGINEERING PROFESSION: EXECUTIVE SUMMARY**. Washington, DC: 1991.

This report is a specific blueprint for all civil engineering organizations to identify where and how to gather resources and to use them in bringing innovation and improvements to the design, construction and environmental industries.
GENERAL.

39. Clinton, William J. **EXECUTIVE ORDER 12893: PRINCIPLES FOR FEDERAL INFRASTRUCTURE INVESTMENTS, 26 JANUARY 1994.** Washington, DC: Weekly Compilation of Presidential Documents. January 30, 1994.

Represents first time that a uniform set of investment principles were formally articulated by the Executive Branch for consistent application across range of federal public works agencies, categories, and programs. Requires that "major" agency direct spending and grants for infrastructure be subjected to a benefit-cost analysis, with full analysis of alternatives including pricing, demand management, and privatization. Encompasses infrastructure investments for both capital and operation/maintenance programs, with primary focus on capital spending. Federal infrastructure covered include transportation, water resources, energy, and environmental protection programs.
GENERAL.

40. Clinton, William J. **EXECUTIVE ORDER 12866: REGULATORY PLANNING AND REVIEW, 30 SEPTEMBER 1993.** Washington, DC: Weekly Compilation of Presidential Documents. October 4, 1993.

Establishes a program to reform the regulatory process. Requires all proposed regulatory actions having an economic impact of $100 million or more to be subjected to a broad benefit-coast analysis, compared with alternatives to regulation, and implemented only if net benefits are maximized. Also requires agencies to develop regulatory plans which lay out goal, legal basis, statement of need and schedule of action for all proposed regulations, and establishes a centralized review process for regulatory issues.
GENERAL.

41. Colman, William. **THE PUBLIC WORKS RESPONSIBILITIES OF FEDERAL, STATE, AND LOCAL GOVERNMENTS AND THE PRIVATE SECTOR**. Washington, DC: National Council on Public Works Improvement. 1986.

This final report for the National Council on Public Works Improvement presents information, ideas, and recommendations about the respective responsibilities of federal, state, and local governments in policy formation, financing, and managing public works.
GENERAL*

42. Consad Research Corporation. **A STUDY OF PUBLIC WORKS INVESTMENT IN THE UNITED STATES**. Washington, DC: U.S. Government Printing Office. 1990.

This report, prepared for the U.S. Department of Commerce, examines the long-term characteristics of federal, state, and local public works investment spending.
GENERAL*

43. Cristofano, Sam M.; Foster, William S. **MANAGEMENT OF LOCAL PUBLIC WORKS**. Washington, DC: ICMA Publications. 1986.

Covers management of the public works function in local government: organization and management, information systems, finance and budgeting, planning, personnel practices and productivity, communications management, and liability. It shows how basic principles apply to the management of technical areas.
GENERAL.

44. Cuciti, Peggy. **PLANNING FOR INFRASTRUCTURE: A HANDBOOK FOR STATE & LOCAL OFFICIALS**. Boulder, CO: University of Colorado. 1985.

Information is offered to aid state and local officials interested in analyzing infrastructure needs within their communities. Conceptual, methodological, and procedural issues that must be confronted in any analysis of infrastructure are addressed. A comprehensive infrastructure review consists of eight tasks, which are outlined and applied to analysis of highways, bridges, mass transit, water supply, and wastewater collection/treatment needs.
GENERAL.

45. Delmar, Clare; Menendez, Aurelio. **INFRASTRUCTURE FINANCE IN THE UNITED STATES: ISSUES AND MECHANISMS**. National Council on Public Works Improvement. 1986.

This report explores the area of financing infrastructure expenditures. It provides a normative framework for analyzing and evaluating methods for financing infrastructure according the general principles of need, demand, public goods, capital goods, efficiency, and equity. GENERAL*

46. Deno, Kevin T. **THE EFFECT OF PUBLIC CAPITAL ON U.S. MANUFACTURING ACTIVITY: 1970 TO 1978**. Southern Economic Journal; 55(2), pages 400-411. October 1988.

The effect of various types of public capital on manufacturing firm's variable input demand and output supply decisions is derived via the estimation of a normalized translog profit function. The time-series-cross-section sample consists of manufacturing data from thirty-six standard metropolitan statistical areas for the 1970-78 time period. The findings indicate that concern over declining public infrastructure is well founded. GENERAL.

47. Diewert, W. Erwin. **THE MEASUREMENT OF THE ECONOMIC BENEFITS OF INFRASTRUCTURE SERVICES**. Berlin, Germany Springer-Verlag. 1986.

GENERAL.

48. Dimeo, Jean. **THE AGONY OF THE STREET. SPECIAL REPORT**. American City and County. 1991.

Compelling statistics are quoted to show how the nation's infrastructure is deteriorating. Inefficient roads cost Americans billions of dollars and hours in wasted time every year. The costs of inefficient roads and airports are noted, and declining support for railroads and mass transit are pointed out. The reasons for the underinvestment in the infrastructure are discussed. Some possible solutions to the problem are noted. GENERAL.

49. Dimeo, Jean. **THE SURFACE TRANSPORTATION ACT: WILL IT BE ENOUGH?** American City and County. 107:26-8+. January 1992.

The likely impact and effectiveness of federal legislation in mass transit and highway development is discussed. GENERAL.

50. Dorris, Virginia Kent. **CAN PUBLIC WORKS SAVE THE NATION? AN UPDATED VERSION OF THE WORKS PROGRESS ADMINISTRATION PURPORTS TO TACKLE BOTH THE INFRASTRUCTURE AND UNEMPLOYMENT PROBLEMS.** American City and County; 107:36-8+. August 1992.

Program proposals and financing options at the federal, state, and local level are presented. GENERAL.

51. Duffy-Deno, Kevin T.; Eberts, Randall W. **PUBLIC INFRASTRUCTURE AND REGIONAL ECONOMIC DEVELOPMENT: A SIMULTANEOUS EQUATIONS APPROACH.** Journal of Urban Economics. November 1991.

This paper estimates the effect of public capital stock on regional income. The study employs a system of two equations that incorporate three dimensions of the relationship between public infrastructure investment and regional income: public infrastructure as an input into the production process, public investment as a construction or "public works" activity, and public infrastructure as a consumption good in the median household's utility function. Public capital stock estimates are based on the perpetual inventory technique for a sample of metropolitan areas. A two-stage least-squares method is used to estimate the relationship between metropolitan personal income and local public capital stock.
GENERAL.

52. Eberts, Randall W. **CROSS SECTIONAL ANALYSIS OF PUBLIC INFRASTRUCTURE AND REGIONAL PRODUCTIVITY GROWTH.** Cleveland, OH: Federal Reserve Bank Of Cleveland Research Dept; 28p. 1990.

This study tests the relationship between local capital stock and regional manufacturing outputs, inputs, and productivity using data for 36 U.S. metropolitan areas, 1965-77.
GENERAL.

53. Eberts, Randall W. **PUBLIC INFRASTRUCTURE AND REGIONAL ECONOMIC DEVELOPMENT.** Cleveland, OH: Federal Reserve Bank of Cleveland Economic Review. 26:15-27 no 1. 1990.

Analyzes the effectiveness of public works investment.
GENERAL.

54. Eberts, Randall W.; Fox, William F. **THE EFFECT OF FEDERAL POLICIES ON LOCAL PUBLIC INFRASTRUCTURE INVESTMENT**. Public Finance Quarterly; 20(4), pages 557-71; Cleveland, OH: Federal Reserve Bank of Cleveland. October 1992.

This report examines the relationship between federal tax policies and municipal infrastructure investment. The report contains discussions of federal tax policies, demand and supply of municipal debt, and demand for public infrastructure. Data is included about public capital investment.
GENERAL.

55. Eggers, WD. **PRIVATIZATION OPPORTUNITIES FOR STATES**. Los Angeles, CA: The Reason Foundation. 1993.

This report discusses the advantages of privatization, privatization techniques, and privatization opportunities. The following areas are discussed: road and rest area maintenance; public transit; motor vehicle registry; fleet operations and maintenance; airports; highways and bridges; turnpikes; and ports.
GENERAL.

56. Eisner, Robert. **INFRASTRUCTURE AND REGIONAL ECONOMIC PERFORMANCE: COMMENT**. New England Economic Review; 0(0), pages 47-58. September 1991.

The author takes the substantial body of data put together by Munnell and Cook for 48 states over the years 1970 to 1986 and uses the data in pooled time series regressions, in pooled cross sections, and finally in distributed-lag investment functions. The author's results support Munnell's finding that states that have more capital have greater output, even after taking into account both their amounts of labor (nonagricultural employment) and private capital.
GENERAL.

57. Enhance Reinsurance Company. **INFRASTRUCTURE INVESTMENT, AN HISTORICAL OVERVIEW**. New York, NY: Enhance Financial Services Group, Inc. 1991.

GENERAL.

58. Eno Transportation Foundation, Inc. **TRANSPORTATION IN AMERICA**. 1992(10th EDITION).

GENERAL.

59. Fawson, Chris; Giroux, Gary. **AN EMPIRICAL EXTENSION OF THE MUNICIPAL MONOPOLY MODEL TO PROVISION OF COMMUNITY INFRASTRUCTURE [BUREAUCRACY AND THE DIVISIBILITY OF LOCAL PUBLIC OUTPUT].** Public Choice; 57(1), pages 79-83. April 1988.

GENERAL.

60. Fitzgerald, Randall. **WHEN GOVERNMENT GOES PRIVATE: SUCCESSFUL ALTERNATIVES TO PUBLIC SERVICES.** Pacific Research Institute for Public Policy; 330p. 1988.

Profiles successful privatization efforts of U.S. local governments. Partial contents include: Rebuilding our infrastructure; Unleashing our hoarded assets and; Privatizing federal spending.
GENERAL.

61. Fox, William F.; Smith, Tim R. **PUBLIC INFRASTRUCTURE POLICY AND ECONOMIC DEVELOPMENT.** Federal Reserve Bank of Kansas City Economic Review; 75:49-59. March 1990.

Examines the slowdown in state and local spending; how the linkage between public infrastructure and economic development depends on location; and options available to deliver services more efficiently.
GENERAL.

62. Frank, J. E.; Falconer, M. K. **THE MEASUREMENT OF INFRASTRUCTURE CAPACITY: THEORY, DATA STRUCTURES, AND ANALYTICS**. Computers, Environment, and Urban Systems. 14(4: 283-297)

GENERAL.

63. Frayer, Eric R.; Libby, Lori B. **CAPITAL IMPROVEMENT FINANCING, 1991**. Baseline Data Report; 24:1-11. January 1992.

Issues influencing local government infrastructure financing are presented.
GENERAL.

64. Fruin, Jerry E.; Baumel, C. Phillip. **HOW MUCH TRANSPORTATION INFRASTRUCTURE DOES RURAL AMERICA NEED?** St: Paul MN: Department of Agricultural and Applied Economics, College of Agriculture, University of Minnesota; 25p. 1992.

The investment needed to maintain and improve freight and passenger services, railroads, roads, and waterways is described.
GENERAL.

65. Gakenheimer, Ralph. **INFRASTRUCTURE SHORTFALL: THE INSTITUTIONAL PROBLEMS.** Journal of the American Planning Association; 55:14-23. December 1989.

Based on a conference paper, issues presented include: new building rather than rebuilding, politics, costs, technological aspects, and other factors.
GENERAL.

66. Garcia, Mila Teresa; McGuire, Therese J. **THE CONTRIBUTION OF PUBLICLY-PROVIDED INPUTS TO STATES' ECONOMIES**. Regional Science and Urban Economics; 22(2), pages 229-41. June 1992.

The authors specify a regional production function that, in addition to labor and private capital, includes two publicly provided inputs--highways and education. They employ a panel data set consisting of annual observations on the 48 contiguous states from 1969 to 1983 to estimate input elasticity coefficients under a specification that allows for differences over time and across states.
GENERAL.

67. Gelpe, Marcia R. **POLLUTION CONTROL LAWS AGAINST PUBLIC FACILITIES**. Harvard Environmental Law Review; 13:69-146 no 1. 1989.

Examines remedies imposed against publicly owned treatment works, primarily actions brought under the Clean Water Act.
GENERAL.

68. Giglio, Joseph M. **INFRASTRUCTURE IN TROUBLE**. Capital projects: New strategies for planning, management, and finance. Matzer, John, Jr. ed. Washington, DC: International City Management Association. 1989.

This paper presents the findings of a two-year study by the National Council on Public Works Improvement entitled, *Fragile Foundations: A Report on America's Public Works*. A report card is included with a grade and explanation for each infrastructure category: highways, mass transit, aviation, water resources, water supply, wastewater, solid waste, and hazardous waste. The paper judges current infrastructure investment to be inadequate, and advises a

higher level of investment. The paper concludes with a discussion of the importance of state roles in infrastructure investment.
GENERAL.

69. Gilbreath, Jan. **FINANCING ENVIRONMENTAL AND INFRASTRUCTURE NEEDS ON THE TEXAS-MEXICO BORDER: WILL THE MEXICAN-U.S. INTEGRATED BORDER PLAN HELP?** Journal of Environment and Development. v1, n1, p151(25). June 1992.

The growing industrial base along the U.S.-Mexican border has created infrastructure and natural resource strains that threaten regional economic growth. The response of the U.S. and Mexican governments to such concerns was to create an integrated border environmental plan that addresses some, but not all, of the border's infrastructure and environmental needs.
GENERAL.

70. Giraudo, John P. **BREAKING FREE OF FEDERAL GRANT RESTRICTIONS: MAKING INFRASTRUCTURE PRIVATIZATION A REAL OPTION**. Los Angeles, CA: Reason Foundation. 1991.

Interest in privatizing airports, highways, wastewater treatment plants, and other state and local infrastructure has been increasing. However, most such facilities have been built in part with federal grants and all such grants contain a variety of restrictions. In many cases, most recently with respect to airports, the granting agency has interpreted the grant agreements as prohibiting the sale of the asset in question. An accurate reading of recently adopted law on the subject, however, would avoid this impasse.
GENERAL.

71. Giraudo, John P. **PRIVATIZING INFRASTRUCTURE: BREAKING FREE OF FEDERAL GRANT RESTRICTIONS**. Municipal Finance Journal; 12:45-58. September 1991.

Presents obstacles to the sale of municipal infrastructures growing out of federal control of funding.
GENERAL.

72. Goldman, H. J.; Mackenzie, D. **INFRASTRUCTURE FINANCING: REALITIES AND PERSPECTIVES**. Journal-Water Pollution Control Federation JWPFA5, Vol. 61, No. 2, p 176-179. February 1989.

The elimination of federal funding and major changes in tax-exempt bond markets have forced government and the private sector to create a new array of financing options. Given this expanded array of options and resources and the new entries into financial management, capital planning is essential; financial considerations have been raised to a significantly higher priority, and must be viewed in both policy and management contexts.
GENERAL.

73. Gole, Barbara S. **ACCOUNTING FOR OUR INFRASTRUCTURE**. Capital Projects: New Strategies for Planning, Management, and Finance. Matzer, John Jr. ed. Washington, DC: International City Management Association. 1989.

This paper discusses the current efforts by the Government Accounting Standards Board to determine the proper accounting for public infrastructure. The paper investigates whether or

not the reporting of public capital assets should be based on historical cost data or other variables such as current economic value, service capacity, condition, age, and maintenance needs. The practicality of implementing an infrastructure-management system is examined based on the author's own experience.
GENERAL.

74. Gomez-Ibanez, Jose A.; Meyer, John R. **GOING PRIVATE: THE INTERNATIONAL EXPERIENCE WITH TRANSPORT PRIVATIZATION**. Washington, DC: Brookings Institution. 1993.

This paper presents a review and analysis of existing public-private partnerships. Several key topics relating to privatization are discussed: varieties of privatization, motives and objections to privatization, and prospects and opportunities for privatization. Five basic lessons or themes are presented in the analysis: 1) competition is especially important in encouraging the cost savings or efficiencies that often motivate privatization; 2) privatization is easier to carry out when the efficiency gains are large; 3) privatization is easier to implement when there are not too many redistributions or transfers linked to it; 4) privatization works best when associated with fewer controversial consequences; and 5) privatization is easier when the activity or services approximately covers its costs.
GENERAL.

75. Gomez-Ibanez, Jose A.; Meyer, John R. **POLITICAL ECONOMY OF TRANSPORT PRIVATIZATION: SUCCESSES, FAILURES AND LESSONS FROM DEVELOPED AND DEVELOPING COUNTRIES, FINAL REPORT**. Washington, DC: U.S. Department of Transportation. 1992.

The report examines the conditions favorable for successful privatization of transportation facilities or services by analyzing the experiences with privatization in a variety of developed and developing countries. Particular attention is devoted to privatization of urban bus transit services and high-performance toll highways; for these two modes, the experiences in the United States, Europe, and developing countries are considered.
GENERAL.

76. Gomez-Ibanez, Jose A.; Meyer, John R.; Luberoff, D. E. **THE PROSPECTS FOR PRIVATIZING INFRASTRUCTURE**. Journal of Transport Economics and Policy. London, England London School of Economics. 1991.

This paper explores the prospects for privatization by examining the U.S. experience with two categories of infrastructure: toll roads and solid waste disposal facilities. Both are capital intensive, but historically in the U.S. they have had different levels of private sector involvement.
GENERAL*

77. Goodrich, James A.; Mayo, Francis T. **ENVIRONMENTAL REGULATION: ITS IMPACT ON INFRASTRUCTURE DECISION MAKING**. First International Conference on Underground Infrastructure Research. Cincinnati, OH: U.S. Environmental Protection Agency. 1989.

This paper discusses a number of laws and regulations and their effect on increasing the environmental infrastructure, including treatment plants, distribution systems, and wastewater

systems. The Safe Drinking Water Act and Clean Water Act, and their ensuing regulations, are highlighted.
GENERAL.

78. Gramlich, Edward M. (The University of Michigan). **INFRASTRUCTURE INVESTMENT: A REVIEW ESSAY**. Journal of Economic Literature; V. 33, N. 3: 1176-1196. September 1994.

This essay reviews the correlation between the decline of U.S. productivity and the drop in U.S. infrastructure investment since the late 1960's. Gramlich defines infrastructure capital, discusses changes in infrastructure investment and their impacts, and analyzes policy alternatives. Gramlich considers the evidence of an infrastructure shortage to be inconclusive. He advocates a diminished role of federal grant programs, allowing states and localities to maintain their own revenue sources and determine their own infrastructure priorities. Quantitative data on U.S. productivity and infrastructure investment is included.
GENERAL*

79. Grigg, N. S. **APPROPRIATE TECHNOLOGY IN INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT**. Hydraulic Engineering: Proceedings of the 1991 National Conference: American Society of Civil Engineers. New York, NY: Colorado State University. 1991.

One reason for the use of the term appropriate technology is to draw attention to the need to meet human needs by providing facilities that work well in different cultural settings at reasonable cost. Often these facilities fall within the broad categories of public works infrastructure: roads, transportation, water, waste management, energy, and buildings. Infrastructure management is the application of the principles of management to making infrastructure systems perform well. Tasks involved include: planning, programming, and budgeting; organizing and managing work; supporting management decisions; and operations, financial, project, and maintenance management.
GENERAL.

80. Grizzle, Charles L. **FINANCING ENVIRONMENTAL INFRASTRUCTURE: A NATIONAL CHALLENGE**. Municipal Finance Journal; 10:231-9. September 1989.

Discusses problems at the local level due to the expansion of environmental programs and activities and reviews the use of public/private partnerships as an alternative financing mechanism.
GENERAL.

81. Haimes, Y. Y. **OPTIONS FOR NATIONAL INFRASTRUCTURE RENEWAL**. Water Resources Update: Water Resources Infrastructure. Issue No. 86, p. 11-14. 1991.

Recently, several commissions have independently studied three critical national issues: the nation's deteriorating physical infrastructure, the nation's mismanagement of hazardous waste, and the nation's inadequate supply of trained engineers. The physical infrastructure is deteriorating at an exceedingly dangerous rate. This neglect and mismanagement stem from several trends: fiscal constraints, drifting objectives and priorities, lack of accountability, and a diminishment of engineering expertise.
GENERAL.

82. Hanson, Royce. **THE NEXT GENERATION IN THE MANAGEMENT OF PUBLIC WORKS: GETTING SOME OF IT TOGETHER**. 1986.

The new generation of general managers needs to adapt to change. Engineers and public works directors must begin to think of themselves not only as builders but maintainers and managers as well.
GENERAL*

83. Hanson, Royce. **PERSPECTIVES ON URBAN INFRASTRUCTURE**. Committee on National Urban Policy, National Research Council. 1984.

This report serves to layout a basis for a research agenda on solvent policy issues concerning urban infrastructure and to identify and discuss major policy concerns.
GENERAL*

84. Hasnath, Syed Abu; Chatterjee, Latta. **PUBLIC CONSTRUCTION IN THE UNITED STATES: AN ANALYSIS OF EXPENDITURE PATTERNS.** Annals of Regional Science; 24:133-45. March 1990.

Presents federal, state, and local expenditures for building new fixed capital stocks and their maintenance, 1957-85.
GENERAL.

85. Hass, Nancy; Reingold, Jennifer. **PSST, WANNA BUY A BRIDGE? PRIVATIZATION IN AMERICA**. Financial World; 162:30-41. August 3, 1993.

Four articles discuss increasing privatization as a way to cope with local government fiscal crises in the U.S. and Canada.
GENERAL.

86. Hatry, Harry P.; Millar, Annie P. **GUIDE TO SETTING PRIORITIES FOR CAPITAL INVESTMENT**. Washington, DC: Urban Institute Press. 1984; Guide to Managing Urban Capital Series, Vol. 5.

This report focuses on the part of the capital planning and budgeting process in local government that occurs from the time that operating agencies submit the capital project proposal until the time that elected officials make their final selections.
GENERAL.

87. Hatry, Harry P.; Steinthal, Bruce G. **GUIDE TO SELECTING MAINTENANCE STRATEGIES FOR CAPITAL FACILITIES**. Washington, DC: Urban Institute Press. 1984; Guide to Managing Urban Capital Series, Vol. 4.

This report focuses on the process by which local governments, especially their operating agencies, select the type and amount of maintenance for their capital facilities.
GENERAL.

88. Hatry, Harry P.; Sullivan, Jonathan M. **SERVICE EFFORTS AND ACCOMPLISHMENTS REPORTING: ITS TIME HAS COME**. Washington, DC: Governmental Accounting Standards Board.

This study investigates the effectiveness of Service Efforts and Accomplishment (SEA) indicators.
GENERAL.

89. Hawkins, Russell Ed.; Benedict, Leah Ed. **ENVIRONMENTAL PARTNERSHIPS: PUBLIC AND PRIVATE PERSPECTIVES.** Management Information Service Report; 22:1-24. September 1990.

Private sector involvement in the financing and managing of local environmental infrastructure.
GENERAL.

90. Holcombe, Randall G. **THE TAX COST OF PRIVATIZATION**. Southern Economic Journal; 56(3), pages 732-42. January 1990.

A substantial tax penalty must be incurred to privatize municipal government services. The municipality that chooses to privatize typically will have to forego tax-exempt financing, and the privatizing firm will have to pay income taxes on the income generated from the privatizing effort.
GENERAL.

91. Holtz, Eakin Douglas; Rosen, Harvey S. (Syracuse University). **MUNICIPAL CONSTRUCTION SPENDING: AN EMPIRICAL EXAMINATION**. Economics and Politics; 5(1), pages 61-84. March 1993.

We investigate several models of the determination of local public capital expenditures. Using Euler equation methods, the authors cannot reject the hypothesis that construction spending is determined by unconstrained, forward looking municipal planning. Consistent with this result, the stochastic structure of resource flows is an important feature of the determination of construction spending.
GENERAL.

92. Hopkins, T. D. **BENEFIT CHARGES FOR FINANCING INFRASTRUCTURE: REPORT TO THE CONGRESS**. Washington, DC: Office of Technology Assessment, U.S. Congress. August 1989.

Benefit-based charges have become an increasingly popular means to generate funds for operating and capital costs of public works. The report examines a variety of policy and implementation issues that deserve attention by those involved in decisions about adoption and retention of such charges.
GENERAL.

93. Hornbeck, J. F. **TRANSPORTATION INFRASTRUCTURE: ECONOMIC ISSUES AND PUBLIC POLICY ALTERNATIVES**. Washington, DC: Congressional Research Service. 1993.

This report discusses alternative perspectives to evaluating the transportation infrastructure issues within the context of Congress' economic policymaking function.
GENERAL.

94. Hoxworth, Dan. **IMPACT FEES: ISSUES AND CASE STUDIES**. Management Information Service Report; 23:1-26. December 1991.

Political and ethical issues, comparison of methods of developer financing, and a multijurisdictional study are described with case studies of Kansas City, Pasco County, Florida, and Lake Geneva, Wisconsin.
GENERAL.

95. Hulten, Charles R.; Schwab, Robert M. **INFRASTRUCTURE SPENDING: WHERE DO WE GO FROM HERE?** National Tax Journal, Vol. 46, No. 3.

This article discusses the main issues of the infrastructure debate of the 1990s, creating a framework for the discussion. The authors review four arguments for increased public investment: (1) shortsighted government policies allowed infrastructure spending to fall sharply and the nation's roads and bridges to deteriorate; (2) lower infrastructure spending in the past was a key reason that the economy performed so poorly during the last two decades; (3) additional spending in the future will allowed the United States to grow much faster and to become more competitive in international markets; and (4) infrastructure spending should be included as a key part of short-term economic policy.
GENERAL.

96. Hulten, Charles R.; Schwab, Robert M. **IS AMERICA REALLY ON THE ROAD TO RUIN?** The Public's Capital; page 6-7. 1991.

This article reviews a report from the Congressional Budget Office showing that the rate of return to new public investment is low, while the rate of return to maintenance and rehabilitation is large, suggesting a possible over-investment in new public capital at the expense of sustaining the existing stock. It critiques the macro approach towards analysis of the productivity of public investment, and suggests that the link between public capital and private output is too complex to be captured by a simple regression analysis.
GENERAL.

97. Hulten, Charles R.; Schwab, Robert M. **IS THERE TOO LITTLE PUBLIC CAPITAL? INFRASTRUCTURE AND ECONOMIC GROWTH**. Washington, DC: American Enterprise Institute and The House Wednesday Group. 1991.

This article discusses the claims of economists who believe there is a significant underinvestment in highway infrastructure. It contrasts these views by citing economists who believe that the undersupply of highway infrastructure is due primarily to the failure to price the capital correctly, leading to excess demand and the failure to build durable highway infrastructure. The article also reviews the debate over the relationship between public infrastructure investments and economic growth. The authors conclude that while there is an important link between infrastructure and growth, the link is too poorly understood to justify the contention that a massive expansion of federal highway spending will lead to significant economic growth, particularly if this spending comes at the expense of other forms of capital formation.
GENERAL.

98. Hulten, Charles R.; Schwab, Robert M. **PUBLIC CAPITAL FORMATION AND THE GROWTH OF REGIONAL MANUFACTURING INDUSTRIES**. National Tax Journal; 44(4), Part 1, pages 121-34. December 1991.

The authors' purpose in this paper is to provide new estimates of the link between public infrastructure and economic performance by extending and updating their earlier work on regional manufacturing productivity. Their findings suggest that this link is weak.
GENERAL.

99. International City/County Management Association Municipal Data Service. **LOCAL GOVERNMENT INFRASTRUCTURE FINANCING**. 1993.

A special data issue, the report presents the results of a survey of 5,160 U.S. cities and counties regarding their methods of public works financing. It lists, by state, the responses of individual jurisdictions to survey questions about forms of financing, types of impact fees levied on developers, cost-shifting methods, and short-term financing mechanisms.
GENERAL.

100. Japan International Research Task Force, Civil Engineering Research Foundation. **TRANSFERRING RESEARCH INTO PRACTICE: LESSONS FROM JAPAN'S CONSTRUCTION INDUSTRY**. 1991.

This report summarizes the findings of the Japan Task Force (JTF). The JTF investigated the Japanese construction industry in 1990 in an attempt to understand the difference between the Japanese and the U.S. construction industry.
GENERAL.

101. Johnson, Gerald W.; Watson, Douglas J. (Auburn, AL). **PRIVATIZATION: PROVISION OR PRODUCTION OF SERVICES? TWO CASE STUDIES**. State and Local Government Review; 23:82-9. March 1991.

Evaluates methods of contracting out solid waste disposal and waste water management.
GENERAL.

102. Johnson, Thomas G. (Virginia Polytechnic Institute/U.S. Department of Agriculture). **LOCAL INFRASTRUCTURE INVESTMENT IN RURAL AMERICA.** 291p. 1988.

Based on a national symposium sponsored jointly by the Virginia Polytechnic Institute and State University and the U.S. Department of Agriculture's Extension Service, 1985, the report assesses decision-making models used in local planning and implementation of infrastructure investments.
GENERAL.

103. Johnson, Thomas G. **STATE RURAL TRANSPORTATION PROGRAMS IN AN ERA OF CONTRACTION. NEW ALLIANCES FOR RURAL AMERICA. BACKGROUND PAPER SUBMITTED TO THE TASK FORCE ON RURAL DEVELOPMENT**. Washington, DC: National Governors' Association. 1989.

This paper focuses on the role of transportation infrastructure and services in rural economic development. It examines the best methods of investing in transportation infrastructure in an era of fiscal austerity and economic decline in many rural areas.
GENERAL.

104.Joint Economic Committee, U. S. Congress. **PUBLIC INVESTMENT IN INFRASTRUCTURE**. Washington, DC: 1989.

GENERAL.

105.Kaplan, Marshall. **INFRASTRUCTURE POLICY: REPETITIVE STUDIES, UNEVEN RESPONSE, NEXT STEPS**. Urban Affairs Quarterly, Vol. No. 25, Iss. No. 3, 371-388. March 1990.

Over the past 10 or 15 years, studies of the U.S. national infrastructure have agreed that the U.S. has not invested enough in bridges, roads, transit and water systems, and airports. Compensatory spending by state and local governments has not been uniform, and user fees and other financial innovations may be inequitable. A national infrastructure policy is needed.
GENERAL*

106.Kilgore, Roger T.; Zatz, Michael N.; Young, G. Kenneth. **THE RELATIONSHIP BETWEEN STANDARDS AND THE PERFORMANCE OF INFRASTRUCTURE**. Springfield, VA. GKY and Associates, Inc., for the U.S. Army Corps of Engineers, Institute for Water Resources. 1991.

An early background paper for the Federal Infrastructure Strategy (FIS) program which documents fundamental concepts related to infrastructure performance measures, standards, criteria and objectives. Includes analysis of three case studies on large airports, flood control, and waste to energy facilities.
GENERAL.

107.Koelemay, J. Douglas. **INFRASTRUCTURE INVESTMENT COMMISSION: INTERIM REPORT**. Washington, DC: Agenda Communications, Inc. 1992.

This report summarizes the work of the Commission to Promote Investment in America's Infrastructure. The Commission studied the feasibility and desirability of creating a type of infrastructure security to permit the investment of pension funds in funds used to design, plan, and construct infrastructure.
GENERAL.

108.Ledebur, Larry et al. **CHANGING STATE ROLES IN PUBLIC WORKS**. Washington, DC: National Council on Public Works Improvement. 1987.

This report studies how the state role has evolved in infrastructure development.
GENERAL*

109.Ledebur, Larry et al. **FEDERAL AND STATE ROLES IN INFRASTRUCTURE**. ASLAN Institute.

This report, prepared for the National Council on Public Works Improvement, examines the interplay between federal and state governments in financing infrastructure.
GENERAL*

110.Liner, B. **SHADOWS ON METROPOLITAN TRANSPORTATION FINANCING IN THE 90s**. Paper presented to the National Association of Regional Councils' Transportation Advocacy/Service Group, Federal Highway Administration, and Urban Mass Transportation Administration. Washington, D.C. The Urban Institute. 1990.

Stating that the transportation industry, while not asleep at the wheel, nonetheless has not yet fought on the new battlefront that includes the twin deficits (budget and trade) and other equally pressing functions (e.g., health care, day care, education), the author proposes "that the time has come to look for a way to make the case for transportation funding that achieves the desired result without going head-to-head against other governmental functions in some kind of zero-sum budget exercise."
GENERAL.

111.Luker, B. **PUBLIC INVESTMENT AND U.S. PRODUCTIVITY CHANGE: AN EVALUATION OF RECENT RESEARCH**. College Station, TX: Texas Transportation Institute. June 1992.

Recent research has uncovered an apparent relationship between rates of productivity growth and levels of investment in core infrastructure by the public sector. If valid, these findings account for most of the widely reported slowdown in U.S. rates of productivity growth in recent decades, and lend a measure of intrinsic worth to government intervention in the national economy more fundamental than a merely countercyclical role.
GENERAL.

112.Lurz, Bill; McLeister, Dan. **INFRASTRUCTURE: WHO SHOULD PAY?** Professional Builder. v55, p112(8). April 1990.

The maintenance and expansion of the nation's basic services, roads, schools, and utilities have been seriously underfunded. The taxpayer revolts of the 1970s, culminating in California's landmark Proposition 13, an essentially local issue which Reagan policies advanced to the national political stage in the 1980s, engendered the decline in infrastructure investment. Strapped by federal subsidy cutbacks, local governments are looking to private developers and builders to provide needed facilities and amenities through impact fees and land exactions.
GENERAL.

113.MacAuley, Patrick H. **FEDERAL CONSTRUCTION-RELATED EXPENDITURES, 1984 TO 1992.** Construction Review; 37:iii-viii. July 1991.

Covers military construction, highways and roads, hospitals and health facilities, conservation and development, sewage treatment facilities, federal industrial building, and housing; direct federal loans and loan guarantee programs.
GENERAL.

114.Mangravite, Frank; Moffitt, Patrick. **A PRIVATIZATION HOW-TO**. American City and County; 108:28+. March 1993.

Contract operations have become a popular alternative for many municipalities, but there are several important aspects of private contracting that should be considered: cost, personnel expertise, and regulatory liability considerations in contracting for water and wastewater facilities.
GENERAL.

115.Marland, Gregg; Weinberg, Alvin M. **LONGEVITY OF INFRASTRUCTURE**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

GENERAL.

116.Marshall, Patrick G. **TRANSPORTATION: AMERICA'S "QUIET CRISIS"**. Editorial Research Reports. p 446-59. August 11, 1989.

Report discusses topics such as: the skies are friendlier than the airports; are railroads the victim of competitors' subsidies?; and obstacles to a balanced transportation policy.
GENERAL.

117.Matzer, John Jr. **CAPITAL PROJECTS: NEW STRATEGIES FOR PLANNING, MANAGEMENT, AND FINANCE.** Practical Management Series; 228p. 1989.

City and county experiences with solving infrastructure problems are discussed.
GENERAL.

118.McDowell, Bruce D. **PUBLIC WORKS FOR TOMORROW**. Washington, DC: Intergovernmental Perspective; pages 23-25. 1992.

This article reviews studies that have examined the performance and maintenance of public works, including Fragile Foundations and New Directions for the Nation's Public Works. The article also outlines a strategy of federal interagency cooperation in infrastructure programs.
GENERAL.

119.McGuire, Therese J. **HIGHWAYS AND MACROECONOMIC PRODUCTIVITY: PHASE TWO**. Chicago, IL: Institute of Government and Public Affairs. March 31, 1992.

This report, prepared for the Federal Highway Administration, U.S. Department of Transportation, addresses the question of whether or not the decline in public capital investment has caused the recent decline in private productivity. The report reviews current literature on the subject, presents new estimates, and recommends future research. The impact of specific types of public capital (i.e. highway, transit, water, sewer) on private output are compared.
GENERAL.

120.Merwin, DP. **PUBLIC-PRIVATE PARTNERSHIPS: WAVE OF THE FUTURE?** Highway and Heavy Construction. Newton, MA: Cahners Publishing Company. 1989.

The public-private partnership is becoming the wave--perhaps the tidal wave--of the future. There are literally thousands of public-private partnerships as the trend grows toward

government eschewing confrontational politics in favor of a spirit of cooperation in both private developments and, to an increasing degree, public services.
GENERAL.

121.Montgomery, W. D. **LESSONS FROM THE PAST, OPPORTUNITIES FOR THE FUTURE: THE CHANGING ROLE OF PUBLIC INVESTMENT IN ECONOMIC GROWTH.** Washington, DC: Colloquium on the Nation's Infrastructure Policy. November 17, 1989.

GENERAL.

122.Moore, John L. **GOVERNING GUIDE: TRANSPORTATION: PLANNING THE FUTURE.** Governing; 4:43+. December 1990.

Topics of the report include: challenges of the Administration's National Transportation Policy; and state and local responses to problems of infrastructure, traffic congestion, and funding. Includes remarks by New Jersey Commissioner of Transportation Thomas M. Downs, an overview of high-technology transportation developments, and sources of information.
GENERAL.

123.Municipal Finance Officers Association. **BUILDING PROSPERITY: FINANCING PUBLIC INFRASTRUCTURE FOR ECONOMIC DEVELOPMENT.** Government Finance Research Center. 1983.

This report surveys the irregular and complicated landscape of the needs for, and financing of, public works in this country, especially focusing on the role of the state and local governments.
GENERAL*

124.Munnell, Alicia H. **HOW DOES PUBLIC INFRASTRUCTURE AFFECT REGIONAL ECONOMIC PERFORMANCE?** New England Economic Review; 0(0), pages 11-32. Boston, MA: Federal Reserve Bank of Boston. September 1990.

This paper explores the impact of public capital on economic activity at the state and regional level. The author concludes that those states that have invested in infrastructure tend to have greater output, more private investment, and more employment growth.
GENERAL*

125.Munnell, Alicia H. **IS THERE A SHORTFALL IN PUBLIC CAPITAL INVESTMENT?** Proceedings of a Conference held at Harwich Port, Massachusetts. Boston, MA: Federal Reserve Bank of Boston; 249p. 1990.

Examines the extent to which the U.S. may be underinvesting in public infrastructure, potential economic consequences and suggested funding mechanisms. Includes a discussion of the effect on regional economic performance and prospects for privatizing infrastructure in light of experiences with roads and solid waste.
GENERAL.

126.Munnell, Alicia H. **POLICY WATCH: INFRASTRUCTURE INVESTMENT AND ECONOMIC GROWTH.** Journal of Economic Perspectives; 6(4), pages 189-98. Boston, MA: Federal Reserve Bank of Boston. September 1992.

This essay addresses the relationship between U.S. productivity and infrastructure investment. It begins with a history of the debate and discussion of the policy implications involved with the issue. The author then compares her previous work to that of David Aschauer. The author analyzes the arguments of her critics and draws conclusions about whether a higher level of infrastructure spending is warranted, given its impact on U.S. productivity.
GENERAL.

127. Munnell, Alicia H. **WHY HAS PRODUCTIVITY GROWTH DECLINED? PRODUCTIVITY AND PUBLIC INVESTMENT**. New England Economic Review; 0(0), pages 3-22. Boston, MA: Federal Reserve Bank of Boston. January 1990.

This study builds upon David Aschauer's insight and explores whether changes in the amount of public capital, combined with the growth of private capital and labor, can explain most of the slowdown. The author concludes that the main causes of the productivity slowdown could be behind us, as long as public infrastructure receives badly needed attention.
GENERAL.

128. Nakicenovic, Nebojsa. **DYNAMICS AND REPLACEMENT OF U.S. TRANSPORT INFRASTRUCTURES**. Cities and their vital systems: Infrastructure past, present, and future. Ausubel, Jesse H.//Herman, Robert. ed. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

GENERAL.

129. National Conference of State Legislature. **CAPITAL BUDGETING AND FINANCE: THE LEGISLATIVE ROLE**. 1987.

This report examines ways of strengthening legislative oversight of the state capital budgeting and finance process.
GENERAL*

130. National Council on Public Works Improvement. **FRAGILE FOUNDATIONS: A REPORT ON AMERICA'S PUBLIC WORKS. FINAL REPORT TO THE PRESIDENT AND THE CONGRESS**. Washington, DC: 1988.

This 3-part report presents the results of an assessment of the state of America's infrastructure. Part one summarizes the findings and conclusions about the capacity of the nation's infrastructure to support future economic growth. Part two provides a synthesis of major themes from extensive research conducted in the last two years. Part three presents appendices that analyze the performance of 8 major categories of public works and provides additional information.
GENERAL*

131. National Governors' Association, Task Force on Transportation Infrastructure. **AMERICA IN TRANSITION: THE INTERNATIONAL FRONTIER: REPORT OF THE TASK FORCE ON TRANSPORTATION INFRASTRUCTURE**. Washington, DC: 1989.

GENERAL.

132. National League of Cities. **FINANCING INFRASTRUCTURE: INNOVATIONS AT THE LOCAL LEVEL**. Annapolis, MD: NLC Publications Center. 1987(ISBN 0-933729-30-8).

This study reviews 24 cases studies of locally financed infrastructure development. The studies were selected to illustrate a range of financing techniques suited to infrastructure expansion and rejuvenation.
GENERAL.

133. National Research Council, Building Research Board. **IN OUR OWN BACKYARD: PRINCIPLES FOR EFFECTIVE IMPROVEMENT OF THE NATION'S INFRASTRUCTURE**. Washington, DC: National Academy Press.

This report presents the state of the nation's infrastructure and suggestions for improvement from the National Research Council committee. The committee emphasized the local nature of urban infrastructure and reviewed the cites of Phoenix, Cincinnati, and Boston.
GENERAL.

134. National Research Council, Committee on Infrastructure Innovation. **INFRASTRUCTURE FOR THE 21ST CENTURY: FRAMEWORK FOR A RESEARCH AGENDA**. Washington, DC: 1987.

This report addresses issues regarding infrastructure technology: promising research areas for the technological improvement of infrastructure; and factors governing the adoption and carrying out a national research agenda to foster innovative research for infrastructure systems. The report recommends a two year implementation program for the development of a national strategy for infrastructure research and development. Efforts to strengthen and encourage existing modal research efforts are an essential to this activity.
GENERAL*

135. National Research Council, Committee on Measuring and Improving Infrastructure Performance. **ISSUES IN INFRASTRUCTURE PERFORMANCE MEASUREMENT: INTERIM REPORT OF A STUDY ON MEASURING AND IMPROVING INFRASTRUCTURE PERFORMANCE**. Washington, DC: National Academy Press. 1993.

This purpose of this study, which was conducted as an element of the U.S. Army Corps of Engineers Federal Infrastructure Strategy, was to develop an evaluation framework to measure and improve infrastructure performance.
GENERAL.

136. National Science Foundation. **CIVIL INFRASTRUCTURE SYSTEMS RESEARCH: STRATEGIC ISSUES**. Washington, DC: 1993.

The report concludes there is an urgent need to rebuild America. The nation must strive for intelligent renewal, a process that uses limited resources in a cost-effective manner.
GENERAL.

137. Petersen, Dennis W. **THE ENVIRONMENTAL REVOLUTION**. Site Selection and Industrial Development; 35:1191-5:. October 1990.

Brief overview of the effects of environmental legislation on designing, building, and operating facilities. Also discusses financial, legal, and design elements associated with current regulations.
GENERAL.

138. Peterson, George E. **HISTORICAL PERSPECTIVES ON INFRASTRUCTURE INVESTMENT: HOW DID WE GET WHERE WE ARE?** Washington, DC: The Urban Institute. 1991.

This paper is presented in two parts. Part I examines the evolution of the infrastructure debate by examining the progress made in understanding the following themes which have characterized policy discussions for the past decade: infrastructure needs estimates; infrastructure condition and performance; the linkage of infrastructure to economic growth and productivity; and federal vs. state-local financing roles. Part II examines the constraint that state and local officials themselves identify as the principal obstacle to adequate infrastructure investment: the need to secure voter approval for bond or tax financing (referendum voting).
GENERAL*

139. Peterson, George; Miller, Ted; Humphrey, Nancy; Walker, Christopher. **INFRASTRUCTURE NEEDS STUDY: A CRITIQUE**. Washington, DC: National Council on Public Works Improvement. 1986.

Needs studies during the 1980s showed that the United States needed to invest more in its public capital facilities if they were to be saved from deterioration. This report estimates the needs of infrastructure, both new facilities and maintenance of old ones.
GENERAL*

140. Poole, R. W. **INCENTIVES FOR MOBILITY: USING MARKET MECHANISMS TO REBUILD AMERICA'S TRANSPORTATION INFRASTRUCTURE. WORKING PAPER**. Santa Monica, CA: Reason Foundation. 1989.

This policy study proposes that the solution to America's inadequate transportation infrastructure should be a market-oriented approach rather than simply spending more public money. This approach stresses user funding, dedicated revenues, market pricing, and the use of private capital: principles which can be applied to airports, highways and freeways, mass transit, ports and waterways.
GENERAL.

141. Porter, Douglas R. **SPECIAL DISTRICTS: A USEFUL TECHNIQUE FOR FINANCING INFRASTRUCTURE (2ND EDITION)**. Washington, DC: The Urban Land Institute. 1992.

This second edition, which expands and updates the original book, looks at special districts as an alternate means of financing public improvements associated with new developments. In-depth case studies examine special districts providing water, sewer, transportation, and drainage facilities in seven states. It also explains how special districts are weathering the national economic downturn and how states are providing more guidance for district activities.
GENERAL.

142.Porter, Douglas R.; Matzer, John Jr. **FINANCING INFRASTRUCTURE WITH SPECIAL DISTRICTS**. Capital projects: New strategies for planning, management, and finance. Washington, DC: International City Management Association; 162-169. 1989.

This paper examines the use of special districts in financing infrastructure projects. Examples are presented for how special districts operate. Advantages and disadvantages of special districts are discussed, and a prognosis is presented for the future use of these financing mechanisms.
GENERAL.

143.Portland Cement Association. **INFRASTRUCTURE: INVESTING IN OUR FUTURE**. Skokie, IL: 1992.

This booklet examines the cost of America's deteriorating infrastructure, then looks at the individual components: highways, roads, and bridges; airports; mass transit systems; water supply systems; wastewater treatment plants; and sewer systems. Final comments concern infrastructure renewal and its cost.
GENERAL.

144.Private Sector Advisory Panel on Infrastructure Financing. **REPORT OF THE PRIVATE SECTOR ADVISORY BOARD ON INFRASTRUCTURE FINANCING TO THE COMMITTEE ON THE BUDGET; U.S. SENATE**.

This report examines options for infrastructure financing, and recommends effective ways to select and fulfill the best option. The report provides important insight with respect to trends in infrastructure funding over the past few decades and with regard to projected funding shortfalls in the coming years.
GENERAL*

145.The Privatization Council. **PROCEEDINGS OF THE PRIVATIZATION COUNCIL'S THIRD NATIONAL CONFERENCE.** Privatization Review. 4:21-35+. September 1989.

Edited versions of the six Partnership Opportunity Workshops presented at the conference, Making Ends Meet: Public-Private Partnerships into the 1990's, held in Washington, D.C., May 15-16, 1989. The workshops include: environmental infrastructure, transportation, municipal service contracting, health care, contracting out for assets and services, and labor relations and public/private partnerships.
GENERAL.

146.Public Infrastructure Subcouncil. **INVESTING IN OUR FUTURE: REPORT OF THE PUBLIC INFRASTRUCTURE SUBCOUNCIL TO THE COMPETITIVENESS POLICY COUNCIL**. March 1993.

The Subcouncil on Public Infrastructure was convened by the Competitiveness Policy Council to produce recommendations for enhancing U.S. international competitiveness by improving the effectiveness and efficiency with which we move people, goods, and information. The Subcouncil proposes a three-point strategy to ensure that U.S. infrastructure enhances our competitive edge, which recommends: 1) an aggressive program to maintain and improve transportation infrastructure, 2) adequate and sustained financing of infrastructure investment over time, and 3) decisive action to advance a new telecommunications infrastructure for the

21st century. The Subcouncil suggests legislation, priorities, financing mechanisms, and principles with which to achieve these goals.
GENERAL*

147.Rebuild America Coalition. **AMERICA'S INFRASTRUCTURE: PRESERVING OUR QUALITY OF LIFE**. Washington, DC: 1989.

This report is the second in a series of reports that addresses various elements of America's infrastructure problems and solutions to these problems. Within this report on America's infrastructure is a section devoted to the transportation network. It is pointed out that not only is America's transportation infrastructure deteriorating from aging facilities, but underinvestment in new facilities is overburdening current transportation networks.
GENERAL*

148.Revis, Joseph S. Tarnoff, Curtis. **THE NATION'S PUBLIC WORKS: REPORT ON INTERMODAL TRANSPORTATION**. National Council on Public Works. Washington, DC: 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining intermodal transportation as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's intermodal transportation.
GENERAL*

149.Rosenberg, Philip; Road, Sally. **PLANNING FOR CAPITAL IMPROVEMENTS**. Washington, DC: Management Information Services. 1984.

GENERAL.

150.Rothenberg, J. **THE QUALITY OF LOCAL INFRASTRUCTURE SERVICES: INVESTMENT, MAINTENANCE, AND REPLACEMENT UNDER TAX FINANCING, USER CHARGES, AND PRIVATIZATION**. 1988.

GENERAL.

151.Rutledge, Gary L.; Leonard, Mary L. **POLLUTION ABATEMENT AND CONTROL EXPENDITURES, 1987-91.** Survey of Current Business. 73:55-62. May 1993.

Provides data for business and government expenditures on air, water, and solid waste pollution control.
GENERAL.

152.Salkin, Patricia E. **IMPACT FEES: THE LAW, POLICY AND PRACTICE: A BIBLIOGRAPHY**. 1991.

Impact fees are assessed by municipalities to developers for costs associated with off-site improvements necessitated as a direct result of the proposed development.
GENERAL.

153.Sanders, H. T. **PUBLIC WORKS AND PUBLIC DOLLARS: FEDERAL INFRASTRUCTURE AND LOCAL INVESTMENT POLICY**. Washington, DC: U.S. Congress, House Wednesday Group. 1991.

GENERAL.

154.Schilling, K. E.; Porter, E. **U.S. URBAN WATER RESOURCES INFRASTRUCTURE.** Urban Water Infrastructure: Proceedings of a NATO Workshop on the Isle of Man. Fort Belvoir, VA: U.S. Army Corps of Engineers, Institute for Water Resources, Policy Studies Division. 1990.

The report reviews navigation/transportation, flood control, urban drainage, dam safety, irrigation, agriculture drainage, erosion, hydropower, recreation, and fish and wildlife created infrastructure needs. Wastewater and water supply, covered by separate Council reports, are more briefly reviewed for common themes and prospective actions.
GENERAL.

155.Schuler, Richard E. **TRANSPORTATION AND TELECOMMUNICATIONS NETWORKS: PLANNING URBAN INFRASTRUCTURE FOR THE 21ST CENTURY**. Urban Studies, V. 29, NO. 2, p. 297-310. April 1992.

This essay suggests measures to ensure that the ease and quality of access to local transportation and telecommunication networks by a diversity of users is maintained. The essay covers cost recovery, private versus public ownership, planning efficiency, and the interaction between transportation and telecommunication networks.
GENERAL.

156.Seader, David. **OPPORTUNITIES IN PRIVATIZATION FINANCE: THE MOVE TO REORIENT PUBLIC SECTOR LENDING PRACTICES.** Bankers Magazine; 172:40-4. May 1989.

Role of banks in alternative financing for municipal expansion and renovation of public works and services.
GENERAL.

157.Sears, D. (Economic Research Service, Agriculture and Rural Economy Division, Washington, DC). **INFRASTRUCTURE INVESTMENT AND ECONOMIC DEVELOPMENT: RURAL STRATEGIES FOR THE 1990's (STAFF REPORT)**. December 1990.

The report examines the effects of investment in transportation, telecommunications, and water and wastewater infrastructure on improving the economies of rural America. The authors leave the reader with a healthy degree of skepticism about the possibility of the direct stimulation of economic development across the spectrum of rural communities through just any infrastructure investments.
GENERAL.

158.Seely, B. **THE SAGA OF AMERICAN INFRASTRUCTURE**. Wilson Quarterly, Washington, DC: Woodrow Wilson International Center for Scholars. 1993.

Infrastructure is said to include not only roads and sewers, but national transportation grids, communication systems, media, housing, education, and, perhaps in the 1990s, computer

networks and fiber-optic information superhighways. The author concentrates on those things that provide crucial physical services: transportation, water and sewage, and power--the systems that historians Joel Tarr and Gabriel Dupuy call technological sinews.
GENERAL.

159.Shields, Evelyn. **FUNDING ENVIRONMENTAL PROGRAMS: AN EXAMINATION OF ALTERNATIVES**. Annapolis Junction, Maryland: National Governors' Association. 1989.

This National Governors' Association report discusses alternative financing mechanisms (AFMs) for environmental programs, including fee programs, tax programs, revolving loan funds, general obligation and revenue bonds, public-private partnerships, and other revenue-generating approaches. Current state experience in using the various AFMs to finance environmental programs, revealed in a survey of all state Environment Directors, are reviewed. The study concludes that AFMs are a powerful tool to supplement general revenue, but that they alone fail to bridge the widening gap between the costs of environmental protection and the resources to pay for it. Therefore, federal, state, and local governments will need to spend more general revenues for environmental protection and attempt to reduce program costs.
GENERAL.

160.Snyder, Thomas P. Stegmen, Micheal A. **PAYING FOR GROWTH: USING DEVELOPMENT FEES TO FINANCE INFRASTRUCTURE**. Washington, DC: Urban Land Institute. 1986.

GENERAL.

161.Stein, Jay M. ,. Ed. **PUBLIC INFRASTRUCTURE PLANNING AND MANAGEMENT**. Urban Affairs Annual Reviews Vol. 33. 1988.

Financial considerations of public infrastructure are discussed including: U.S. role of economic growth in the demand for services; federal budget policies; and the ability of state and local government to finance infrastructure development.
GENERAL.

162.Steinnes, Donald N. **AN ANALYSIS OF INFRASTRUCTURE PROVISION AND LOCAL ECONOMIC DEVELOPMENT POLICY.** Journal of the Community Development Society; 21:33-53 no 1. 1990.

Uses a policy evaluation model for a sample of U.S. cities in the upper Midwest to establish the relationship between infrastructure and economic growth, 1962-82. Results for growth in manufacturing jobs are presented.
GENERAL.

163.Stiglitz, J. E.; Arnott, R. J. **SAFETY, USER FEES, AND PUBLIC INFRASTRUCTURE**. Evanston, IL: The Transportation Center, Northwestern University. 1988.

GENERAL.

164.Studholme, Edward D.; Findley, Dean P. **PRIVATIZATION OF PUBLIC FACILITIES: DOES IT MAKE ECONOMIC SENSE?** Privatization Review; 5:22-9. December 1990.

Addresses financing, construction, operation and maintenance costs, and risk and ancillary markets.
GENERAL.

165.Suarez-Villa, L.; Hasnath, SA. **THE EFFECT OF INFRASTRUCTURE ON INVENTION. INNOVATIVE CAPACITY AND THE DYNAMICS OF PUBLIC CONSTRUCTION INVESTMENT**. Technological Forecasting and Social Change. 4. 1993.

The association between public infrastructure investment and invention is explored in this study, analyzing expenditure and patenting trends and cycles over much of the 20th century. The analysis of the infrastructural investment and the innovative capacity age cycle dynamics reveals a remarkable association between educational infrastructure construction and both aggregate and corporate innovative capacity.
GENERAL.

166.Sussna, Stephen. **LAND USE REGULATION AND FINANCING TRANSPORTATION IMPROVEMENTS.** Transportation Quarterly; 44:389-403. July 1990.

Analyzes some recent cases that deal with the issue of traffic impact fees and other possible means of raising revenue on the city and county level.
GENERAL.

167.Taylor, Leon (Tulane University). **BUILDING INFRASTRUCTURE TO ACCOMMODATE GROWTH**. Eastern Economic Journal; 17(4), pages 473-81. October 1991.

Do jurisdictions spend too little on infrastructure? To answer the question, one must separate infrastructure built to accommodate growth from infrastructure built to compete for growth. Underspending is most likely for accommodative infrastructure. This paper finds that the accommodative spending path that maximizes utility is also the path leading to an equilibrium. Empirical data that suggest an equilibrium would cast doubt upon the underspending hypothesis.
GENERAL.

168.Thompson, J. R. **MEETING VAST CHALLENGES IN ROADS, PORTS, AIRPORTS**. Knoxville, TN: Forum for Applied Research and Public Policy, Tennessee University, Knoxville Energy Environment Resources Center. 1990.

It has been estimated that the United States will need to spend from $50 billion to $150 billion annually to bring its transportation infrastructure into adequate condition within the next 20 years. The needs affect every region of the country and every sector of transportation infrastructure. To succeed in meeting these needs will require the combined commitment of all levels of government and the private sector.
GENERAL.

169.Thurmond, James. **ARGUMENT FOR INVESTING IN INFRASTRUCTURE**. Washington, DC: Public Management. June 1989.

GENERAL.

170. Torkelson, Richard. **PAYING THE COST FOR ENVIRONMENTAL PROTECTION.** Privatization Review; 6:10-15. March 1991.

Financing issues affecting public-purpose environmental facilities are discussed.
GENERAL.

171. Transportation Research Board, National Research Council. **DATA FOR DECISIONS: REQUIREMENTS FOR NATIONAL TRANSPORTATION POLICY MAKING.** Washington, DC: 1992.

The U.S. Department of Transportation (DOT) requested that the Transportation Research Board (TRB) undertake a 15-month study of the availability and quality of national transportation data to support DOT's continuing strategic decision-making requirements. This report is the result of that study. Chapter 1 examines the role of data in national policy making. The key elements of a data support system are identified in Chapter 2. Chapter 3 focuses on how these requirements can be met by improving existing databases and supplying missing data; opportunities for public-private collaboration in data collection are considered, and applications of new technologies for reducing the cost and burden of data collection are explored. The institutional changes needed to develop a more effective and permanent data and analytic capability to support strategic decision making within the DOT are discussed in Chapter 4, and a new organization is recommended. The steps required to put such a capability in place are outlined in Chapter 5.
GENERAL.

172. Transportation Research Board, National Research Council. **PRIMER ON TRANSPORTATION, PRODUCTIVITY, AND ECONOMIC DEVELOPMENT.** Washington, DC: 1991.

The objective of the research reported here was to develop a primer for transportation executives and decision-makers that documents what is known about the relationship between transportation and the economy and provides guidance on the use of economic analysis to identify policies and investments with the potential to foster growth and productivity.
GENERAL.

173. U. S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: URBAN TRANSPORTATION PLANNING CAN BETTER ADDRESS MODAL TRADE-OFF.** 1992.

The GAO examined issues related to funding flexibility between highway and mass transit programs.
GENERAL.

174. University of Colorado, Graduate School of Public Affairs. **HARD CHOICES: A REPORT ON THE INCREASING GAP BETWEEN AMERICA'S INFRASTRUCTURE NEEDS AND OUR ABILITY TO PAY FOR THEM.** Boulder, CO: University of Colorado. 1984.

The Graduate School of Public Affairs at the University of Colorado prepared an analysis of the infrastructure conditions of 23 states and developed an aggregate estimate of national infrastructure needs and available revenues through the end of the century.
GENERAL*

175. The Urban Institute. **GUIDES TO MANAGING URBAN CAPITAL SERIES, ESPECIALLY, GUIDE TO SELECTING MAINTENANCE STRATEGIES FOR CAPITAL FACILITIES,** Hatry, Harry P. And Steinthal, Bruce G., **AND GUIDE TO SETTING PRIORITIES FOR CAPITAL INVESTMENT,** Hatry, Harry P., Millar, Annie P., and Evans, James H., The Urban Institute Press. Washington, DC: 1984.

The first report on maintenance strategies provides a description of local government procedures for rating road and water projects, based on field work with ten local governments and three special districts. These procedures not only address the physical condition of the assets but also consider other programmatic and local government criteria. The second volume on setting priorities was based on field data from the ten communities, plus a random sample of 25 cities with a population between 125,000 and 500,000.
GENERAL.

176. Urban Land Institute. **MYTHS AND FACTS ABOUT TRANSPORTATION AND GROWTH.** Washington, DC: 1989.

Because travel plays such an important role in daily living, virtually everyone has a perception of, and a solution for, the problem. Many of these perceptions, though based little on reality, have become entrenched, emerging as popular myths that even professionals find difficult to discredit. This booklet examines some of the most popular of these myths and offers facts in their stead in the hope that public debate can then be more sharply focused on the true problems and the most effective solutions available to communities.
GENERAL.

177. U.S. Advisory Commission on Intergovernmental Relations. **FEDERAL REGULATION OF STATE AND LOCAL GOVERNMENTS: REGULATORY FEDERALISM A DECADE LATER**. Washington, DC: 1992.

This report reviews regulatory federalism during the presidency of Ronald Reagan.
GENERAL.

178. U.S. Advisory Commission on Intergovernmental Relations. **HIGH PERFORMANCE PUBLIC WORKS: A NEW FEDERAL INFRASTRUCTURE INVESTMENT STRATEGY FOR AMERICA**. Washington, DC: U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. November 1993.

This report, prepared by ACIR as part of the Federal Infrastructure Strategy program, examines six key public works improvement topics: improving the quality of infrastructure investments; applying benefit-cost analysis to investment options; improving the maintenance of infrastructure; making federal regulation of infrastructure more effective, efficient, and equitable; improving environmental decisionmaking for public works; and improving the financing of infrastructure.
GENERAL*

179. U.S. Advisory Commission On Intergovernmental Relations. **INTERGOVERNMENTAL DESIONMAKING FOR ENVIRONMENTAL PROTECTION AND PUBLIC WORKS.** Washington, DC: November 1992.

The aim of this paper is to find better ways to make intergovernmental decisions with respect to both environmental and infrastructure needs. Reasons for current difficulties in

environmental and infrastructure decisionmaking are presented. The paper suggests ways to improve the decisionmaking process, including a new role for the National Environmental Policy Act and the Council on Environmental Quality.
GENERAL*

180. U.S. Advisory Committee on Intergovernmental Relations. **SOURCEBOOK OF WORKING DOCUMENTS TO ACCOMPANY - HIGH PERFORMANCE PUBLIC WORKS: A NEW FEDERAL INFRASTRUCTURE INVESTMENT STRATEGY FOR AMERICA.** Washington, DC: U.S. Army Corps of Engineers, Institute for Water Resources. 1994.

Companion document to the ACIR/IWR report: *High Performance Public Works: A New Federal Infrastructure Strategy for America.* Compiles those documents judged to be the most useful references in planning, designing, and executing infrastructure policies conveniently available to a wide range of public works professionals and policymakers.
GENERAL

181. U.S. Advisory Committee on Intergovernmental Relations. **TOWARD A FEDERAL INFRASTRUCTURE STRATEGY: ISSUES AND OPTIONS.** Washington, DC: 1992.

Federal investment, regulations, technology, financing, and management of infrastructure are issues presented in this report.
GENERAL*

182. U.S. Army Corps of Engineers. **A FEDERAL ACTION PLAN FOR ADDRESSING NEEDS TO SUSTAIN AND IMPROVE THE NATIONS INFRASTRUCTURE**. Washington, DC: 1991.

This report presents a proposed action plan to address infrastructure problems from the federal perspective and the overall national interest.
GENERAL.

183. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **CHALLENGES AND OPPORTUNITIES FOR INNOVATION IN THE PUBLIC WORKS INFRASTRUCTURE - VOLUMES I AND II**. Alexandria, VA: June 1993.

The objective of this report, prepared by the U.S. Army Corps of Engineers Construction and Engineering Research Laboratory as part of the Federal Infrastructure Strategy Program, is to summarize the proceedings of the workshop "Public Works Infrastructure Innovation: Barriers, Opportunities, and Challenger," and provide recommendations on enhancing the transfer of innovative technology and management practices to improve the declining condition of the nation's public works infrastructure.
GENERAL*

184. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **A CONSOLIDATED PERFORMANCE REPORT ON THE NATION'S PUBLIC WORKS: AN UPDATE**. Alexandria, VA: Apogee Research, Inc. October 1994.

Presents a summary of the net capital stocks and representative performance measures within each of eight public works categories: highways, aviation, mass transit, water resources, water supply, wastewater treatment, and solid waste management. Represents an update of the performance information presented by the National Council on Public Works Improvement

in 1986. Update was provided by Apogee Research, Inc. as part of the Corps Federal Infrastructure Strategy (FIS) program.
GENERAL.

185.U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **FEDERAL PUBLIC WORKS INFRASTRUCTURE R&D: A NEW PERSPECTIVE.** Alexandria, VA: July 1993.

The objective of this report is to provide the Federal Infrastructure Strategy with a "snapshot" in time of federal resources committed to infrastructure research and development.
GENERAL.

186.U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **THE FEDERAL ROLE IN FUNDING STATE AND LOCAL INFRASTRUCTURE: TWO REPORTS ON PUBLIC WORKS FINANCING.** Alexandria, VA: Apogee Research, Inc. and The Urban Institute. August 1993

Presents the results of two inquiries into the federal role in state and local infrastructure finance as an element of the Corps Federal Infrastructure Strategy (FIS) program. Report I, entitled *Effects of Federal Tax Policy on Infrastructure Investment*, examines the volume of tax-exempt bonds issued over the period 1979-1989 in order to assess the impact that the 1986 Tax Reform Act had on the ability of state and local governments to finance public works projects. Report II by The Urban Institute, *State Programs for Community Infrastructure: Innovations in Financing Methods and Program Operations*, examines innovative public works programs in nine states.
GENERAL.

187.U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **FRAMING THE DIALOGUE: STRATEGIES, ISSUES AND OPPORTUNITIES.** Alexandria, VA: May 1993.

This report describes the progress to date of a new federal interagency initiative to develop a Federal infrastructure strategy (FIS). It documents the activities that took place in 1991 and 1992 during the first half of the FIS program, including the results of the intergovernmental coordination. Infrastructure issues essential to the development of a federal strategy are outlined, and opportunities for further interagency cooperation discussed.
GENERAL*

188.U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: AN INTERIM REPORT VOL. I-III.** Alexandria, VA: February 1994.

This study was conducted as an element of the Federal Infrastructure Strategy (FIS) Program, a collaborative interagency study effort facilitated by the U.S. Army Corps of Engineers Institute for Water Resources and designed to develop and stimulate implementation of effective national policies for managing and maintaining the nation's public works. This interim report follows up the July 1993 publication, *Infrastructure in the 21st Century Economy: A Review of the Issues and Outline of a Study of the Impacts of Federal Infrastructure Investments*. This interim report consists of three volumes. Volume 1 contains an overview of the research effort to date, comprised of three related research tracks to capture the different dimensions of infrastructure's effects on the economy. Volume 2

contains technical papers which develop and document the research approaches which form this study. Volume 3 contains the details of a database on public capital collected and developed by Apogee Research, Inc.
GENERAL*

189. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: A REVIEW OF THE ISSUES AND OUTLINE OF A STUDY OF IMPACTS OF FEDERAL INFRASTRUCTURE INVESTMENTS**. Alexandria, VA: July 1993.

The U.S. Army Corps of Engineers, through its Institute for Water Resources, has commenced an ongoing interagency study to assess the relationship of Federal infrastructure, specifically investments in water, waste management, and transportation, to the nation's productivity, economic health, and quality of life. This report describes the effort and the process by which the study's workplan was derived.
GENERAL*

190. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **ISSUES IN DEFERRED MAINTENANCE.** Alexandria, VA: The Urban Institute. November 1994.

This report, conducted as an element of the federal infrastructure strategy facilitated by the U.S. Army Corps of Engineers, presents the findings of an examination of public agency practices (federal, state, and local) in analyzing and reporting deferred maintenance on their facilities, such as roads, bridges, buildings, water, or sewer systems. The report examines existing literature on the subject. Several past and present state, federal, and local agency efforts to improve deferred maintenance reporting are detailed (including field visits to New York City and San Jose, California). Suggestions are presented for governments and agencies, as well as for future research needs.
GENERAL*

191. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **LOCAL PUBLIC FINANCE IMPACT MODEL: USER'S GUIDE AND TECHNICAL DOCUMENTATION**. Alexandria, VA: June 1994.

Documents a Federal Infrastructure Strategy (FIS) effort by Dr. Dennis Robinson on the development and use of a model to estimate the impacts that the construction and operation of a public facility would have on local public revenue and expenditures. The resulting Local Public Finance Impact (LPFI) model is a working prototype of a system for public managers to predict potential changes in local revenues and expenditures caused by infrastructure investments.
GENERAL.

192. U.S. Army Corps of Engineers, Water Resources Support Center, Institute of Water Resources. **NATIONAL OPERATION AND MAINTENANCE PROGRAM PLAN OF IMPROVEMENT**. Alexandria, VA: 1993.

The objective of the program is to examine policies, procedure and structure of the Corps' existing projects, to ensure that justified levels of service in the least cost manner are provided.
GENERAL.

193.U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **NONDESTRUCTIVE TESTING, EVALUATION, AND REHABILITATION FOR ROADWAY PAVEMENT: WARREN COUNTY, MISSISSIPPI, CINCINNATI, OHIO, AND BERKELEY, CALIFORNIA**. Alexandria, VA: U.S. Army Engineer Waterways Experiment Station. July 1994.

Documents the results of one of the technology transfer initiatives undertaken as part of the Federal Infrastructure Strategy (FIS) program: the demonstration of nondestructive pavement evaluation technology (NDT) to cooperating federal and nonfederal partners. Three demonstrations were undertaken by the U.S. Army Engineer Waterways Experiment Station, each utilizing Falling Weight Deflectometer (FWD) technology, a commercially available nondestructive procedure for determining the structural adequacy of a pavement system. GENERAL.

194. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **PUBLIC WORKS MANAGEMENT PRACTICES -- VOLUME I: A PUBLIC WORKS PERSPECTIVE OF THE ROADBLOCKS AND OPPORTUNITIES TO IMPROVE PERFORMANCE, VOLUME II: LOCAL GOVERNMENT PUBLIC WORKS AGENCIES: THE EFFECTS OF FEDERAL MANDATES ON THEIR ACTIVITIES AND IMPROVING THEIR PERFORMANCE**. Alexandria, VA: American Public Works Association (APWA); National Academy for Public Administration (NAPA). August 1994.

This report examines constraints and obstacles that limit the effectiveness of public works activities. APWA and NAPA conducted twelve site visits to state, county, city, and town governments as part of the federal infrastructure strategy program facilitated by the U.S. Army Corps of Engineers. The first objective of these visits was to evaluate the progress of public works departments in adopting improved management practices. The second objective was to obtain from public works professionals: perceived impediments that hinder public works agencies from complying with the APWA management practices, and possible strategies which would improve the performance and operating efficiencies of public works agencies. The public works functions covered include: municipal engineering, design, construction, buildings, grounds, equipment, potable water, solid waste collection, solid waste processing and disposal, streets, snow and ice control, storm water and wastewater. GENERAL*

195.U.S. Congress, Joint Economic Committee. **PUBLIC INVESTMENT IN HUMAN AND PHYSICAL INFRASTRUCTURE: HEARING, JULY 19, 1989.** 101st Cong., 1st sess. S Hearing 101-434; iii+200p. 1990.

Includes recommendations for public welfare and education. GENERAL.

196.U.S. Congress, Joint Economic Committee, Subcommittee On Technology and National Security (Congressional Research Service). **DEMOGRAPHIC CHANGE AND THE ECONOMY OF THE NINETIES: REPORT.** 102d Cong., 1st sess.; xii+167p. 1991.

Implications of population changes, 1970-2010, for selected economic sectors. Effect on the labor force, manufacturing, homebuilding and housing markets, nonresidential construction, transportation infrastructure, and water supply and wastewater treatment. GENERAL.

197.U.S. Congress, Subcommittee on Transportation Appropriations. **ECONOMIC STIMULUS PROPOSALS AND INFRASTRUCTURE INVESTMENT, SPECIAL HEARINGS.** Washington, DC: 1993.

Hearings before the Subcommittee on Transportation Appropriations to examine the economic benefits of increased federal spending on transportation infrastructure and related issues. Includes brief consideration of Administration economic stimulus proposal, focusing on provisions providing for increased funding of transportation infrastructure projects.
GENERAL.

198.U.S. Congressional Budget Office. **AN ANALYSIS OF THE REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE.** Washington, DC: 1994.

This Congressional Budget Office report analyzes the report of the Commission to Promote Investment in America's Infrastructure. This report reviews how the commission's recommendations could affect the allocation of society's resources and examined alternative ways to organize the National Infrastructure Corporation (NIC) and the Infrastructure Insurance Company.
GENERAL*

199.U.S. Congressional Budget Office. **THE FEDERAL BUDGET FOR PUBLIC WORKS INFRASTRUCTURE.** Washington, DC: July 1985.

Current federal policies for infrastructure spending are surveyed. Options for change are examined, including proposals contained in the FY86 budget. Emphasis is on seven components of public works infrastructure: highways, aviation, mass transit, wastewater treatment, water resources such as ports and waterways, water supply, and railroads.
GENERAL*

200.U.S. Congressional Budget Office. **HOW FEDERAL SPENDING FOR INFRASTRUCTURE AND OTHER PUBLIC INVESTMENTS AFFECTS THE ECONOMY.** Washington, DC: July 1991.

This report examines the effect on the economy of three broad classes of federal investment spending: physical infrastructure, including programs for transportation and environmental facilities; human capital, including programs that increase the skills and productive knowledge that people bring to their jobs, and intangible capital, such as research and development (R&D). Within each of these categories, the study examines trends in spending, discusses the rationales for that spending, and reviews evidence on the contribution of public investment to economic performance.
GENERAL*

201.U.S. Congressional Budget Office. **NEW DIRECTIONS FOR THE NATION'S PUBLIC WORKS.** Washington, DC: 1988.

Assesses the federal programs for highways, mass transit, aviation, waterways, and waste-water treatment. Includes discussion of policies to improve the effectiveness of these programs.
GENERAL*

202. U.S. Congressional Budget Office. **PAYING FOR HIGHWAYS, AIRWAYS, AND WATERWAYS: HOW CAN USERS BE CHARGED?** Washington, DC: 1992.

The combination of budgetary pressures at all levels of government and increasing demands on transportation facilities has generated increased interest in directly charging users of highways, airways, and waterways. In response to a request from the Senate Committee on the Budget, this study examines the advantages and disadvantages of alternative user fee structures, including existing taxes.
GENERAL.

203. U.S. Congressional Budget Office. **PUBLIC WORKS INFRASTRUCTURE: POLICY CONSIDERATIONS FOR THE 1980S**. Washington DC: 1983.

This study assesses the needs of seven infrastructure systems and the costs of meeting those needs.
GENERAL*

204. U.S. Congressional Budget Office (CBO). **UPDATING TRENDS IN PUBLIC INFRASTRUCTURE SPENDING AND ANALYZING THE PRESIDENT'S PROPOSALS FOR INFRASTRUCTURE SPENDING FROM 1994 TO 1998**. Washington, DC: August 1993.

This paper highlights trends in spending for infrastructure by all levels of government from 1956 to the 1990s. It also analyzes the President's proposals for federal infrastructure spending for 1994 through 1998 and compares them with the Congressional Budget Office's (CBO's) baseline projections. The CBO presents figures on total state and local government spending (both total spending and total spending net of federal grants and loans) and total public spending (total federal spending plus state and local spending net of federal grants and loans) through 1990. Additionally, historical analysis of federal spending on infrastructure is presented for 1991 and 1992.
GENERAL.

205. U.S. Congressional Office of Technology Assessment. **DELIVERING THE GOODS: PUBLIC WORKS TECHNOLOGIES, MANAGEMENT, AND FINANCING**. Washington, DC: 1991.

Recommendations for financing, improving, and maintaining the nation's critical infrastructure, such as bridges, interstate highways, sewage pipes, and water systems.
GENERAL*

206. U.S. Congressional Office of Technology Assessment. **REBUILDING THE FOUNDATIONS: A SPECIAL REPORT ON STATE AND LOCAL PUBLIC WORKS FINANCING AND MANAGEMENT**. Washington, DC: March 1990.

To assess the progress of state and local governments in coping with infrastructure problems and to outline the framework for congressional decision-making, the Office of Technology Assessment (OTA) has prepared this special report documenting recent trends in public works financing and management. The report presents snapshots of current approaches and identifies successful programs and issues that have yet to be resolved.
GENERAL*

207.U.S. Department of Agriculture, Farmers Home Administration. **FINANCING SMALL COMMUNITY INFRASTRUCTURE--THE FARMERS HOME ADMINISTRATION COMMUNITY DISCOUNT PURCHASE PROGRAM**. 1989.

This report begins by providing background on the Farmers Home Administration community program discount purchase program and describes the general provisions and eligibility for participation. A discussion of the advantages and disadvantages of participating in this program is provided.
GENERAL.

208.U.S. Department of Commerce, Office of Economic Affairs. **EFFECTS OF STRUCTURAL CHANGE IN THE U.S. ECONOMY ON THE USE OF PUBLIC WORKS SERVICES**. Washington, DC: National Council on Public Works Improvement. 1987; Project No. PW 7-625.

Part I examines how structural change caused by international trade and technological developments, will affect the nation's requirements for public works services and how the requirements will differ among different regions. Part II provides the National Council on Public Works Improvement with a methodology and a new database to assist it with planning public works improvements that anticipated economic development.
GENERAL.

209.U.S. Department of Transportation. **FINANCING THE FUTURE: REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE, PUBLIC WORKS FINANCING BY PENSION PLANS, AND OTHER FUNDING ISSUES, FINDINGS AND RECOMMENDATIONS**. Washington, DC: 1993.

Report examines public works financing methods, including a proposal to issue infrastructure securities attractive to pension fund and other institutional investors. Report is the final publication of the Commission To Promote Investment in America's Infrastructure, established under the Intermodal Surface Transportation Efficiency Act of 1991.
GENERAL*

210.U.S. Department of Transportation. **MOVING AHEAD: 1991 SURFACE TRANSPORTATION LEGISLATION**. Washington, DC: U.S. Government Printing Office. 1991.

This OTA report was requested by Congress to help identify changes and set new priorities for federal surface transportation assistance programs. Moving Ahead provides four illustrative, generic models with program components that can be mixed and matched. Other items discussed in this report include safety, research, and development agendas, and other motor carrier issues, with special attention to heavy trucks with multiple trailers.
GENERAL*

211.U.S. Department of Transportation. **MOVING AMERICA: NEW DIRECTIONS, NEW OPPORTUNITIES. VOLUME 1: BUILDING THE NATIONAL TRANSPORTATION POLICY**. Washington, DC: 1989.

"This report assesses the conditions and trends in the markets served by transportation, identifies the external factors that affect transportation, and sets out key issues for discussion

and negotiation," stated Samuel K. Skinner, Secretary of Transportation. The report also highlights the nation's growth trends and current investment priorities in transportation.
GENERAL*

212.U.S. Department of Transportation. **NATIONAL TRANSPORTATION STRATEGIC PLANNING STUDY**. Washington, DC: 1990.

This is a companion volume to Moving America: New Directions, New Opportunities. Volume 1: Building the National Transportation Policy. Provided is an overview of the Nation's transportation system which identifies future investments required to maintain and develop its infrastructure. It is organized around a framework in which transportation is viewed as an integral part of our socioeconomic system.
GENERAL.

213.U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: TRANSPORTATION AND AIR QUALITY**. Washington, DC: August 1992; Number 5(FHWA-PL-92-029).

This report summarizes a Federal Highway Administration (FHWA) seminar on key issues in air quality and transportation in 1991 - supplemented by findings that emerged during the year after the seminar. The report discusses developments in methods for reducing mobile source emissions, including technological innovations, land use measures, congestion pricing and transportation user fees, and other "Transportation Control Measures."
GENERAL.

214.U.S. Department of Transportation, Office of the Secretary of Transportation. **FEDERAL TRANSPORTATION FINANCIAL STATISTICS FISCAL YEARS 1983-1993**. Washington, DC: (DOT-P-36-94-1).

This report presents time series on federal government transportation-related outlays and collections for fiscal years 1983 through 1993. The figures are "aggregative" in the sense that they are nationwide; i.e., there are no state or lower level geographical breakdowns. However, the data are detailed down to the program level.
GENERAL.

215.U.S. Environmental Protection Agency. **PAYING FOR PROGRESS: PERSPECTIVES ON FINANCING ENVIRONMENTAL PROTECTION**.

Paying for environmental programs presents one of the major challenges for the 1990s. This report covers: the changing roles of the federal, state, and local government; creative approaches to environmental funding; and overcoming barriers and introducing incentives.
GENERAL*

216.U.S. Environmental Protection Agency, Office of Administration and Resource Management. **PUBLIC PRIVATE PARTNERSHIPS FOR ENVIRONMENTAL FACILITIES: A SELF-HELP GUIDE FOR LOCAL GOVERNMENTS**. Washington, DC: May 1990.

This self-help guide for local governments was written by the U.S. Environmental Protection Agency to introduce local officials to the concept of public-private partnerships for environmental facilities, their benefits, and the steps that a community must take to enter into partnerships with the private sector. The report includes the following sections: public-private

partnerships: what and why; building a public-private partnership: an action checklist; and financing, procurement, and the service agreement.
GENERAL*

217.U.S. Environmental Protection Agency, Office of Administration and Resources Management. **A PRELIMINARY ANALYSIS OF THE PUBLIC COSTS OF ENVIRONMENTAL PROTECTION: 1981-2000**. Washington, DC: 1990.

This report provides an overview of environmental expenditures from 1981 to 2000, both to maintain current levels of environmental quality and to meet standards associated with new regulations.
GENERAL.

218.U.S. Environmental Protection Agency, Office of Administration and Resources Management. **ALTERNATIVE FINANCING MECHANISMS FOR ENVIRONMENTAL PROGRAMS: STATE CAPACITY TASK FORCE: THE ALTERNATIVE FINANCING MECHANISMS TEAM REPORT**. Washington, DC.

The report outlines the financing challenges of funding environmental programs and provides a range of alternative financing mechanisms at both the state and local level.
GENERAL.

219.U.S. Environmental Protection Agency, Office of Administration and Resources Management. **PUBLIC PRIVATE PARTNERSHIP CASE STUDIES: PROFILES OF SUCCESS IN PROVIDING ENVIRONMENTAL SERVICES.** Washington, DC 20460. vi+118p. 1989.

Components of successful partnerships in the areas of solid waste management, wastewater treatment, and drinking water are provided based upon the experience of 23 U.S. communities.
GENERAL.

220.U.S. Environmental Protection Agency, Office of Administration and Resources Management. **PUBLIC-PRIVATE PARTNERSHIPS (P3) STRATEGY**. Washington, DC: 1989.

The purpose of this document is to give an overview of EPA's Public-Private Partnerships initiative. It identifies the objectives, activities, products, and time frames to implement this initiative.
GENERAL.

221.U.S. General Accounting Office. **ENVIRONMENTAL INFRASTRUCTURE: EFFECTS OF LIMITS ON CERTAIN TAX-EXEMPT BONDS**. Washington, DC: 1993(GAO/RCED-94-2).

One important incentive for private investment in environmental infrastructure is the issuance of tax-exempt bonds by state and local governments for private projects that help meet public needs. In 1986 the U.S. Congress placed a $50 per capita or $150 million cap on the volume of these bonds that could be issued. This GAO report addresses the question of whether these limits on tax-exempt bonds have reduced investment in environmental infrastructure. The report finds that the cap has not reduced the volume of bond issues for environmental infrastructure; this volume has remained constant. However, the cost of complying with federal mandates has risen, and the cap might be discouraging investment from meeting these

additional needs. Data is included on environmental capital investment of states that are limited by the bond cap verses states that are not limited by the bond cap.
GENERAL.

222.U.S. General Accounting Office. **INVESTING IN INFRASTRUCTURE**. G.A.O. Journal. p 4-21. March 1991.

These articles discuss the role of infrastructure in the U.S. economy and building and maintaining transportation and telecommunications systems.
GENERAL.

223.U.S. General Accounting Office. **INVESTMENT**. Washington, DC: 1992(GAO/OCG-93-2TR).

This report is part of the Transition Series by the General Accounting Office. It emphasizes the importance of investment for economic growth and how the government can increase investment in the nation.
GENERAL.

224.U.S. General Accounting Office. **TRANSPORTATION ISSUES**. Washington, DC: 1992.

This transition series report discusses major policy, management, and program issues facing the Congress and the new administration in the area of transportation.
GENERAL*

225.U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: DEPARTMENT OF TRANSPORTATION HIGHWAY AND MASS TRANSIT PROGRAM REAUTHORIZATION PROPOSALS. STATEMENT BY KENNETH M. MEAD BEFORE THE SUBCOMMITTEE ON SURFACE TRANSPORTATION, COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, HOUSE OF REPRESENTATIVES**. Washington, DC: 1991.

This is the testimony of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office, on the proposed Surface Transportation Assistance Act of 1991. The 5-year, $105 billion package would reauthorize highway and highway safety programs at $89.1 billion and mass transit programs at $16.3 billion. It focuses on those aspects of the Administration's reauthorization proposal that concern future federal spending, consolidation of highway programs, increased funding flexibility between mass transit and highways, and the outlook for highway safety.
GENERAL.

226.U.S. House of Representatives. **THE NEED FOR A NATIONAL POLICY TO REBUILD THE INFRASTRUCTURE OF THE U.S.** Washington, DC: September 26, 1990.

Recommends passage, with an amendment in the nature of a substitute, of H. Con. Res. 362, to express the sense of Congress that a national policy should be established for rebuilding the U.S. infrastructure, including assistance to States and localities to meet basic infrastructure needs. Also proposes to use funds from the Highway Trust Fund and the Airport and Airway Trust Fund to meet transportation infrastructure needs.
GENERAL.

227.U.S. House of Representatives, Committee on Banking, Finance, and Urban Affairs, Subcommittee on Policy Research. **INFRASTRUCTURE NEEDS ASSESSMENTS AND FINANCING ALTERNATIVES: HEARING, MAY 8, 1990.** 101st Cong., 2d sess., iii+373p. Washington, DC: 1990.

State and local problems in the areas of environmental public works, including water supply, sewers, and garbage, and in transportation, including highways, transit, and intercity rail.
GENERAL.

228.U.S. House of Representatives, Committee on Government Operations, Legislation and National Security Subcommittee. **INVESTING IN AMERICA: PROPOSED CHANGES IN THE FEDERAL BUDGET PROCESS: HEARING, JULY 23, 1992.** Washington, DC: 102nd Cong., 2d sess., iii+84p. 1993.

Presents the case for more federal investment in infrastructure: roads, bridges, airports, and water systems.
GENERAL.

229.U.S. House of Representatives, Committee on Public Works and Transportation. **TO EXAMINE THE FUTURE OF OUR NATION'S INFRASTRUCTURE NEEDS. HEARINGS BEFORE THE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, HOUSE OF REPRESENTATIVES, 1O1ST CONGRESS, 2ND SESSION**. Washington, DC: 1991.

The subject of these hearings is the future of the Nation's infrastructure needs. From 1960 to 1985, total public spending on infrastructure dropped from 3.6 percent of the GNP to 2.6 percent. These hearings examine this decline in investment and its impact on the nation's infrastructure systems and the economy. Included are testimony, prepared statements submitted by members of Congress, prepared statements of witnesses, submissions for the record, and additions to the record.
GENERAL.

230.U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Economic Development. **TO DISCUSS THE FINAL REPORT OF THE NATIONAL COUNCIL ON PUBLIC WORKS IMPROVEMENT: HEARING, MAY 18, 1988.** 100th Cong., 2d sess., iii+448. Washington, DC: 1988.

Fragile Foundations: A Report on America's Public Works. Includes the text of the Feb. 1988 report, as well as the Council's Sept. 1986 and May 1987 reports.
GENERAL.

231.U.S. House of Representatives, Committee on Science, Space, and Technology. **TECHNOLOGY POLICY: SURFACE TRANSPORTATION INFRASTRUCTURE R&D. HEARINGS BEFORE THE SUBCOMMITTEE ON TECHNOLOGY, ENVIRONMENT AND AVIATION, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, 103RD CONGRESS, 1ST SESSION, MAY 25 AND AUGU.S.T 3, 1993**. Washington, DC: 1993.

These are hearings on technology policy dealing with surface transportation improvements. The progress which has been made to date in the development of technologies related to intelligent vehicle highway systems, human factor engineering, high speed rail systems, and

maglev is examined. Also discussed are scrap tire utilization technologies. Included are the testimony and prepared statements of witnesses and additional material submitted for the record.
GENERAL.

232.U.S. House of Representatives, Subcommittee on Water Resources, Transportation, and Infrastructure. **INFRASTRUCTURE, PRODUCTIVITY, AND ECONOMIC GROWTH**. Washington, DC: 1991.

Hearing before the Subcommittee on Water Resources, Transportation, and Infrastructure to review national transportation policy issues involved in federal aid highway programs in light of upcoming reauthorization of the Surface Transportation and Uniform Relocation Assistance Act of 1987.
GENERAL.

233.U.S. House of Representatives, Subcommittee on Water Resources, Transportation and Infrastructure. **TRANSPORTATION INFRASTRUCTURE**. Washington, DC: 1991.

Hearing to examine issues involved in future Federal policies regarding transportation infrastructure, in light of the pending reauthorization of highway and mass transit programs.
GENERAL.

234.U.S. Senate, Committee on Environment and Public Works. **INFRASTRUCTURE, PRODUCTIVITY, AND ECONOMIC GROWTH. HEARING BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE, 102ND CONGRESS, 1ST SESSION, FEBRUARY 5, 1991**. Washington, DC: 1991.

This hearing focuses on the relationship between infrastructure investment and economic growth, and is the first of a series of hearings to be held on the reauthorization of the Surface Transportation Act of 1987. Included are the opening statements of U.S. Senators from the states of North Dakota, New Jersey, Connecticut, New York, Nevada, New Hampshire, and Virginia, testimony and prepared statements of witnesses, and additional material submitted for the record.
GENERAL.

235.U.S. Senate, Committee on Environment and Public Works. **SMALL COMMUNITIES ENVIRONMENTAL ASSISTANCE: HEARING**. 101st Cong., 2d sess., iii+220p. Washington, DC: 1990.

Proposed legislation to correct certain provisions of the Clean Water Act which put small communities at an economic disadvantage by assisting small communities in financing environmental facilities.
GENERAL.

236. U.S. Senate, Committee on Governmental Affairs, Subcommittee on General Services, Federalism, and The District Of Columbia. **INFRASTRUCTURE PROBLEMS AND INTERGOVERNMENTAL SOLUTIONS: HEARING, MAY 4, 1989.** Washington, DC: 101st Cong., 1st sess. S. hearing 101-116; iv+300p. 1989.

Possible federal, state, and local initiatives to develop solutions for infrastructure problems. GENERAL.

237. Van Daniker, Relmond P. Kwiatkowski, Vernon. **INFRASTRUCTURE ASSETS: AN ASSESSMENT OF USER NEEDS AND RECOMMENDATIONS FOR FINANCIAL REPORTING.** Stamford CT: Government Accounting Standards Board. 1986.

This GASB-sponsored research report presents the findings from a 1985 mail survey of a sample of (1) academics, (2) investors, (3) public managers, (4) legislators, and (5) citizens about the need for financial reporting on infrastructure assets.
GENERAL.

238. Wheeler, Porter. **THE ALLOCATION OF GOVERNMENTAL RESPONSIBILITIES IN CONSTRUCTING, MAINTAINING, AND FINANCING PUBLIC WORKS.** Washington, DC: National Council on Public Works Improvement. October 1986.

This report examines the role of the federal government and initiatives toward decentralization in the context of infrastructure investment and repair. Situations in which state and local authority verses federal control could or could not be preferable are discussed.
GENERAL*

239. Wieman, C. **ROAD WORK AHEAD: HOW TO SOLVE THE INFRASTRUCTURE CRISIS.** Technology Review. Cambridge, MA: Massachusetts Institute of Technology, Association of Alumni and Alumnae of MIT. 1993.

The report states that we owe today's infrastructure crisis to yesterday's shortsightedness. The vision that produced our cities' subways, highways, bridges, and thousands of miles of water mains earlier in the century failed to provide for the care and replenishment of the infrastructure once it was built. The author provides the good news: the infrastructure crisis is solvable. Promoting system efficiency will have to be the watchword for solving the infrastructure crisis on all levels - funding, organization, planning and implementation, and as its name implies, the new $155 billion federal Intermodal Surface Transportation Efficiency Act has adopted this approach as a chief policy goal.
GENERAL*

240. Williams, K. M. **STATES' ROLE IN REBUILDING AMERICA.** Transportation Executive Update. 1990.

This article discusses the states' plans to participate in a rebuilding of our nation's infrastructure. Through the National Governor's Association, the states have developed a strategy to meet this challenge. It requires cooperation among federal, state, and local governments with a clear definition of roles and with greater state responsibility.
GENERAL.

241. Williams, Kristine M. **STRATEGIES FOR MANAGING CAPITAL IMPROVEMENTS.** Planning and Zoning News; 10:5-9. February 1992.

Report uses the level of service approach derived from the 1991 report, Infrastructure Management Options to Deal with the Impacts of Growth. The experiences of Florida and Michigan are presented as case studies.
GENERAL.

242. Wilson, Robert H. **STATES AND THE ECONOMY: POLICYMAKING AND DECENTRALIZATION**. xi+290p. 1993.

Argues that economic and political decentralization forces state governments to adjust and reform functions and programs, especially economic development functions. Partial contents: Structural economic change and the states; Development and technology policy; The state as regulator of infrastructure: telecommunications policy; The state as social infrastructure provider: education and training.
GENERAL.

243. Winston, C. **EFFICIENT TRANSPORTATION INFRASTRUCTURE POLICY**. Journal of Economic Perspectives. 1991.

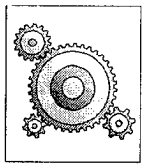
This paper offers a different perspective on paying for, and investing in, the transportation infrastructure. Making efficient use of current transportation capacity will reduce the need for massive public investment in airports and roads and will prevent the recurrence of infrastructure problems.
GENERAL.

244. Working Group on Infrastructure. **AN INFRASTRUCTURE PROPOSAL FOR JOBS, THE ENVIRONMENT, AND PERFORMANCE**. Washington, DC: 1993.

GENERAL.

245. Zimmerman, Dennis. **THE PRIVATE USE OF TAX EXEMPT BONDS: CONTROLLING PUBLIC SUBSIDY OF PRIVATE ACTIVITY**. xxiv+364p. 1991.

Examines U.S. tax legislation, and economic and fiscal policy aspects; emphasis on federal, state, and local government relations. Other issues include tax immunity and equity, economic incentives, administration and enforcement, infrastructure, municipal socialism, and the volume cap.
GENERAL.



2. HIGHWAYS

1. Advisory Committee on Highway Policy 2020 Transportation Program. **"BEYOND GRIDLOCK": THE FUTURE OF MOBILITY AS THE PUBLIC SEES IT**. Washington, DC: 1988.

   This report summarizes the findings from an unprecedented series of 65 public forums held all across the United States between August 1987 and May 1988. The public forums were an element of the initial fact-finding state of Transportation 2020.
   HIGHWAYS.

2. American Association of State Highway and Transportation Officials. **A NEW FOCUS FOR AMERICA'S HIGHWAYS: RECOMMENDATIONS ON THE FEDERAL-AID HIGHWAY PROGRAM**. Washington, DC: 1985.

   This document updates the comprehensive highway policy statement, "A Program for American Highways in the 1980s".
   HIGHWAYS.

3. American Association of State Highway and Transportation Officials. **A REPORT ON THE HIGHWAY PROGRAM CAPACITY OF STATE HIGHWAY AND TRANSPORTATION DEPARTMENTS**. Washington, DC: 1992.

   The primary purposes of the survey were to develop information on: the expectations of the states on their use of the $18 billion federal-aid highway funding for FY 1993; the capability of the states to utilize highway funding at the full funding levels under the Intermodal Surface Transportation Efficiency Act for FY 1994; and the capability of the states to use additional highway funding in FY 1993, 1994, 1995, and 1996 if it should become available.
   HIGHWAYS.

4. American Association of State Highway and Transportation Officials. **A REPORT ON READY-TO-GO PROJECTS OF THE STATE HIGHWAY AND TRANSPORTATION DEPARTMENTS**. Washington, DC: 1993.

   The survey was undertaken to identify projects that are in a ready-to-go status within the state departments of highways and transportation, which could be put to contract within 30-90 days to create jobs in 1993 as part of a possible federal counter-cyclical program.
   HIGHWAYS.

5. American Association of State Highway and Transportation Officials. **HIGHWAY NEEDS, STRUCTURAL ISSUES AND HIGHWAY OPERATIONS: APPENDIX 1 TO THE BOTTOM LINE**. Washington, DC: 1988.

   The purpose of this report is to describe the process used in producing the needs assessment survey of state transportation agencies and to interpret the results.
   HIGHWAYS.

6. American Association of State Highway and Transportation Officials. **KEEPING AMERICA MOVING: THE BOTTOM LINE : EXECUTIVE SUMMARY : A SUMMARY OF SURFACE TRANSPORTATION INVESTMENT REQUIREMENTS**. Washington, DC: 1988.

This report is part of Transportation 2020, an unprecedented effort initiated by American Association of State Highway and Transportation Officials (AASHTO) to develop a national consensus on a future national surface transportation program. This report examines several alternatives for the surface transportation system of the future, the implication for users, and funding options each would require. Included in this report are AASHTO best estimates of combined Federal, State, and local government investment requirements for highways and public transportation.
HIGHWAYS*

7. American Association of State Highway and Transportation Officials. **UNDERSTANDING THE HIGHWAY FINANCE EVOLUTION/REVOLUTION**. Washington, DC: 1987.

   This document reviews the discussions of the National Conference on State Highway Finance meeting entitled "Understanding the Highway Finance Evolution/Revolution." Papers were presented addressing five major funding techniques: user fees, nonuser fees, special benefit fees, private financing, and debt financing.
   HIGHWAYS.

8. American Association of State Highway and Transportation Officials, Standing Committee on Highway Traffic Safety. **HIGHWAY SAFETY STRATEGIC PLAN 1991-2000**. Washington, DC:

   This report gives an overview of highway safety problems and presents a long-term strategy and plan that will guide the Standing Committee on Highway Traffic Safety in the 1990s.
   HIGHWAYS.

9. American Road and Transportation Builders Association. **ENHANCING U.S. COMPETITIVENESS THROUGH HIGHWAY INVESTMENT**. Transportation Builder, Washington, DC: 1990.

   It is noted that in this decade, the U.S. ability to compete in world markets will be strongly put to the test. Countries that sustain a high level of public investment relative to output experience higher productivity growth than other countries. The U.S. has a low public investment ratio of 0.3% and an inferior productivity growth of 0.6% per year. A simulation of the likely economic effects of a significant increase in federal highway spending proposed by the American Road and Transportation Builders Association is reported.
   HIGHWAYS.

10. American Road and Transportation Builders Association. **THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991**. Washington, DC: 1991.

    This report reviews the effects of the Intermodal Surface Transportation Efficiency Act of 1991. This law is described as the most sweeping revision of federal surface transportation programs in 35 years.
    HIGHWAYS/MASS TRANSIT.

11. American Road and Transportation Builders Association; Mudge, R.; Aschauer, DA. **ENHANCING U.S. COMPETITIVENESS THROUGH HIGHWAY INVESTMENT: A STRATEGY FOR ECONOMIC GROWTH**. Bethesda, MD: Apogee Research, Inc. 1990.

Recent research provides persuasive evidence that the slowdown in public works investment in the United States over the past quarter century may well be the most significant single force behind the relative decline in U.S. productivity. This paper utilizes Dr. Aschauer's work to quantify the potential economic effects of implementing the $25 billion per year increase in federal highway and bridge investment that has been proposed by the American Road and Transportation Builders Association (ARTBA). The discussion explains how, and why, transportation infrastructure plays a key role in encouraging greater private sector productivity.
HIGHWAYS*

12. American Trucking Association. **ROAD WORK**. Transportation Executive Update. 1. 1990.

This article discusses the ideas proposed in a study produced by the Brookings Institution entitled Road Work: A New Highway Pricing & Investment Policy, by Kenneth A. Small, Clifford Winston, and Carol A. Evans. The authors propose a pricing and investment policy that would enable roads to be nearly completely supported by user fees. To cover truck damage to roads, the authors suggest pavement-wear taxes based on axle weight.
HIGHWAYS.

13. Apogee Research, Inc. **THE FULL COSTS OF TRANSPORTATION: A REVIEW OF THE LITERATURE**. Cambridge, MA: Conservation Law Foundation. 1993.

This literature review, prepared by Apogee Research, Inc. concentrates on literature discussing the total costs of public transit transportation. Apogee's review of studies on transportation costs found that the literature can be grouped into four major categories: User Cost Studies, Cost Allocation Studies, Externality Studies, and Total Cost Studies.
HIGHWAYS*

14. Apogee Research, Inc. **HIGHWAY INVESTMENT & U.S. COMPETITIVENESS: HOW THE U.S. COMPARES TO JAPAN, GERMANY, AND KOREA**. Bethesda, MD: American Road & Transportation Builders Association. 1991.

Recent empirical research suggests there is a strong link between national investment in public capital stock such as highways and bridges and national productivity performance. This study compares U.S. highway investment and competitiveness with several of our major economic competitors.
HIGHWAYS.

15. Apogee Research, Inc. **THE JOBS IMPACT OF AN EXPANDED FEDERAL HIGHWAY PROGRAM**. Washington, DC: American Road and Transportation Builders Association. 1991.

This analysis, prepared by Apogee Research, Inc., estimates the number of new jobs that would be created by the American Road & Transportation Builders Association proposal to increase annual federal highway investment by $25 billion.
HIGHWAYS.

16. Ball, James T. **TRANSPORTATION: NEW SYSTEMS FOR THE NEW CENTURY**. Civil Engineering-ASCE. v60, n10, p54(3). October 1990.

An integrated transportation system will be needed in the 21st century to alleviate traffic congestion and improve transportation safety. To this end, a solution is proposed based on three steps: a North American high-speed rail system consisting of both steel rail and magnetic levitation; new regional airports linked with this new rail system; and a highway safety program designed to separate large-truck traffic from smaller vehicles.
HIGHWAYS/MASS TRANSIT.

17. Bernardeau, Christine; Mudge, Richard. **CURRENT LITERATURE ON HIGHWAY INVESTMENT AND ECONOMIC DEVELOPMENT**. Washington, DC: Transportation Research Board, National Research Council. 1989.

This report surveys current literature on the relationship between highway investment and economic productivity. The report includes an analysis of the economic models currently used to discuss the relationship between economic productivity and highway investment, recommendations for future economic methodologies, a bibliography, a synopsis of selected papers, and a summary of selected papers.
HIGHWAYS.

18. Blinder, AS. **ECONOMIC VIEWPOINT: ARE CRUMBLING HIGHWAYS GIVING PRODUCTIVITY A FLAT?** Business Week. 3067. 1988.

This article notes America's slipping productivity growth rate, and notes a hypothesis offered by a recent study which relates it to America's failure to maintain infrastructure. The study suggests that America's failure to maintain an adequate growth in such aspects as highways, mass transit, airports, and sewers may underlie the much-lamented but poorly understood productivity slowdown.
HIGHWAYS.

19. Cantor, David J. **HIGHWAY CONSTRUCTION: ITS IMPACT ON THE ECONOMY**. Washington, DC: Congressional Research Service. 1993.

HIGHWAYS.

20. Civil Engineering Research Foundation. **SUMMARY REPORT ON THE CREATION OF A HIGHWAY INNOVATIVE TECHNOLOGY EVALUATION CENTER(HITEC)**. Washington, DC: 1992.

This paper is a summary of the Workshop on Implementing Innovative Highway Technology. The primary goal of the workshop was to enable participants, on the basis of their collective experience and expertise, to provide guidance and recommendations regarding critical operational, marketing, and financial/ legal parameters for an independent innovative highway technology evaluation center.
HIGHWAYS.

21. Downs, Anthony. **STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION**. Washington, DC: Brookings Books. 1992.

This book analyzes the likely effects of adopting each of the anticongestion remedies that has been seriously proposed. They include raising gasoline taxes, building more high-occupancy-vehicle lanes, better coordinating traffic lights on city arterials, and constructing new residential and commercial subdivisions at higher average population

densities. Before discussing how each remedy would affect congestion, the author presents several principles about how congestion actually occurs. In the final chapter, the author summarizes his findings about congestion's causes and possible means of ameliorating it.
HIGHWAYS.

22. Enis, Charles R.; Morash, Edward A. **INFRASTRUCTURE TAXES, INVESTMENT POLICY, AND INTERMODAL COMPETITION FOR THE TRANSPORTATION INDUSTRIES**. Journal of Economics and Business. February 1993.

    The study provides a market-based methodology to empirically determine the net economic effects of a major highway user tax-infrastructure improvement package on the competitive balance between the trucking and rail industries and on the competitiveness of different types of motor carriers. Based on the findings, the economic implications for management and future public policy actions are presented.
    HIGHWAYS.

23. Evans, Carol A.; Small, Kenneth A.; Winston, Clifford. **ROAD WORK: A NEW HIGHWAY PRICING AND INVESTMENT POLICY**. xii+128p. 1989.

    This essay proposes a new highway policy to meet the goals of efficiency, equity, and financial soundness. The proposed policy is based on efficient pricing to regulate demand for highway services and efficient investment to minimize the total cost of providing them. Topics covered include: U.S. interstate highway system, pavement wear and road durability, economic effects of investment in durability, heavy vehicle user charges, congestion and highway capacity.
    HIGHWAYS.

24. Hornbeck, J. F. **HIGHWAY PRIVATIZATION AND ISTEA: ECONOMIC POLICY AND FINANCING ISSUES**. Washington, DC: Congressional Research Service. 1992.

    This CRS report analyzes issues involved with highway privatization. It begins with a history of toll roads and turnpikes. The report then discusses benefits and drawbacks of private sector highway financing and maintenance. The report also includes an analysis of economic models for privatization.
    HIGHWAYS.

25. Hulten, Charles R. **GETTING ON THE RIGHT ROAD: HIGHWAY POLICY IN THE 1990s**. American Enterprise; 2(3),pages 39-43. Washington, DC: American Enterprise Institute. May 1991.

    This article reviews the supply-side arguments linking transportation and productivity that are often used to support increased highway and public infrastructure spending. It theorizes that indirect impacts of transportation can be exaggerated by the methods used in the macroeconomic analysis of production. Because statistical estimates of production at the macro level are notoriously unstable, relatively small changes in estimation methods can produce vastly different results. The author's research shows that the same data set can produce estimates of public capital elasticity that vary enormously (from 3 percent to 21 percent) depending on which of two standard statistical techniques is used. The article suggests that the current approach to highway spending must be modified; incentives must be built into the new highway program to encourage more maintenance and repair, stimulate

more private involvement in new highway construction, spur the adoption of advanced transportation technologies, and allow the use of tolls on congested roads and bridges.
HIGHWAYS.

26. Keeler, Theodore E.; Ying, John S. **MEASURING THE BENEFITS OF A LARGE PUBLIC INVESTMENT: THE CASE OF THE U.S. FEDERAL AID HIGHWAY SYSTEM**. Journal of Public Economics; 36(1), pages 69-85. June 1988.

This paper analyzes an important component of the benefits of highway infrastructure investments in the United States. Specifically, it focuses on the effects of federal-aid investments since 1950 on costs and productivity of firms in the trucking industry. Using an econometric model of regional truck firm costs, the paper documents that the rapid growth of highways, which occurred between 1950 and 1973, had a strong and positive effect on productivity growth in trucking.
HIGHWAYS.

27. Larson, TD. **WANTED: PLIABLE PARADIGMS FOR TRANSPORTATION INVESTMENT**. This paper appears in Transportation Research Board Special Report No: 237, Moving Urban America, Proceedings of a Conference. Washington, DC: Transportation Research Board. 1993.

Applying the new directions embodied in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) demands a sea change in the way we think about transportation investments and the role they will play in society. That change in thinking and how it affects organizations charged with implementing this law are explored.
HIGHWAYS/MASS TRANSIT.

28. Lashar, JD. **HIGHWAY POLICY AT A CROSSROADS: OPTIONS FOR U.S. HIGHWAY AND INFRASTRUCTURE POLICY IN THE POST-INTERSTATE ERA**. Washington, DC: April 1990.

This Wednesday Group report summarizes a number of recent infrastructure studies, highlighting policy options for improving federal public works programs, particularly the highway program.
HIGHWAYS.

29. McFarland, W. F.; Chui, M. K.; Memmott, J. L. **ASSESSMENT OF TRANSPORTATION INFRASTRUCTURE NEEDS: RESEARCH REPORT (FINAL)JAN 88-AUG 90**. U:S: Department of Transportation, Federal Highway Administration//Texas Department of Transportation: 1991.

Four reports recently published by the Federal Highway Administration (FHWA), the American Association of Highway and Transportation Officials (AASHTO), the National Council on Public Works Improvement, and the Congressional Budget Office (CBO) present information that is important in evaluating highway needs in the United States. The objective of the study is to provide a comparison and critique of the four reports. Special emphasis is placed on evaluating the rate-of-return analysis for highway investment in the CBO report.
HIGHWAYS.

30. Mead, K. M. **SURFACE TRANSPORTATION: BUDGET ISSUES AND OPTIMIZING INVESTMENT RETURNS**. Washington, DC: U.S. General Accounting Office. 1993.

This is the statement of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office (GAO), before the Subcommittee on Transportation, Committee on Appropriations, United States House of Representatives, on key issues affecting the implementation of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the results of some of GAO's past and ongoing work in the area of surface transportation infrastructure.
HIGHWAYS/MASS TRANSIT.

31. Neienhaus, Michael. **HIGHWAYS AND MACROECONOMIC PRODUCTIVITY PHASE ONE: THE CURRENT STATE OF RESEARCH**. Cambridge, MA: U.S. Department of Transportation, Volpe National Transportation Systems Center. 1991.

This report is the first of a two phase effort by the FHWA to investigate the relationship between highway infrastructure investment and macroeconomic growth and productivity. Phase one's objectives are 1) to examine the relationship between aggregate output, productivity on the one hand and public capital, public infrastructure on the other, and 2) to assess future research needs. The approach taken by the report involves reviewing literature on the subject, concentrating on three papers by Aschauer (1989), Munnell (1990), and Munnell and Cook (1990). The data used by these three authors were obtained, updated, and an attempt was made to duplicate their analyses. The FHWA then ran statistical tests for each analysis, comparing the findings. Conclusions were drawn from the comparisons, and recommendations made for future research.
HIGHWAYS.

32. Osmon, DR. **THE CRITICAL LINK. A MESSAGE ON THE IMPORTANCE OF THE HIGHWAY INFRASTRUCTURE TO U.S. ECONOMIC GROWTH AND PRODUCTIVITY**. Washington, DC: Highway Users Federation for Safety and Mobility. 1991.

Donn R. Osmon, Group Vice President of Traffic and Personal Safety Products of 3M Company, addressed more than 80 Congressmen and members of Congressmen's staffs at a special U.S. Congressional breakfast meeting during the Highway Users Federation 1991 Highway Transportation Congress. Mr. Osmon discusses America's infrastructure needs and the link between investment in infrastructure and the productivity of our workforce.
HIGHWAYS.

33. Pisarski, Alan. **THE NATION'S PUBLIC WORKS: REPORT ON HIGHWAYS, STREETS, ROADS, AND BRIDGES**. Washington, DC: National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining highways, streets, roads, and bridges as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's highway, streets, roads, and bridges.
HIGHWAYS*

34. Rephann, Terance J. **HIGHWAY INVESTMENT AND REGIONAL ECONOMIC DEVELOPMENT: DECISION METHODS AND EMPIRICAL FOUNDATIONS**. Urban Studies; 30(2), pages 437-50. March 1993.

This paper reviews criteria used in U.S. development highway corridor selection and variables identified by various regional development theories. A synthesis of highway empirical research suggests that geographical region, urbanization, development and public infrastructure may be important "triggering forces" in the U.S.
HIGHWAYS.

35. Rothberg, Paul F. **INTELLIGENT VEHICLE HIGHWAY SYSTEMS (IVHS): CHALLENGES, CONSTRAINTS, AND FEDERAL PROGRAMS**. Washington, DC: Congressional Research Service. 1992.

    The challenges and constraints facing the Intelligent Vehicle Highway Systems (IVHS) are considered, the IVHS Act of 1991 is summarized, the management and structure of this program are analyzed and options that might be considered in appropriating funds for, or conducting oversight on, this national efforts are outlined.
    HIGHWAYS.

36. Shuman, M. **ARE AMERICA'S BRIDGES FALLING DOWN?** Traffic Safety. Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration. 1991.

    The problems that plague America's bridges are pointed out, and it is noted that of 842 bridges under local jurisdiction in New York, 56% are deficient. By the end of the decade, it will cost about $1 billion to repair New York's bridges. In the United States, in an average year, about 150 bridges collapse, and a quarter of the half million rural bridges are structurally deficient. A Federal Highway Administration study found that nearly half the bridges in the United States should be repaired or replaced. In California, because of earthquake history, bridge safety is of particular concern.
    HIGHWAYS.

37. Small, Kenneth A. **URBAN TRAFFIC CONGESTION: A NEW APPROACH TO THE GORDIAN KNOT**. Brookings Review. 11:6-11. March 1993.

    Methods of implementing congestion pricing, or charging fees for use of popular routes during rush hours, and using the revenues to improve infrastructure are presented.
    HIGHWAYS.

38. Small, Kenneth A. **USING THE REVENUES FROM CONGESTION PRICING**. Institute of Transportation Studies, University of California, Irvine, CA; 24p. 1992.

    Viability of tax levies and credits for miles travelled alone or by carpooling to finance highways and relieve congestion is presented, based on 1990 Los Angeles data.
    HIGHWAYS.

39. Snell, Ronald K. **HIGHWAY TOLLS AND PRIVATE ROADS: THE WAY TO THE FUTURE?** State Legislatures; 17:52-6. July 1991.

    Presents pros and cons of toll roads to finance and maintain the U.S. highway infrastructure.
    HIGHWAYS.

40. Transportation Research Board, National Research Council. **HIGHWAY MAINTENANCE OPERATIONS AND RESEARCH**. 1990.

This report examines new methods of highway maintenance. Twenty-five case studies are presented showing different techniques to repair roads and bridge, under various environmental conditions.
HIGHWAYS.

41. Transportation Research Board, National Research Council. **ISTEA AND INTERMODAL PLANNING: CONCEPT, PRACTICE, VISION**. Washington, DC: 1993.

The publication considers a number of issues concerned with U.S. intermodal transportation policies. These issues include: a review of the planning and funding of the U.S. transport system; the planning mechanisms developed in the Intermodal Surface Transportation Efficiency Act (ISTEA) concerned with intermodal transportation management; and the achievement of more economical and environmentally efficient transportation systems through the optimum use of various combined modes. An assessment is made of how such issues need to be integrated into a transportation planning process. Conclusions consider intermodal systems, their management and their potential for further development.
HIGHWAYS.

42. Transportation Research Board, National Research Council. **MEASURING STATE TRANSPORTATION PROGRAM PERFORMANCE**. Washington, DC: 1993.

This report explains the findings and conclusions of a study undertaken to: 1) assess the current practice in comparative program/system evaluation; 2) explore the feasibility of making comparisons of the performance of state highway systems; 3) define the characteristics of methodologies used and proposed for use in making such comparisons; and 4) propose appropriate actions. An annotated bibliography of pertinent literature is provided in an appendix and is summarized in the report for highway, transportation, and nontransportation cases. A conceptual framework for program assessment is presented with more focus and description given to three major elements of an assessment methodology: performance measures, input variable, and external factors. The report concludes with a series of observations that provide direction to conducting any comparisons of state highway program/system performance.
HIGHWAYS.

43. U.S. Congress, Committee on Public Works and Transportation, Subcommittee on Surface Transportation. **THE STATUS OF THE NATION'S HIGHWAYS, BRIDGES, AND TRANSIT: CONDITIONS AND PERFORMANCE: REPORT OF THE SECRETARY OF TRANSPORTATION**. Pursuant to Section 307(h) of Title 23 and Section 308(e) of Title 49, United States Code; viii+197p. Washington, DC: 1993.

Highway system and usage characteristics, finance, and projected investment requirements for the years 1992-2011.
HIGHWAYS/MASS TRANSIT*

44. U.S. Congressional Office of Technology Assessment. **ADVANCED VEHICLE/HIGHWAY SYSTEMS AND URBAN TRAFFIC PROBLEMS**. Washington, DC: September 1989(PB94-134731).

HIGHWAYS.

45. U.S. Department of Agriculture, Office of Transportation. **RURAL ROADS AND BRIDGES--FEDERAL AND STATE FINANCING**. 1989.

This report studies the condition of rural bridges and roads and how to finance their construction/repair.
HIGHWAYS*

46. U.S. Department of Transportation. **HIGHWAY BRIDGE REPLACEMENT AND REHABILITATION PROGRAM 1991 TENTH REPORT OF THE SECRETARY OF TRANSPORTATION TO THE UNITED STATES CONGRESS**. Washington DC: 1991.

This tenth report on the Highway Bridge Replacement and Rehabilitation Program(HBRRP) describes in detail the progress made in administering the HBRRP through June 30,1990 as well as the status of bridge inventories for both Federal-aid and off-system highways. It also summarizes the status of bridge management system.
HIGHWAYS.

47. U.S. Department of Transportation, Bureau of Transportation Statistics. **DIRECTORY OF TRANSPORTATION DATA SOURCES**. Washington, DC: 1993(DOT-VNTSC-BTS-93-2).

HIGHWAYS.

48. U.S. Department of Transportation, Federal Highway Administration. **THE 1992 STATUS OF THE NATION'S HIGHWAYS AND BRIDGES: CONDITIONS, PERFORMANCE, AND CAPITAL INVESTMENT REQUIREMENTS**. Washington, DC: 1992.

This report is presented in four chapters. Chapter 1 describes recent trends in highway travel and highway system mileage. Chapter 2 outlines sources of highway revenue and recent expenditure patterns for Federal, State, and local governments. Chapter 3 describes current conditions and performance for highways and bridges. It also discusses selected trends. Chapter 4 projects future highway travel demand and estimates capital investment requirements.
HIGHWAYS.

49. U.S. Department of Transportation, Federal Highway Administration. **ASSESSING THE RELATIONSHIP BETWEEN TRANSPORTATION INFRASTRUCTURE AND PRODUCTIVITY: SUMMARY OF CURRENT RESEARCH: PART OF A HIGHWAYS AND ECONOMIC PRODUCTIVITY AGENDA**. Washington, DC: August 1992.

The paper attempts to present a broad review of the literature, a summary of the results of recent research studies, the strengths and weaknesses of the research, and new estimates concerning the debate over the relationship between productivity and public capital and highways. Overall, national production function estimates for the magnitude of the relationship between highway investment and economic productivity are unrealistically large, but they signify the existence of this relationship.
HIGHWAYS.

50. U.S. Department of Transportation, Federal Highway Administration. **GUIDANCE FOR STATE IMPLEMENTATION OF ISTEA TOLL PROVISIONS IN CREATING PUBLIC-PRIVATE PARTNERSHIPS**. Washington, DC: 1993(FHWA-PL-93-015).

This report is intended to serve as a guide for states seeking to make legislative changes to create a more hospitable environment for public-private toll partnerships.
HIGHWAYS*

51. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: EXAMINING CONGESTION PRICING IMPLEMENTATION ISSUES.** Washington, DC: 1992; Number 6.

This report summarizes the results of a symposium on congestion pricing implementation issues sponsored by the Federal Highway Administration and the Federal Transit Administration.
HIGHWAYS/MASS TRANSIT.

52. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: AN EXAMINATION OF TRANSPORTATION INDUSTRY PRODUCTIVITY MEASURES**. Washington, DC: 1993; Number 8.

This document summarizes the proceedings of the Highway-Related Transportation Industry Productivity Measures Symposium on November 19 and 20, 1992, in Arlington, Virginia. The symposium brought together approximately 80 participants to address problems with the derivation of currently available statistics, including the underlying methodology, and to identify additional research necessary to provide more representative measures of the transportation sector's economic performance.
HIGHWAYS.

53. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: BOND FINANCING AND TRANSPORTATION INFRASTRUCTURE: EXPLORING CONCEPTS AND ROLES**. Washington, DC: 1994; Number 9.

HIGHWAYS/MASS TRANSIT.

54. U.S. Department of Transportation, Federal Transit Administration. **REPORT ON FUNDING LEVELS AND ALLOCATIONS OF FUNDS: REPORT OF THE SECRETARY OF TRANSPORTATION TO THE UNITED STATES CONGRESS**. Washington, DC: 1993.

HIGHWAYS/MASS TRANSIT.

55. U.S. General Accounting Office. **BRIDGE INFRASTRUCTURE: MATCHING THE RESOURCES TO THE NEED**. Washington, DC: 1991(GAO/RCED-91-167).

This report compares the Department of Transportation's current methodology for determining bridge needs to an alternative (level of service) methodology.
HIGHWAYS.

56. U.S. General Accounting Office. **HIGHWAY DEMONSTRATION PROJECTS: IMPROVED SELECTION AND FUNDING CONTROLS ARE NEEDED**. Washington, DC: 1991(GAO/RCED-91-146).

This GAO report examined 66 of the 152 Surface Transportation and Uniform Relocation and Assistance Act projects in 8 states to determine (1): their relationship to state and regional transportation plans;(2) progress and problems encountered in implementing such projects;(3)

their estimated costs and impacts on other highway project funding; and (4) options that Congress may wish to consider if demonstration projects are included in the 1991 federal-aid highway program reauthorization.
HIGHWAYS.

57. U.S. General Accounting Office. **HIGHWAY FINANCING: PARTICIPATING STATES BENEFIT UNDER TOLL FACILITIES PILOT PROGRAM**. Washington, DC: 1990(GA/RCED-91-46).

This document reviews the progress of states using tolls as a means to help finance new and reconstructed federal-aid highway facilities.
HIGHWAYS.

58. U.S. General Accounting Office. **HIGHWAY TRUST FUND: STRATEGIES FOR SAFEGUARDING HIGHWAY FINANCING**. Washington, DC: 1992(GAO/RCED-92-245).

This report examines the capacity of the highway account to support ISTEA's authorization and the reasons for anticipating a shortfall in revenue; the consequences of a shortfall; and the strategies for dealing with a shortfall.
HIGHWAYS.

59. U.S. General Accounting Office. **HIGHWAY TRUST FUND: REVENUE SOURCES, USES, AND SPENDING CONTROLS**. Washington, DC: 1991(GAO/RCED-92-48FS).

This report reviews the sources and amounts of Highway Trust Fund revenues during fiscal years 1987 through 1991. It also examines the uses of the revenues, the estimated balance remaining in the trust fund when federal-aid highway and mass transit programs expire at the end of fiscal year 1991, and the influence of the 1990 Budget Act on surface transportation spending during the next reauthorization period.
HIGHWAYS.

60. U.S. General Accounting Office. **INTERMODAL FREIGHT TRANSPORTATION: COMBINED RAIL-TRUCK SERVICE OFFERS PUBLIC BENEFITS, BUT CHALLENGES REMAIN**. Washington, DC: 1992(GA/RCED-93-16).

As a possible alternative to the trucking industry, the General Accounting Office examined the status and potential benefits of intermodal rail transportation, in which loaded containers or trailers are transferred intact from truck to rail and back to truck.
HIGHWAYS*

61. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: BETTER TOOLS NEEDED FOR MAKING DECISIONS ON USING ISTEA FUNDS FLEXIBLY**. Washington, DC: 1993.

The General Accounting Office (GAO) evaluated (1) the extent to which states and localities have used the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) highway and mass transit capital funds flexibly to finance highway, mass transit, and nontraditional projects; (2) the factors that have influenced or will influence the flexible use of ISTEA funds; and (3) the adequacy of analytical tools for making transportation investment decisions.
HIGHWAYS/MASS TRANSIT*

62. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: PRESERVING THE NATION'S INVESTMENT IN THE INTERSTATE HIGHWAY SYSTEM.** August 1991.

This GAO report for the House Committee on Public Works and Transportation examines the condition of the Interstate system, the outlook for future preservation needs, and factors that influence Interstate pavement deterioration and federal and state efforts to ensure adequate maintenance of the Interstate Highway System. The General Accounting Office recommends a number of measures that Congress may want to consider in reauthorizing the federal-aid highway program to ensure that Interstate preservation needs are met. Important among these are changes to the system by which the FHWA certifies that maintenance efforts of states are adequate.
HIGHWAYS*

63. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: FEDERAL HIGHWAY ADMINISTRATION FY 1992 BUDGET REQUEST AND HIGHWAY PROGRAM REAUTHORIZATION PROPOSAL.** Washington, DC: March 5, 1991.

The Department of Transportation (DOT) estimates that about $29 billion must be invested annually by all levels of government over the next 15 years to maintain the national highways at 1985 conditions and meet bridge needs. While the plan recognized these needs, it lacked specific funding strategies and suggested a major shifting of financial burden to the states. FHWA fiscal year (FY) 1992 budget and reauthorization proposal offers an ambitious, yet conceptually sound strategic framework for helping states address important highway and bridge investment requirements through increased funding and more flexibility in using those funds. Testimony focuses on the proposed FY 1992 through FY 1996 federal-aid highway program budget commitment and plan for restructuring the program.
HIGHWAYS.

64. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: FLEXIBILITY IN FEDERAL-AID FUNDING ESSENTIAL TO HIGHWAY PROGRAM RESTRUCTURING. STATEMENT OF KENNETH M. MEAD BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE.** Washington, DC: 1990.

This is the testimony of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office, on transportation issues related to the federal-aid highway program reauthorization. It shows how states have used existing federal-aid highway program flexibilities and other funding mechanisms to better meet their needs, and suggests options for restructuring the federal-aid highway program.
HIGHWAYS.

65. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: REPORT TO THE SECRETARY OF TRANSPORTATION.** Washington, DC: 2v: 1989.

Based on a GAO seminar, *New Directions in Surface Transportation Infrastructure*, held June 29, 1989. Examines federal highway and mass transportation programs, focusing on traffic

congestion, road and bridge deterioration, block grants, toll financing, intermodal and multimodal transport, and environmental aspects.
HIGHWAYS.

66. U.S. Interstate Commerce Commission, Bureau of Economics. **A COST AND BENEFIT ANALYSIS OF SURFACE TRANSPORT REGULATION**. Washington, DC: Interstate Commerce Commission.

HIGHWAYS.

67. U.S. Senate. **CONGESTION PRICING AND INFRASTRUCTURE FINANCING**. Washington, DC: March 21, 1991.

Hearing before the Subcommittee on Water Resources, Transportation, and Infrastructure to examine highway congestion pricing for urban areas, involving the imposition of tolls during peak traffic hours to reduce highway use and generate funds for highway maintenance. Also examines financing issues and proposals for State and local infrastructure projects.
HIGHWAYS.

68. U.S. Senate, Committee on Environment and Public Works. **OVERSIGHT OF THE FEDERAL-AID HIGHWAY PROGRAM. HEARING BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE, 101ST CONGRESS, 2ND SESSION, ST. PAUL MINNESOTA, JULY 10, 1990. PART 4**. Washington, DC: 1990.

This hearing addresses a number of issues, including the impact of federal transportation policy under the State and local governments, the impact of the federal transportation policy on the transportation system users and consumers, the importance of a national transportation system to the United States in general, and Minnesota specifically, and innovations in the area of better management and research and development that can help meet transportation's needs. Included are prepared statements, testimony, and additional material submitted for the record.
HIGHWAYS.

69. Wieman, Clark. **ROAD WORK AHEAD: HOW TO SOLVE THE INFRASTRUCTURE CRISIS**. Technology Review. August 1993.

Recommends adequate maintenance, dedicated funds and bureaucratic reform.
HIGHWAYS/GENERAL*

70. Williams, M.; Mullen, J. K. **THE CONTRIBUTION OF HIGHWAY INFRASTRUCTURE TO STATES' ECONOMIES**. International Journal of Transport Economics; 19(2), pages 149-63. June 1992.

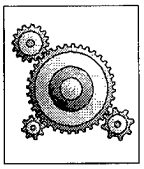
HIGHWAYS.

71. Winston, Clifford. **CONCEPTUAL DEVELOPMENTS IN THE ECONOMICS OF TRANSPORTATION: AN INTERPRETIVE SURVEY**. Journal of Economic Literature; pages 57-94. March 1985.

The objective of this paper is to survey the literature in transportation economics, exploring two basic themes: first, the conceptual developments in the analysis of supply and demand, which recognize noteworthy aggregation biases in the empirical work on aggregate data and indicate that a correct analysis of the issues should take place at a highly disaggregated level; second, the use of these conceptual developments to evaluate efficiency aspects of transportation pricing, investment, and the impact of government regulation on resource allocation and distribution in the transportation sector.
HIGHWAYS.

72. Winston, Clifford; Corsi, Thomas M. **THE ECONOMIC EFFECTS OF SURFACE FREIGHT DEREGULATION**. Washington, DC: The Brookings Institution. 1990.

This study quantitatively assesses the effects of surface freight deregulation. It investigates the costs of regulating surface freight transportation and estimates the efficiency and distributional effects of surface freight deregulation on shippers, carriers, labor, and small communities. Deregulation and shipper optimality; competition and welfare under deregulation; and the benefits to railroads and shippers from further adjustments to deregulation are discussed. The study concludes with an examination of railroad and motor carrier policy issues.
HIGHWAYS.



3. AIR TRANSPORTATION

1. Aaronson, RJ. **WHERE IS THE AVIATION TRUST FUND?** Vital Speeches. Mount Pleasant, SC: City News Publishing Company. 1990.

This speech discusses the positive and negative elements of air transportation infrastructure, suggesting that deregulation resulted in the highly successful hub and spoke concept, quieter, more fuel-efficient jets, lower fares, and an increase in projected airport building and renovation. Attempts by government to re-regulate the airline industry could jeopardize this growth. Such problems as inadequate airport capacity, unreliable equipment and outmoded technology could be best approached through increased economic support by governmental agencies without legislative restrictions.
AIR TRANSPORTATION.

2. American Association of State Highway and Transportation Officials. **BEYOND THE HORIZON: THE FUTURE OF THE NATION'S AIR TRANSPORTATION SYSTEM 1988-2020**. Washington, DC: 1989.

This report was developed to provide an aviation component for the AASHTO Transportation 2020 Program effort. Major work elements of this effort were: evaluation of the requirements for the nation's air transportation system through the year 2020; and a review of existing AASHTO aviation polices.
AIR TRANSPORTATION.

3. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON AIRPORT AND AIRWAYS**. Washington, DC: National Council on Public Works Improvement.

This report was prepared to assist the National Council on Public Works Improvement in examining airports and airways as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's airports and airways.
AIR TRANSPORTATION*

4. Apogee Research, Inc. **THE SUSQUEHANNA VALLEY REGIONAL AIRPORT AUTHORITY (SVRAA) AVIATION NEEDS STUDY**. Bethesda, MD: May 1994.

This study is designed to examine the long-term air transportation needs, both operational and economic, of the South Central Pennsylvania region. The study focuses on examining long-term demand and capacity at Harrisonburg International Airport (HIA), the region's primary commercial service airport. In addition, it considers the role of the region's other airports relative to HIA. This report describes recent trends in the air transportation industry, demand and capacity at HIA and other regional airports, and the economic value of aviation in the Susquehanna Valley.
AIR TRANSPORTATION.

5. Arnott, Richard J.; Stiglitz, Joseph E. **CONGESTION PRICING TO IMPROVE AIR TRAVEL SAFETY**. Moses, Leon N.//Savage, Ian, ed., Transportation Safety in an Age of Deregulation. New York, NY: Oxford University Press; pages 167-85. 1989.

AIR TRANSPORTATION.

6. Batey, Peter W. J.; Madden, Moss; Scholefield, Graham. **SOCIO ECONOMIC IMPACT ASSESSMENT OF LARGE SCALE PROJECTS USING INPUT OUTPUT ANALYSIS: A CASE STUDY OF AN AIRPORT**. Regional Studies; 27(3), pages 179-91. 1993.

This paper focuses upon the methodological issues that are encountered in measuring the socio-economic impacts of a large-scale infrastructure investment. Focusing on the example of airport expansion, the paper demonstrates how an appropriate impact assessment model can be developed, based on the principles of extended input-output analysis.
AIR TRANSPORTATION.

7. Colodny, E. I. **AVIATION'S PERSPECTIVE: MOVING AMERICA: A LOOK AHEAD TO THE 21ST CENTURY**. Washington, DC: U.S. Department of Transportation. 1989.

   Edwin I. Colodny, president of U.S.AIR, Incorporated, emphasizes that aviation today is truly mass transportation. He predicts that air traffic will grow by 25% in the next century and calls for increased aviation infrastructure to meet this need. He recommends: retention of user fees in airport and airway capital development; assignment of capital spending to airport capacity expansions and new airports, with consideration of environmental aspects; acceleration of the National Airspace System plan to modernize air traffic control systems and surveillance and weather technology; and allocation of additional resources to research and development to increase capacity.
   AIR TRANSPORTATION.

8. Craig, Thomas. **AIR TRAFFIC CONGESTION: PROBLEMS AND PROSPECTS**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

   AIR TRANSPORTATION.

9. Fujii, Edwin; Im, Eric; Mak, James. **THE ECONOMICS OF DIRECT FLIGHTS**. Journal of Transport Economics and Policy; 26(2), pages 185-95. May 1992.

   Many tourist industry officials lobby their local governments to invest in airport infrastructure in order to accommodate direct flights. The authors evaluate the impact of the recent introduction of direct flights from the West Coast of the U.S. to Hawaii's neighboring islands, bypassing the previous hub, Honolulu. They find a significant, though modest, increase in travel to the neighboring islands.
   AIR TRANSPORTATION.

10. Goetz, Andrew R. **AIR PASSENGER TRANSPORTATION AND GROWTH IN THE U.S. URBAN SYSTEM, 1950-1987**. Growth and Change; 23(2), pages 217-38. March 1992.

    AIR TRANSPORTATION.

11. Golaszewski, Richard. **AVIATION INFRASTRUCTURE: A TIME FOR PERESTROIKA?** Logistics and Transportation Review; 28(1), pages 75-101. March 1992.

    This paper reviews financing mechanisms for airports and air traffic control. Cost allocation and pricing systems (residual costs and compensatory systems) are analyzed. A change to Hopkinson tariffs and from centralized planning to more market-based approaches is advocated.
    AIR TRANSPORTATION.

12. Grosshuesch, Peter; Plavin, David. **AIRPORT INFRASTRUCTURE**. Transportation Law Journal, V. 20, NO. 1, P. 141-152. 1991.

Covers economic impact of the new Denver airport, and the impact of air transportation on the New York City area economy.
AIR TRANSPORTATION.

13. Hardaway, R. M. **AIRPORT REGULATION, LAW, AND PUBLIC POLICY: THE MANAGEMENT AND GROWTH OF INFRASTRUCTURE**. Contributing authors: J. Spensley, S. Hamilton ,. M. Bell, J. Haidar, and G. K. Scott. Westport, CT: Quorum Books. 1991.

The dramatic rise in air traffic, together with rapid residential and commercial development around our metropolitan areas, has strained the capacity of airports to serve the public safely and efficiently. This book explores this problem in depth. Drawing on both the hands-on expertise of professionals in the field and a thorough grounding in law and public policy, it looks at the laws governing airport development and addresses the complex regulatory and policy issues surrounding the construction, expansion, and operations of airports.
AIR TRANSPORTATION.

14. Lemer, Andrew C. **MEASURING PERFORMANCE OF AIRPORT PASSENGER TERMINALS**. Transportation Research, Volume 26a, Issue 1, pages 37-45. 1992.

Performance of an airport passenger terminal generally has something to do with moving travelers and their bags between aircraft and ground transportation, but airport operators, travelers, airlines, and other users of the terminal have a range of concerns about comfort, convenience, costs, and ambiance that should accompany this movement and will assess performance in terms of such factors. The principle factors comprising a framework for describing airport passenger terminal performance are presented, focusing primarily on passengers, airlines, and the airport operator. Specific measures that may be used to assess performance within this framework are considered, along with computational tools that might be developed to support more systematic assessment of airport terminal investments and operating strategies.
AIR TRANSPORTATION.

15. Meyer, John R.; Strong, John S. **FROM CLOSED SET TO OPEN SET DEREGULATION: AN ASSESSMENT OF THE U.S. AIRLINE INDUSTRY**. Logistics and Transportation Review; 28(1), pages 1-21. March 1992.

Airline industry performance has been shaped by sustained growth, technological change, and varying aspects of governmental oversight. In the United States, deregulation initially was of a "closed set" nature, with competition limited to existing carriers and with residual economic regulation. Subsequently, "open set" deregulation emerged characterized by rapid entry and exit and little economic regulation. Industry prospects depend on financial performance, especially for capital investment, and public policy toward mergers, infrastructure, and international competition.
AIR TRANSPORTATION.

16. Moses, Leon N.; Savage, Ian. **AVIATION DEREGULATION AND SAFETY: THEORY AND EVIDENCE**. Journal of Transport Economics and Policy; 24(2), pages 171-88. May 1990.

There is a popular belief that the economic deregulation of the United States' airline industry has led to a denigration of its safety performance. This paper describes the academic evidence on the validity of this fear. The evidence is presented within a theoretical framework which describes the potential linkages between economic conditions and the safety performance of firms.
AIR TRANSPORTATION.

17. Pustay, M. W. (British Columbia University, Canada Center for Transportation Studies). **TOWARD A GLOBAL AIRLINE INDUSTRY: PROSPECTS AND IMPEDIMENTS**. Logistics and Transportation Review. 1992.

International aviation has undergone much change due to increasing liberalization of bilateral agreements, increased domestic competition, and privatization. Initiatives in deregulation and toward limited "open skies" enhanced the competitive position of U.S. airlines internationally, which has encouraged a variety of organizational affiliations and industry changes worldwide. Subsequent globalization will be multilateral in nature and conditioned by policies toward antitrust, public enterprise, and infrastructure.
AIR TRANSPORTATION.

18. Sloane, Morris. **THE WORLD'S AIRPORTS: TODAY AND TOMORROW**. Via International Port of New York New Jersey; 40:6-9 10-13. September 1988.

Covers trends in airport development in Western Europe, Japan, and the U.S.. and it discusses cargo, noise, environmental issues, and capital improvement programs.
AIR TRANSPORTATION.

19. Smith, Frederick W. **AIR CARGO TRANSPORTATION IN THE NEXT ECONOMY**. Guile, Bruce R.; Quinn, James Brian. Technology in Services: Policies for Growth, Trade, and Employment. Washington, DC: National Academy Press; pages 160-166. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

AIR TRANSPORTATION.

20. Thompson, D. **MATCHING SUPPLY AND DEMAND IN THE LONGER TERM: INFRASTRUCTURE REGULATION AND AIRLINE COMPETITION**. Longer Term Issues In Transport. Brookfield, CT: Savebury/Aldershot. 1991.

AIR TRANSPORTATION.

21. Transportation Research Board, National Research Council. **PUBLIC-SECTOR AVIATION ISSUES: GRADUATE RESEARCH AWARD PAPERS**. Washington, DC: 1991.

AIR TRANSPORTATION.

22. U.S. Congressional Budget Office. **POLICIES FOR THE DEREGULATED AIRLINE INDUSTRY**. Washington, DC: 1988.

This Congressional Budget Office Report provides an overview of airline deregulation, the effects of deregulation on industry, and a future outlook for the deregulated environment. The problems of congestion associated with the aviation system reaching capacity are

reviewed, and options for increasing competition and reducing congestion are discussed. The report suggests that expanding the capacity of the aviation system would be costly and time-consuming, and that more efficient management of the existing capacity might be a more effective solution.
AIR TRANSPORTATION.

23. U.S. Congressional Budget Office. **THE STATUS OF THE AIRPORT AND AIRWAY TRUST FUND**. Washington, DC: 1988.

This Congressional Budget Office report examines the status of the Airport and Airway Trust Fund (AATF). The AATF has accumulated a substantial surplus since it was established in 1971. This study examines the history of the trust fund income and spending; the degree to which the public sector has subsidized private-sector use of the aviation system; and alternative interpretations of trust fund balances on capital-only and full user-pay approaches to trust fund accounting.
AIR TRANSPORTATION.

24. U.S. Department of Transportation, Federal Aviation Administration. **1993 AVIATION SYSTEM CAPACITY PLAN**. Washington, DC: 1993(DOT/FAA/ASC-93-1).

This report quantifies the magnitude of delay for the top 100 airports in the U.S. It is a comprehensive review of the Federal Aviation Administration's (FAA) program to improve capacity of the National Air Transportation System.
AIR TRANSPORTATION*

25. U.S. Department of Transportation, Federal Aviation Administration. **AVIATION SYSTEM CAPITAL INVESTMENT PLAN**. Washington, DC: U.S. Government Printing Office. 1991.

The second annual Aviation Systems Capital Investment Plan describes the Facilities and Equipment programs that the FAA will pursue in addressing key concerns of the National Airspace System such as safety, efficiency, traffic demands, equipment and facilities, and airspace use.
AIR TRANSPORTATION.

26. U.S. Department of Transportation, Federal Aviation Administration. **NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS(NPIAS): 1990-1999**. Washington, DC: U.S. Government Printing Office. 1991.

This report estimates the type and cost of development that will be required at a large majority of U.S. airports from 1990-1999. The developments recommendations are drawn primarily from plans prepared by state and local agencies responsible for airport planning and development; only development eligible for federal-aid under the Airport Improvement Program are included.
AIR TRANSPORTATION.

27. U.S. Department of Transportation, Federal Aviation Administration. **REPORT TO CONGRESS: LONG TERM AVAILABILITY OF ADEQUATE AIRPORT SYSTEM CAPACITY**. Washington, DC: 1992(DOT/FAA/PP-92-4).

The report describes the probable extent of airport congestion in the future, given current trends. Specific proposals for airport development seldom extend more than ten years into the future, so the report relied heavily on the judgement of experts from various segments of the air transportation industry.
AIR TRANSPORTATION*

28. U.S. House of Representatives. **AVIATION INFRASTRUCTURE INVESTMENT ACT OF 1993**. Washington, DC: September 1993.

Recommends passage, with an amendment in the nature of a substitute, of H.R. 2739, the Aviation Infrastructure Investment Act of 1993, to amend the Airport and Airway Improvement Act of 1982 and other acts to extend and revise federal aviation programs.
AIR TRANSPORTATION.

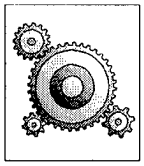
29. U.S. House of Representatives. **MARKUP OF WAYS AND MEANS COMMITTEE AMENDMENT TO H.R. 2739 (AVIATION INFRASTRUCTURE INVESTMENT ACT OF 1993)**. Washington, DC: October 1993.

Description, prepared by Joint Taxation Committee staff, of provisions for Airport and Airway Trust Fund FY94-FY96 authorizations and program revisions contained in: H.R. 2739, the Aviation Infrastructure Investment Act of 1993, to amend the Airport and Airway Improvement Act of 1982 to authorize FY94-FY96 funding for FAA airport development and air traffic control programs. H.R. 2820, the Federal Aviation Administration Research, Engineering, and Development Authorization Act of 1993, to authorize FY94-FY96 funding for FAA R&D programs. H.R. 2820 provisions are expected to be offered as an amendment to H.R. 2739 when considered by the House. Reviews present law, provides background on the purpose of Airport and Airway Trust Fund expenditures, and explains proposed changes.
AIR TRANSPORTATION.

30. Utterback, Nancy. **MANAGING THE NATION'S AIR TRANSPORTATION NEEDS: THE EVOLVING PARTNERSHIP OF AIRLINES, AIRPORTS, AND THE FEDERAL GOVERNMENT**. Municipal Finance Journal. 14:76-98 1993. March 1993.
Financing air transport infrastructure, the FAA's outlook, and legal issues.
AIR TRANSPORTATION.

31. Whitlock, Edward M. **FINANCING AIRPORT FACILITIES**. Transportation Quarterly; 46:99-114. January 1992.

Issues in public finance as well as forces behind privatization of airport facilities are presented.
AIR TRANSPORTATION.



4. MASS TRANSIT

1. American Association of State Highway and Transportation Officials. **PUBLIC TRANSPORTATION NEEDS: APPENDIX 2 TO THE BOTTOM LINE**. Washington, DC: 1988.

   This AASHTO report analyzes existing public transit data to estimate future capital and operating condition, performance, and funding requirements at interim time periods through the year 2020. Transit systems are divided into three categories for comparison, 1) systems serving urbanized areas over 200,000 in population, systems serving urbanized areas of 50,000 to 200,000 in population, 3) specialized and rural transit systems funded through Section 16(b)(2) and Section 18. In general, the report concludes that projected funding will be insufficient to pay for the capital costs of the nation's transit systems. Data is presented on deferred capital needs, capital costs verses funding, projected new start accomplishments, and potential annual shortfalls with status quo funding, with fare increases, and with fare and funding increases.
   MASS TRANSIT.

2. American Association of State Highway and Transportation Officials, Standing Committee on Public Transportation. **SURVEY OF STATE INVOLVEMENT IN PUBLIC TRANSPORTATION**. Washington, DC:

   This survey tracks the growing role of states in public transportation. The survey identifies the categories of funding provided, state technical assistance activities, and the use of oil overcharge funds.
   MASS TRANSIT.

3. American Road and Transportation Builders Association. **THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991**. Washington, DC: 1991.

   This report reviews the effects of the Intermodal Surface Transportation Efficiency Act of 1991. This law is described as the most sweeping revision of federal surface transportation programs in 35 years.
   HIGHWAYS/MASS TRANSIT.

4. Ball, James T. **TRANSPORTATION: NEW SYSTEMS FOR THE NEW CENTURY**. Civil Engineering-ASCE. v60, n10, p54(3). October 1990.

   An integrated transportation system will be needed in the 21st century to alleviate traffic congestion and improve transportation safety. To this end, a solution is proposed based on three steps: a North American high-speed rail system consisting of both steel rail and magnetic levitation; new regional airports linked with this new rail system; and a highway safety program designed to separate large-truck traffic from smaller vehicles.
   HIGHWAYS/MASS TRANSIT.

5. Boyle, Wayne. **EIGHT WAYS TO FINANCE TRANSIT: A POLICYMAKER'S GUIDE**. Denver, Colorado: National Conference of State Legislatures. 1994.

   State and local governments are being called upon to assume a greater share of the ever-increasing costs of public transportation. This report examines the alternative private-sector sources used to help meet these costs. Each of nine chapters includes a

particular financing method, examples of it in action, a case study showing all stages of development and a discussion of related issues.
MASS TRANSIT.

6. Cromwell, Brian A. **THE IMPACT OF CAPITAL GRANTS ON MAINTENANCE IN THE LOCAL PUBLIC SECTOR**. Cleveland, OH: Federal Reserve Bank of Cleveland; 45p. 1988.

   Based on an analysis of data on the maintenance practices of privately and publicly owned local mass transit systems. Examines whether state and federal grant policies induce local governments to substitute new investment for the maintenance of existing capital, resulting in excessive deterioration of public infrastructure.
   MASS TRANSIT.

7. Cromwell, Brian A. **PUBLIC SECTOR MAINTENANCE: THE CASE OF LOCAL MASS TRANSIT**. National Tax Journal; 44(2), pages 199-212. June 1991.

   This paper explores maintenance practices in the local public sector and their relationship to state and federal grant policies. If state and federal grant policies induce local governments to substitute new investment for the maintenance of existing capital, excessive deterioration of public infrastructure may result. Using a new data set on the maintenance policies of local mass-transit providers, it shows that private owners of transit capital equipment devote significantly greater resources to maintenance than do public owners of similar capital.
   MASS TRANSIT.

8. Cross, Ted; Palmer, D. **PASSENGER TRANSPORT:THE NEW FRAMEWORK. PAPERS PRESENTED AT A CONFERENCE HELD IN APRIL 1993. CHAPTER 4. EXTRACTING MONEY FROM THE SYSTEM: PRIVATE FUNDING OF TRANSPORT INFRASTRUCTURE INVESTMENT**. Hertfordshire, England: Construction Industry Conference Centre. 1993.

   The history of private funding for transport infrastructure is outlined. Different approaches to private sector funding are considered including developers contributions. The advantages to the private sector of investing in such projects are discussed, and the problems encountered are highlighted.
   MASS TRANSIT.

9. Fouracre, P. **THE ROLE OF INFRASTRUCTURE IN IMPROVING PUBLIC TRANSPORT PERFORMANCE**. Brussels, Belgium: Transport and Road Research Laboratory and the International Union of Public Transport. 1991.

   MASS TRANSIT.

10. Giglio, Joseph M. **FINANCING URBAN TRANSPORTATION**. Civil Engineering. New York, NY: American Society of Civil Engineers. 1989.

    It is noted that innovative financing approaches are essential if further deterioration of the transit infrastructure is to be halted. The National Council on Public Works Improvement endorsed the principle that users should pay a greater share of the cost of infrastructure service. Significant elements of these systems serve identifiable customers; use can be measured and priced to support the system. It also recommended that federal user fees be

used to maintain threshold service levels and to guarantee a minimum level of service where users cannot afford maintenance costs. A critical component of the user fee principle is the spending of trust funds earmarked for specific infrastructure purposes.
MASS TRANSIT*

11. Kain, J. F.; Gittell, R.; Daniere, A.; Daniel, S.; Somerville, T. **INCREASING THE PRODUCTIVITY OF THE NATION'S URBAN TRANSPORTATION INFRASTRUCTURE: MEASURES TO INCREASE TRANSIT USE AND CARPOOLING: FINAL REPORT**. Washington, DC: U.S. Department of Transportation. January 1992.

    The report surveys the growing use of bus and carpool priority measures to increase the productivity of the nation's transportation infrastructure. While it identifies a wide variety of priority measures, the report principally focuses on the planning and operation of exclusive and shared busways and high occupancy vehicle (HOV) facilities. It presents a variety of case studies describing the implementation of busways and transitways.
    MASS TRANSIT.

12. Larson, TD. **WANTED: PLIABLE PARADIGMS FOR TRANSPORTATION INVESTMENT**. This paper appears in Transportation Research Board Special Report No: 237, Moving Urban America, Proceedings of a Conference. Washington, DC: Transportation Research Board. 1993.

    Applying the new directions embodied in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) demands a sea change in the way we think about transportation investments and the role they will play in society. That change in thinking and how it affects organizations charged with implementing this law are explored.
    HIGHWAYS/MASS TRANSIT.

13. The MAGLEV Technology Advisory Committee and Grumman Corporation. **BENEFITS OF MAGNETICALLY LEVITATED HIGH-SPEED TRANSPORTATION FOR THE UNITED STATES**. 1989.

    This report to the United States Senate Committee on Environment and Public Works examines the technical and economic feasibility of running MagLev transport systems along U.S. Interstate highway.
    MASS TRANSIT*

14. Mead, K. M. **SURFACE TRANSPORTATION: BUDGET ISSUES AND OPTIMIZING INVESTMENT RETURNS**. Washington, DC: U.S. General Accounting Office. 1993.

    This is the statement of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office (GAO), before the Subcommittee on Transportation, Committee on Appropriations, United States House of Representatives, on key issues affecting the implementation of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the results of some of GAO's past and ongoing work in the area of surface transportation infrastructure.
    HIGHWAYS/MASS TRANSIT.

15. Menczer, WB. **BUS SUPPORT FACILITIES: CONDITIONS AND NEEDS**. Washington, DC: U.S. Department of Transportation, Federal Transit Administration. 1993.

This three chapter report focuses on the current condition of the nation's bus support facility infrastructure. The purpose of the study was to develop estimates of the current condition of the nation's transit bus maintenance facilities and the capital investment needs to assure that these facilities remain in good condition.
MASS TRANSIT.

16. Pashigian, B. Peter. **CONSEQUENCES AND CAUSES OF PUBLIC OWNERSHIP OF URBAN TRANSIT FACILITIES**. Stigler, George J. Chicago Studies in Political Economy. Chicago, IL: University of Chicago Press; pp. 404-425. 1988.

MASS TRANSIT.

17. Shughart, William F.; Kimenyi, Mwangi S. **A PUBLIC CHOICE ANALYSIS OF PUBLIC TRANSIT OPERATING SUBSIDIES**. Research in Law and Economics; 14(0): pages 251-76. 1991.

MASS TRANSIT.

18. Talley, Wayne K. **REGULATORY REFORM OF THE U.S. AND U.K. INTER CITY BUS INDUSTRIES**. The Age of Regulatory Reform. New York, NY: Oxford University Press, Clarendon Press. 1989.

MASS TRANSIT.

19. Thomas, E. **UMTA PRIVATE FINANCING FOR TRANSIT CONSTRUCTION: INFORMATION ON DEMONSTRATION GRANTS**. Washington, DC: U.S. Department of Transportation, Urban Mass Transit Administration. 1991.

This Private Financing for Transit Construction folder is a Demonstration Announcement for the innovative financing of transit projects. UMTA encourages public/private partnerships in the development of transit projects using little, or no, federal funds for capital expenditures. UMTA will fund demonstration studies that examine the institutional relationships that exist or must be created to develop and execute these projects which will include front-end studies and feasibility analyses necessary as part of the local/private decisionmaking process to undertake a project.
MASS TRANSIT.

20. The Urban Institute. **THE NATION'S PUBLIC WORKS: REPORT ON MASS TRANSIT**. Washington, DC: National Council on Public Works. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining mass transit in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's mass transit system.
MASS TRANSIT*

21. U.S. Department of Transportation, Federal Highway, and Federal Transit Administrations. **THE STATUS OF THE NATION'S HIGHWAYS, BRIDGES, AND TRANSIT: CONDITIONS AND PERFORMANCE: REPORT OF THE SECRETARY OF TRANSPORTATION**. Pursuant to Section 307(h) of Title 23 and Section 308(e) of Title 49, United States Code; viii+197p. Washington, DC: 1993.

Highway system and usage characteristics, finance, and projected investment requirements for the years 1992-2011.
HIGHWAYS/MASS TRANSIT*

22. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: EXAMINING CONGESTION PRICING IMPLEMENTATION ISSUES**. Washington, DC: 1992; Number 6.

    This report summarizes the results of a symposium on congestion pricing implementation issues sponsored by the Federal Highway Administration and the Federal Transit Administration.
    HIGHWAYS/MASS TRANSIT.

23. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: BOND FINANCING AND TRANSPORTATION INFRASTRUCTURE: EXPLORING CONCEPTS AND ROLES**. Washington, DC: 1994; Number 9.

    HIGHWAYS/MASS TRANSIT.

24. U.S. Department of Transportation, Federal Transit Administration. **INTRODUCTION TO PUBLIC FINANCE AND PUBLIC TRANSIT**. Washington, DC: Office of Technical Assistance and Safety. 1993.

    This report provides a comprehensive description of the elements of public finance, particularly as they relate to public transit issues.
    MASS TRANSIT.

25. U.S. Department of Transportation, Federal Transit Administration. **REPORT ON FUNDING LEVELS AND ALLOCATIONS OF FUNDS: REPORT OF THE SECRETARY OF TRANSPORTATION TO THE UNITED STATES CONGRESS**. Washington, DC: 1993.

    HIGHWAYS/MASS TRANSIT.

26. U.S. Department of Transportation, Federal Transit Administration. **TURNKEY PROCUREMENT: OPPORTUNITIES AND ISSUES**. Washington, DC: 1992(FTA-MA-08-7001-92-1).

    MASS TRANSIT.

27. U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center. **COMMUTER-INTERCITY RAIL IMPROVEMENT STUDY (BOSTON-NEW YORK)**. Washington, DC/Cambridge, MA: U.S. Department of Transportation, Federal Transit Administration. 1992.

    This study documents potential system improvements to benefit commuter and intercity rail passenger service in the Boston-New York corridor.
    MASS TRANSIT.

28. U.S. Department of Transportation, Urban Mass Transportation Administration. **PUBLIC TRANSPORTATION IN THE UNITED STATES: PERFORMANCE AND CONDITION REPORT TO CONGRESS**. Washington, DC: February 1991.

The report examines the performance and condition of mass transportation in the United States in relationship to the changing market for urban and suburban transportation. The role urban mass transportation is able to play is determined in large part by the cost and convenience of auto use in congested urban areas. An uncertain energy future and increasing atmospheric pollution will continue to spur interest in transit and related forms of high occupancy mobility to support economic growth.
MASS TRANSIT.

29. U.S. General Accounting Office. **HIGH-SPEED GROUND TRANSPORT: ACQUIRING RIGHTS-OF-WAY FOR MAGLEV SYSTEMS REQUIRES A FLEXIBLE APPROACH**. Washington, DC: 1992(GAO/RCED-92-82).

    This report discusses the advantages and disadvantages of right-of-way alternatives for magnetic levitation(maglev) systems.
    MASS TRANSIT.

30. U.S. General Accounting Office. **MASS TRANSIT: NEEDS PROJECTIONS COULD BETTER REFLECT FUTURE COSTS**. Washington, DC: 1993(GAO/RCED-93-61).

    This GAO report reviews the extent to which current transportation needs are adequately addressed and estimates the future transit needs of the nation.
    MASS TRANSIT*

31. U.S. General Accounting Office. **SURFACE TRANSPORTATION: AVAILABILITY OF INTERCITY BUS SERVICE CONTINUES TO DECLINE**. Washington, DC: 1992(GAO/RCED 92-126).

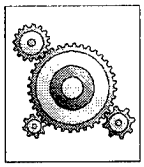
    This report assesses the reasons and the socio-economic impacts of the decline of intercity bus service.
    MASS TRANSIT.

32. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: BETTER TOOLS NEEDED FOR MAKING DECISIONS ON USING ISTEA FUNDS FLEXIBLY**. Washington, DC: 1993.

    The General Accounting Office (GAO) evaluated (1) the extent to which states and localities have used the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) highway and mass transit capital funds flexibly to finance highway, mass transit, and nontraditional projects; (2) the factors that have influenced or will influence the flexible use of ISTEA funds; and (3) the adequacy of analytical tools for making transportation investment decisions.
    HIGHWAYS/MASS TRANSIT*

33. Viton, Philip A. **CONSOLIDATIONS OF SCALE AND SCOPE IN URBAN TRANSIT**. Regional Science and Urban Economics; 22(1), pages 25-49. March 1992.

    The author studies the cost-effectiveness of forming large multi-modal transit organizations by estimating a quadratic multi-product frontier cost function on a U.S. sample, 1984-86. Several policy applications, including a pilot study of San Francisco Bay Area proposals are presented.
    MASS TRANSIT.



5. WATER SUPPLY

1. Apogee Research, Inc. **AMERICA'S ENVIRONMENTAL INFRASTRUCTURE: A WATER AND WASTEWATER INVESTMENT STUDY**. Washington, DC: Clean Water Council. December 1990.

   This report presents new insights into the extent to which water and wastewater treatment infrastructure supports economic growth and productivity throughout the nation. It documents recent underinvestment in water and wastewater facilities, relative to independent assessments of "needs" in greater detail on a state-by-state basis. Finally, this report presents several options to address the projected shortfall in the level of investment in water and wastewater infrastructure.
   WASTEWATER TREATMENT*/WATER SUPPLY.

2. Burnaby, Priscilla; Herhold, Susan. **SERVICE EFFORTS AND ACCOMPLISHMENTS REPORTING: ITS TIME HAS COME -- WATER AND WASTEWATER TREATMENT**. Government Accounting Standards Board. 1990.

   This report examines performance indicators and reporting for drinking water, wastewater treatment, and storm drainage.
   WASTEWATER TREATMENT/WATER SUPPLY*

3. Clark, R. M.; Lykins, B. W.; Goodrich, J. A. **INFRASTRUCTURE AND MAINTENANCE OF WATER QUALITY**. Cincinnati, OH: U.S. Environmental Protection Agency, Water Engineering Research Lab. September 1985.

   This paper analyzes the various factors that influence repair and replacement decisions in water distribution systems and the problems surrounding maintenance of water quality. Concern over maintenance of water quality in distribution systems and a growing awareness of the apparent decay of America's infrastructure has motivated EPA's Drinking Water Research Division to sponsor a series of projects dealing with the repair and rehabilitation of drinking water distribution systems.
   WATER SUPPLY.

4. Ernst & Young. **ERNST AND YOUNG 1992 NATIONAL WATER AND WASTEWATER RATE SURVEY**. Charlotte, NC: 1992.

   WASTEWATER TREATMENT/WATER SUPPLY.

5. Grigg, N. S. **URBAN WATER INFRASTRUCTURE: PLANNING, MANAGEMENT, AND OPERATIONS**. Fort Collins, CO: John Wiley and Sons. 1986.

   This book, written for engineers, planners, and managers, describes potential solutions to the infrastructure problem. Topics covered in the 11 chapters are: managing urban water systems, cooperation and integration in the urban water system, urban water supply systems, wastewater management systems, stormwater and combined sewer systems, planning and management essentials, engineering essentials, computer-based decision support systems, managing operations and maintenance, automating operations of urban water systems, and future issues in urban water management.
   WASTEWATER TREATMENT/WATER SUPPLY.

6. Grigg, N. S.; Schilling, K. E.; Porter, E. **DIMENSIONS AND CHALLENGES OF THE U.S. WATER SUPPLY INDUSTRY**. Urban Water Infrastructure, Proceedings of a NATO

workshop. Isle of Man: International School for Water Resources, Colorado State University. 1990.

Statistics of the U.S. water supply industry are presented. Sources include the U.S. Environmental Protection Agency and the American Water Works Association. Statistics include: operational data, financial operations, industry employment, infrastructure data and water quality.
WATER SUPPLY.

7. Hamilton, Joel R.; Whittlesey, Norman K.; Halverson, Philip. **INTERRUPTIBLE WATER MARKETS IN THE PACIFIC NORTHWEST**. American Journal of Agricultural Economics; 71(1), pages 63-75. February 1989.

   This paper analyzes the potential for using a market to shift water from irrigation to hydropower use in periods of low river flow in the Snake River basin of Idaho. The water could be used for irrigation in most years, but in dry years would be very valuable for firming up electric power supplies. A model of crop growth and water use is utilized to estimate farmer responses and resulting farm income losses due to market-restricted irrigation water supplies.
   WATER SUPPLY.

8. Hanson, Royce. **WATER SUPPLY AND DISTRIBUTION: THE NEXT 50 YEARS**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

   WATER SUPPLY/WATER RESOURCES.

9. Kim, H. Youn; Clark, Robert M. **ECONOMIES OF SCALE AND SCOPE IN WATER SUPPLY**. Regional Science and Urban Economics; 18(4), pages 479-502. November 1988.

   This study examines the multiproduct nature of water supply relative to economies of scale and scope. The water utility is viewed as a multiproduct firm providing residential and non-residential services with spatial variation. The study finds there are no significant economies of scale in the utility's operation. The utility, however, enjoys considerable economies for non-residential water supply but suffers from diseconomies in residential supply. The economies of scale achieved in water treatment are mostly lost in the distribution of water. The utility on the whole experiences economies of scope associated with joint production of the two services. Furthermore, water utilities have no perceptible tendency to behave as a natural monopoly.
   WATER SUPPLY.

10. Maniatis, Melina Ed. **STORMWATER MANAGEMENT**. Management Information Service Report. 22:1-15. November 1990.

    Tracking of rainwater runoff is the issue presented, with case studies of Bellevue, Washington; Cincinnati, Ohio; Asheville, North Carolina; and Port Orange, Florida.
    WATER RESOURCES/WATER SUPPLY.

11. Mays, L. W. **WATER DISTRIBUTION SYSTEM INFRASTRUCTURE ANALYSIS**. Water Resources Update: Water Resources Infrastructure. Issue No. 86, Autumn, 1991. p 20-22. 4 ref.

An EPA survey concluded that the distribution facilities in water supply systems account for the largest cost item in future maintenance budgets. A survey of methods used by municipal water utilities was performed to (1) obtain failure data for water distribution system components; (2) examine the methods used by utilities to collect and maintain data on the maintenance, failure and repair of various components of water distribution systems; and (3) identify existing sources of computerized data bases that have been developed and maintained. A review of the literature revealed that there is currently no universally acceptable definition or measure of the reliability of water distribution systems.
WATER SUPPLY.

12. McGough, Joseph T. Jr. **AGING INFRASTRUCTURE A NEED FOR FEDERAL FUNDING OF URBAN WATER SUPPLY SYSTEMS**. Proceedings AWWA Seminar on Developing Financial Programs In the 80's. 1984.

This paper discusses the need for federal involvement in water supply infrastructure financing. The author encourages expansion of the historic U.S. government role of funding new infrastructure construction, to one of also financing rehabilitation and replacement of existing structures. The deterioration of water supply structures in the northeastern United States is documented, and possible solutions for existing physical and financial problems of water supply systems are addressed.
WATER SUPPLY.

13. Megbolugbe, Isaac F. **DEVELOPER FINANCING OF MUNICIPAL WATER SUPPLY (AN ASSESSMENT OF SYSTEM-DEVELOPMENT CHARGES)**. Proceedings of the AWWA Seminar on Capital Financing. Washington, DC: National Home Builders Association. 1990.

This paper gives a brief overview of some methods for financing public improvements before going on to address system development charges. The author concludes that system development charges are best used in high-growth areas.
WATER SUPPLY.

14. National Association of Water Companies. **FINANCIAL AND OPERATING DATA: 1991 (INVESTOR-OWNED WATER UTILITIES)**. Washington, DC: 1991.

This report is based on the responses of 167 companies to the NAWC Economic Research Program survey of members. The data presented in this report are categorized by both type of customer and company size, reporting selected industry-wide data on water sales, customer profiles, and water supply source and plant expenditures. The financial summary includes additional statistics and regional breakdowns of data. It is important to note that the summarization of results by revenue classes does not explicitly recognize the effects of different operational methodologies and water supply sources on the financial data submitted by the individual companies.
WATER SUPPLY.

15. Obradovic, D.; Schilling, KE; Porter, E. **MODERNIZATION OF URBAN WATER SUPPLY SYSTEMS**. Urban Water Infrastructure, Proceedings of a NATO Workshop. Isle of Man, Canada: National Water Resources Institute. 1990.

Waterworks are urged by society to use resources better, cut down costs, and improve standards of service. To meet these requirements, the waterworks must undertake modernization. They should first appreciate the deficiencies, decide on a long-term plan, and start to implement it in carefully balanced steps. The compilation and calibration of a good mathematical model of the system is always a good initial step - both for the undeveloped and for the advanced. Another is the analysis of water consumption in time and space, using available water meters.
WATER SUPPLY.

16. Roesner, L. A.; Walesh, S. G. **URBAN WATER RESOURCES ISSUES IN THE 21ST CENTURY**. Journal of Professional Issues in Engineering. New York, NY: American Society of Civil Engineers. 1988.

The Urban Water Resources Research Council identifies four critical engineering issues that must be addressed in the 21st century: water supply, storm water management, combined sewer systems, and engineering education.
WATER RESOURCES/WATER SUPPLY.

17. Schnare, D. W.; Cromwell, J. E. **CAPITAL REQUIREMENTS FOR DRINKING WATER INFRASTRUCTURE**. Cincinnati, OH: AMERICAN WATER WORKS ASSOCIATION. 1990.

This document was written as a joint conference paper by a U.S. EPA Office of Drinking Water employee and a private contractor for a capital financing seminar at the annual conference of the American Water Works Association. It assesses the impact estimates made in conjunction with the reauthorization of the Safe Drinking Water Act (SDWA) in relation to the baseline trends of water industry capital expenditures and the size of the customer base over which the costs will ultimately be spread.
WATER SUPPLY*

18. Tiemann, Mary E. **SAFE DRINKING WATER ACT: IMPLEMENTING THE 1986 AMENDMENTS**. Washington, DC: U.S. Congressional Research Service, The Library of Congress.

Discusses the status of EPA's implementation of the amendments and associated policy issues.
WATER SUPPLY.

19. U.S. Environmental Protection Agency, Office of Water. **INNOVATIVE OPTIONS FOR FINANCING NONGOVERNMENTAL PUBLIC WATER SUPPLIES' NEEDS**. September 1993.

The document describes a range of alternative funding mechanisms available to assist small, non-public drinking water systems in financing infrastructure improvements needed to stay in compliance with the state and federal regulations.
WATER SUPPLY.

20. U.S. Environmental Protection Agency, Office of Water. **LOCAL FINANCING FOR WELLHEAD PROTECTION**. Washington, DC: June 1989.

Provides information to state and local managers of water quality and water supply about a variety of financing approaches available to support wellhead protection initiatives.
WATER SUPPLY.

21. U.S. Environmental Protection Agency, Office of Water. **WELLHEAD PROTECTION PROGRAMS: TOOLS FOR LOCAL GOVERNMENTS**. Washington, DC: April 1989.

    This EPA Technical Assistance Document (TAD) describes how localities can, as a part of a State Wellhead Protection Program, develop and implement effective techniques for the protection of ground water. The document emphasizes innovative wellhead protection methods that have been used by local communities, discusses combinations of programs that have worked well, and presents several factors that affect the success of local wellhead protection programs, such as budgetary constraints and legal issues. Contacts for more information on these local programs are listed.
    WATER SUPPLY.

22. U.S. Environmental Protection Agency, Office of Water, Office of Wastewater, Enforcement, and Compliance. **MUNICIPAL WASTEWATER REUSE: SELECTED READINGS ON WATER REUSE**. Washington, DC: iv+74p: 1991.

    Focuses on projects demonstrating successful effluent reclamation and recycling.
    WATER SUPPLY/WASTEWATER TREATMENT.

23. U.S. General Accounting Office. **DRINKING WATER: WIDENING GAP BETWEEN NEEDS AND AVAILABLE EPA RESOURCES THREATENS VITAL EPA PROGRAM**. Washington, DC: July 1992.

    WATER SUPPLY.

24. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Health And the Environment. **SAFE DRINKING WATER ACT: HEARING, APRIL 19, 1993, ON H.R. 1701, A BILL TO AMEND TITLE XVI OF THE PUBLIC HEALTH SERVICE ACT (THE SAFE DRINKING WATER ACT) TO ESTABLISH STATE REVOLVING FUNDS TO PROVIDE FOR DRINKING WATER TREATMENT FACILITIES, AND FOR OTHER PURPOSES**. 103d Cong., 1st sess., iii+232p. Washington, DC: 1993.

    Hearing on proposal to establish state revolving funds for drinking water facilities. Some focus on the water contamination problems experienced by Milwaukee.
    WATER SUPPLY.

25. U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Water Resources. **WATER SUPPLY POLICY OF THE FEDERAL GOVERNMENT: HEARING, APRIL 26, 1989.** 101st Cong., 1st sess., iii+151p. Washington, DC: 1989.

    Discusses cost and infrastructure concerns, particularly in the West.
    WATER SUPPLY.

26. Viessman, Jr. Warren (University of Florida, Gainesville). **WATER MANAGEMENT ISSUES FOR THE NINETIES**. Water Resources B. v26, n6, p883(9). December 1990.

Water management includes the application of structural and nonstructural measures on problems related to water supply, allocation, quality, extreme events, and environmental protection.
WATER SUPPLY.

27. Wade Miller Associates, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON WATER SUPPLY**. Washington, DC: National Council on Public Works Improvement. 1987.

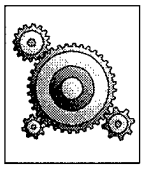
This report was prepared to assist the National Council on Public Works Improvement in examining water supply as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's water supply.
WATER SUPPLY*

28. Walski, T. M. **COST OF WATER DISTRIBUTION SYSTEM INFRASTRUCTURE REHABILITATION, REPAIR, AND REPLACEMENT: FINAL TECHNICAL REPORT**. Vicksburg, MS: Army Engineer Waterways Experiment Station, Environmental Laboratory. March 1985.

This report presents data and estimating procedures for predicting the cost of several types of work involved with maintaining water systems, including cleaning and cement mortar lining of pipes, cathodic protection of buried pipes, repair of pipe breaks and leaks, replacing (relaying) water mains, and chemical addition to produce water that is neither corrosive nor scaleforming. The report is intended to serve as a tool for water supply engineers required to develop planning level cost estimates of alternative rehabilitation measures.
WATER SUPPLY.

29. Water Quality 2000. **A NATIONAL WATER AGENDA FOR THE 21st CENTURY**. Alexandria, VA: Water Environment Federation. November 1992.

This report provides consensus recommendations from a coalition of over 80 public, private, and nonprofit organizations for improvements for water quality policies and programs. Recommendations include promoting wise use of water resources, strengthening existing federal programs, and providing incentives and funding for water quality improvements.
WATER SUPPLY.



6. WASTEWATER TREATMENT

1. Apogee Research, Inc. **AMERICA'S ENVIRONMENTAL INFRASTRUCTURE: A WATER AND WASTEWATER INVESTMENT STUDY**. Washington, DC: Clean Water Council. December 1990.

   This report presents new insights into the extent to which water and wastewater treatment infrastructure supports economic growth and productivity throughout the nation. It documents recent underinvestment in water and wastewater facilities, relative to independent assessments of "needs" in greater detail on a state-by-state basis. Finally, this report presents several options to address the projected shortfall in the level of investment in water and wastewater infrastructure.
   WASTEWATER TREATMENT*/WATER SUPPLY.

2. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON WASTEWATER MANAGEMENT**. Washington, DC: National Council on Public Works Improvement. 1987.

   This report was prepared to assist the National Council on Public Works Improvement in examining wastewater management as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's wastewater management.
   WASTEWATER TREATMENT*

3. Associated General Contractors of America. **FINANCING THE REBUILDING**. Constructor. 1989.

   State revolving loan funds (SRFs) were established in order for states to be able to fund infrastructure improvements. The establishment and administration of an SRF in Texas is discussed in this article. It illustrates how a successful SRF works. The Texas State Water Pollution Control Revolving Fund came into existence on June 17, 1987 by an act of the state legislature. It is a perpetual fund through which the Texas Water Development Board (TWDB) provides low interest loans to Texas communities for construction of wastewater treatment facilities. The fund is managed by the state with minimal federal oversight.
   WASTEWATER TREATMENT.

4. Berger, Bernard B. **THE URBAN WASTEWATER INFRASTRUCTURE**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988.

   WASTEWATER TREATMENT.

5. Burnaby, Priscilla; Herhold, Susan. **WATER AND WASTEWATER TREATMENT**. Government Accounting Standards Board. 1990.

   This report examines Service and Effort Accomplishment measurement and reporting for drinking water, wastewater treatment, and storm drainage.
   WASTEWATER TREATMENT/WATER SUPPLY*

6. Casey, P. **EFFLUENT FEES: POLICY CONSIDERATIONS ON A SOURCE OF REVENUE FOR INFRASTRUCTURE FINANCING**. Springfield, VA: National Technical Information Service. August 1988.

This paper discusses the experience of effluent fees in Europe, and proposes an effluent fee program that would provide needed capital to the State Revolving Fund. The fee would be tied into the National Pollutant Discharge Elimination System permits through gradual implementation. Various options for settling the fee and enforcement procedures are also discussed.
WASTEWATER TREATMENT.

7. Copeland, Claudia. **CLEAN WATER ACT REAUTHORIZATION: ISSUE BRIEF**. Washington, DC: U.S. Congressional Research Service, The Library of Congress.

   Covers priority issues in the Clean Water Act reauthorization, including municipal wastewater treatment programs and impacts on small communities.
   WASTEWATER TREATMENT.

8. Copeland, Claudia. **CLEAN WATER ACT LEGISLATION: SUMMARY OF S. 1114**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. June 1993.

   This CRS report summarizes legislation introduced by Max Baucus and John Chafee to reauthorize the Clean Water Act, S. 1114. The report includes an introduction that places the bill within a legislative and political context and introduces the Clean Water Act. Each section of the bill is summarized separately.
   WASTEWATER TREATMENT.

9. Copeland, Claudia. **WASTEWATER TREATMENT: OVERVIEW AND BACKGROUND**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

   The availability of funding for the construction of municipal sewage treatment plants continues to be a major concern of cities and states and will be a key issue for reauthorization of the Clean Water Act.
   WASTEWATER TREATMENT.

10. Ernst & Young. **ERNST AND YOUNG 1992 NATIONAL WATER AND WASTEWATER RATE SURVEY**. Charlotte, NC: 1992.

    WASTEWATER TREATMENT/WATER SUPPLY.

11. Gillette, Becky. **EVERYTHING'S DUCKY: MORE AND MORE AMERICAN CITIES AND COUNTIES ARE OPTING FOR WASTEWATER TREATMENT FACILITIES THAT ESCHEW EXPENSIVE TECHNOLOGY**. American City and County; 108:36-8+. February 1993.

    The use of aquatic plants in artificially created marshlands are discussed as a means of wastewater purification.
    WASTEWATER TREATMENT.

12. Grigg, N. S. **URBAN WATER INFRASTRUCTURE: PLANNING, MANAGEMENT, AND OPERATIONS**. Fort Collins, CO: John Wiley and Sons. 1986.

This book, written for engineers, planners, and managers, describes potential solutions to the infrastructure problem. Topics covered in the 11 chapters are: managing urban water systems, cooperation and integration in the urban water system, urban water supply systems, wastewater management systems, stormwater and combined sewer systems, planning and management essentials, engineering essentials, computer-based decision support systems, managing operations and maintenance, automating operations of urban water systems, and future issues in urban water management.
WASTEWATER TREATMENT/WATER SUPPLY.

13. Harleman, Donald R. F. **CUTTING THE WASTE IN WASTEWATER CLEANUPS: RATHER THAN MANDATE TECHNOLOGICAL FIXES TO WATER POLLUTION PROBLEMS, CONGRESS SHOULD LET COASTAL COMMUNITIES USE INNOVATIVE APPROACHES TO SOLVE THEM**. Technology Review: 93:60-8. April 1990.

    Municipal cost problems in meeting EPA requirements.
    WASTEWATER TREATMENT.

14. Heilman, J. G.; Johnson, G. W. **THE POLITICS AND ECONOMICS OF PRIVATIZATION: THE CASE OF WASTEWATER TREATMENT**. xiv+235p. 1992.

    Examines public-private partnerships in infrastructure development through case studies of three U.S. sewage treatment projects: Auburn, Alabama; Mount Vernon, Illinois; the Western Carolina Regional Sewer Authority (South Carolina).
    WASTEWATER TREATMENT.

15. Heilman, J. G.; Johnson, G. W. **SYSTEM AND PROCESS IN CAPITAL-INTENSIVE PRIVATIZATION: A COMPARATIVE CASE STUDY OF MUNICIPAL WASTEWATER TREATMENT WORKS**. Policy Studies Review.1989.Vol 8,Issue 3.

    Capital-intensive privatization (CIP) is an option for infrastructure project development. Advocates claim that CIP generates cost savings through efficiencies inherent in the coordinated design, construction, and operation of facilities. The present paper assesses these claims in the field of municipal wastewater treatment facilities (WIWs). It presents case-study results and aggregate data on seven of the first privatized WIWs, and on seven comparable grant-funded facilities. It concludes that CIP changes the system of players and the processes through which they interact.
    WASTEWATER TREATMENT.

16. Holcombe, Randall G. **PRIVATIZATION OF MUNICIPAL WASTEWATER TREATMENT**. Public Budgeting and Finance; 11(3), pages 28-42. September 1991.

    Privatization of wastewater treatment facilities was encouraged by changes in the law and in the attitude of government officials during the early 1980s. The idea was for localities to benefit from the efficiency gains expected when operations were transferred from municipal administration to a profit-making organization. However, significant differences between the ideal and reality often existed, particularly when contracts all but eliminated the profit motive.
    WASTEWATER TREATMENT*

17. Holcombe, Randall G. **REVOLVING FUND FINANCE: THE CASE OF WASTEWATER TREATMENT**. Public Budgeting and Finance; 12(3), pages 50-65. September 1992.

This article examines the general topic of revolving fund finance by looking at the specific case of wastewater treatment. The analysis that follows focuses on the organization and administration of the fund to see what types of benefits are generated for the future rather than the present.
WASTEWATER TREATMENT.

18. Hurley, J. M. **DEVELOPER FINANCING OF PUBLIC WASTEWATER SERVICE INFRASTRUCTURE**. Journal - Water Pollution Control Federation JWPFA5, Vol. 60, No. 5, p 608-613. May 1988.

    With changes in the roles of federal, state, and local governments relative to infrastructure financing and the shift to greater use of public-private partnerships, developer financing has surfaced as an important means of providing major off-site public facilities for new development. In pursuit of the developer financing alternative, Anne Arundel County, Maryland, has defined terms for contract negotiations. The county has negotiated agreements with developers that go beyond the traditional requirement for developers to construct and dedicate the on-site sewer lines necessary to serve their projects.
    WASTEWATER TREATMENT.

19. Kracht, Jeffrey K.; Westerhoff, Garrett P. **WASTEWATER REUSE: INFRASTRUCTURE DEVELOPMENT BASED UPON LEASE PURCHASE FINANCING**. Conserv 90 The National Conference and Exposition Offering Water Supply Solutions for the 1990s. 1990.

    The author suggests lease/purchase financing as an approach to funding wastewater reclamation facilities. The benefits and mechanism of lease/purchase financing are discussed.
    WASTEWATER TREATMENT.

20. McConnell, Virginia D.; Schwarz, Gregory E. **THE SUPPLY AND DEMAND FOR POLLUTION CONTROL: EVIDENCE FROM WASTEWATER TREATMENT**. Journal of Environmental Economics and Management; 23(1), pages 54-77. July 1992.

    This paper analyzes the determination of pollution control from wastewater treatment plants as an economic decision facing local or regional regulators. Pollution control is measured by plant design effluent concentration levels and is fully endogenous in a supply-and-demand model of treatment choice. On the supply side, plant costs are a function of the design treatment level of the plant, and on the demand side, treatment level is a function of both the costs of control and the regional or regulatory preferences for control. The authors find evidence that the economic model of effluent choice by local regulators has a good deal of explanatory power.
    WASTEWATER TREATMENT.

21. O'Toole, Laurence J. **GOAL MULTIPLICITY IN THE IMPLEMENTATION SETTING: SUBTLE IMPACTS AND THE CASE OF WASTEWATER TREATMENT PRIVATIZATION**. Policy Studies Journal; 18:1-20. September 1989.

    Top-down and bottom-up perspectives on intergovernmental action on behalf of wastewater treatment.
    WASTEWATER TREATMENT.

22. Paterson, Robert G. **SEWERING THE COAST: BANE OR BLESSING TO MARINE WATER QUALITY**. Coastal Management; 19:239-52. April 1991.

Wastewater and sewage management issues associated with increasing development of coastal regions are presented with data from 161 jurisdictions in the southeastern U.S.
WASTEWATER TREATMENT.

23. Raftelis, George A. **THE ARTHUR YOUNG GUIDE TO WATER AND WASTEWATER FINANCE AND PRICING**. Washington, DC: Lewis Publishers. 1991.

This guide provides a review of financing and pricing strategies for the provision of wastewater services. Financing mechanisms described include bonds, short-term financing, credit enhancements, capital recovery charges, and privatization. The wastewater pricing process is discussed, including identification of revenue requirements, costing of services, designing water and wastewater rate structures, and the comparison for rates among different utilities. An appendix provides calculations of capital recovery charges under alternative approaches.
WATER RESOURCES/WASTEWATER TREATMENT.

24. U.S. Environmental Protection Agency, Center for Environmental Research Information. **HANDBOOK: SEWER SYSTEM INFRASTRUCTURE ANALYSIS AND REHABILITATION**. Cincinnati, OH: October 1991.

The Handbook provides guidance on the evaluation and rehabilitation of existing sewers. It presents information on typical problems, procedures and methods for rehabilitation, case study information, budgetary costs, advantages and disadvantages of rehabilitation techniques, and application of these techniques and materials/equipment used in rehabilitation.
WASTEWATER TREATMENT.

25. U.S. Environmental Protection Agency, Office of Water. **1990 NEEDS SURVEY: REPORT TO CONGRESS: ASSESSMENT OF NEEDED PUBLICLY OWNED WASTEWATER TREATMENT FACILITIES IN THE UNITED STATES -- INCLUDING FEDERALLY RECOGNIZED INDIAN TRIBES AND ALASKA NATIVE VILLAGES**. Washington, DC: November 1991.

WASTEWATER TREATMENT.

26. U.S. Environmental Protection Agency, Office of Water, Office of Wastewater, Enforcement, and Compliance. **MUNICIPAL WASTEWATER REUSE: SELECTED READINGS ON WATER REUSE**. Washington, DC: iv+74p: 1991.

Focuses on projects demonstrating successful effluent reclamation and recycling.
WATER SUPPLY/WASTEWATER TREATMENT.

27. U.S. General Accounting Office. **WATER POLLUTION: STATE REVOLVING FUNDS INSUFFICIENT TO MEET WASTEWATER TREATMENT NEEDS**. Washington, DC: January 1992.

On the basis of GAO's survey of state officials responsible for SRFs, visits to five states, and consultations with financial experts and others, GAO concluded that although the SRF program is structurally sound, a number of provisions of the 1987 Amendments to the Clean

Water Act and administrative problems may hamper the efficiency and effectiveness of its implementation.
WASTEWATER TREATMENT*

28. U.S. General Accounting Office. **WATER POLLUTION: STATES' PROGRESS IN DEVELOPING REVOLVING LOAN FUND PROGRAMS**. Washington, DC: March 1991.

States are developing SRF programs at different paces. While many SRFs are not in final form, all 50 states and Puerto Rico have developed statutory and administrative frameworks.
WASTEWATER TREATMENT.

29. U.S. General Accounting Office. **WATER POLLUTION: ISSUES CONCERNING STATE REVOLVING LOAN FUND PROGRAMS**. Washington, DC: April 1991.

This GAO report presents testimony of Richard L. Hembra, Director of Environmental Protection Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office before the Subcommittee on Water Resources, Committee on Public Works and Transportation of the U.S. House of Representatives. According to Mr. Hembra's testimony, all 50 states have created State Revolving Loan Fund Programs (SRFs) and have received at least one capital grant. These programs are generally similar in structure, but will become increasingly different as states customize their programs over time. States officials maintain that several key statutory and regulatory changes, including allowing of land not directly used in the treatment process to be eligible for SRF assistance, would increase the effectiveness of the SRF Program. The testimony includes key characteristics of state programs, lists questionable SRF statutory and regulatory requirements, and provides preliminary observations of states' ability to meet needs through SRF. Survey information gathered to date indicates that SRFs will only meet about one-third of states' wastewater treatment needs over the next ten years.
WASTEWATER TREATMENT.

30. U.S. General Accounting Office. **WATER POLLUTION: ALTERNATIVE STRATEGIES NEEDED TO REDUCE WASTEWATER TREATMENT COSTS**. Washington, DC: August 1992.

GAO study suggests that several barriers may be impeding the use of promising alternative technologies, including insufficient information about the alternatives, institutional biases towards conventional treatment technologies, and private-sector financial disincentives for using these alternatives.
WASTEWATER TREATMENT.

31. U.S. General Accounting Office. **WATER POLLUTION: NONINDUSTRIAL WASTEWATER POLLUTION CAN BE BETTER MANAGED**. Washington, DC: December 1991.

This GAO report discusses the range, sources, and seriousness of pollutants found in nonindustrial wastewater; strategies and programs developed by local and state governments to better manage and control these pollutants; and federal options that might encourage or require better management and control of nonindustrial wastewater pollution. Recommendations are made to the U.S. Environmental Protection Agency to better manage, control, and possibly reduce nonindustrial wastewater pollution. Recommendations include:

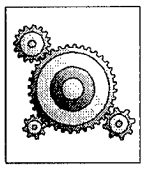
(1) requiring major wastewater treatment plants to identify the most serious nonindustrial pollutants entering their facilities and the sources of these pollutants, and report on efforts to control them; (2) exercising the EPA's authority under the Toxic Substance Control Act to restrict or ban substances, or require manufacturers to place warning labels on their products to alert consumers of their products' risks.
WASTEWATER TREATMENT.

32. U.S. House of Representatives, Committee on Merchant Marine and Fisheries. **NATIONAL CLEAN WATER INVESTMENT CORPORATION AND OPTIONS FOR CLEAN WATER FUNDING: HEARING, AUGUST 11, 1992, BEFORE THE SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT AND THE SUBCOMMITTEE ON OCEANOGRAPHY, GREAT LAKES AND THE OUTER CONTINENTAL SHELF ON THE FUTURE COURSE OF THE FEDERAL CLEAN WATER ACT AND A PROPOSAL TO ESTABLISH A NATIONAL CLEAN WATER INVESTMENT CORPORATION**. 102nd Cong., 2d sess., v+138p. Washington, DC: 1992.

Discusses financing state and municipal water pollution control projects. Proposes charging fees for wastewater discharges and for pesticide and fertilizer use to set up the corporation.
WASTEWATER TREATMENT/WATER RESOURCES.

33. U.S. Senate, Committee on Environment and Public Works. **PROTECTION OF MARINE AND COASTAL WATERS: JOINT HEARINGS, JULY 12-AUGUST 11, 1989, ON S.587,[AND OTHER] BILLS CONCERNING RESEARCH AND PROTECTION OF MARINE AND COASTAL WATERS, BEFORE THE SUBCOMMITTEE ON SUPERFUND, OCEAN, AND WATER PROTECTION AND THE SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION**. 101st Cong., 1st sess, iv+579p. Washington, DC: 1990.

Discusses proposals to establish regional research programs and reduce pollution from industrial plants and sewage treatment facilities.
WASTEWATER TREATMENT.



7. WATER RESOURCES

1. Aggarwal, Raj. **THE EXPORT OF HIGH VALUE ADDED PRODUCTS: THE ROLE OF INTERNATIONAL PORT AND CARRIER SERVICES**. Journal of Global Marketing. 2:65-80 no 4. 1989.

   This report describes the efforts/interaction of ports and carriers handling U.S. imports to improve the efficiency of trade.
   WATER RESOURCES.

2. American Association of State Highway and Transportation Officials. **WATER TRANSPORTATION REPORT: A SUMMARY OF MAJOR ISSUES AFFECTING THE NATION'S WATER TRANSPORTATION SYSTEM**. Washington, DC: 1989.

   This report identifies major issues which affect the nation's water transportation system.
   WATER RESOURCES.

3. American Association of State Highway and Transportation Officials, Standing Committee on Water Transportation. **SURVEY OF STATE FUNDING OF LANDSIDE PORT FACILITIES, CARGO TERMINALS AND HARBOR IMPROVEMENTS PROJECTS, 1977-1988**. Washington, DC: 1989.

   This survey provides information on how state governments conduct needed port and terminal development and harbor improvement projects in light of increasing costs and changing federal and state responsibilities.
   WATER RESOURCES.

4. Association of Metropolitan Sewerage Agencies. **APPROACHES TO COMBINED SEWER OVERFLOW PROGRAM DEVELOPMENT: A CSO ASSESSMENT REPORT**. November 1994.

   This comprehensive report discusses CSO control programs in twenty-one communities. The information assists in characterizing the site-specific nature of CSOs, placing CSOs in context with other water quality issues and understanding water quality goals and the processes used to establish the basis for CSO control programs. The report examines options for CSO controls and associated costs of programs by factually describing effective CSO control efforts that are completed or underway nationally.
   WATER RESOURCES*

5. Ferguson, Bruce K. **URBAN STORMWATER MANAGEMENT BIBLIOGRAPHY**. 15p. 1989.

   This report focuses on the technical tracking of volumes of water. Environmental hydrology, runoff from individual storms, conveyance and erosion control, flood control, stormwater facilities, and other issues are discussed.
   WATER RESOURCES.

6. Fuller, Stephen; Grant, Warren. **EFFECT OF LOCK DELAY ON GRAIN MARKETING COSTS: AN EXAMINATION OF THE UPPER MISSISSIPPI AND ILLINOIS WATERWAYS**. Logistics and Transportation Review; 29(1), pages 81-95. March 1993.

   The paper evaluates the effect of lock delay on the efficiency of marketing the north central U.S.'s corn and soybean production via the upper Mississippi and Illinois waterways. The

analysis is accomplished with a multicommodity least-cost network flow model. Lock delay was found to have an important effect on the cost of barging the region's surplus grain production. If the lock and dam system on the upper Mississippi and Illinois waterways is not continually upgraded, grain is redirected to less efficient modes, thus increasing the cost of marketing the region's grain surplus. These increased costs need to be weighed against the costs of upgrading lock capacity.
WATER RESOURCES.

7. Hanson, Royce. **WATER SUPPLY AND DISTRIBUTION: THE NEXT 50 YEARS**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

   WATER SUPPLY/WATER RESOURCES.

8. Hayes, Douglas L. **THE ALL AMERICAN CANAL LINING PROJECT: A CATALYST FOR RATIONAL AND COMPREHENSIVE GROUND WATER MANAGEMENT OF THE UNITED STATES MEXICO BORDER**. Natural Resources Journal; 31(4), pages 803-27. September 1991.

   WATER RESOURCES.

9. Interagency Floodplain Management Review Committee. **SHARING THE CHALLENGE: FLOODPLAIN MANAGEMENT IN THE 21ST CENTURY**. June 1994.

   This report by the Interagency Floodplain Management Review Committee proposes a better way to manage floodplains. It suggests runoff control, land use and ecosystem management measures that can reduce hazards associated with flooding. The report also proposes legislation to develop and fund a national Floodplain Management Program.
   WATER RESOURCES*

10. Kuby, Michael; Reid, Neil. **TECHNOLOGICAL CHANGE AND THE CONCENTRATION OF THE U.S. GENERAL CARGO PORT SYSTEM**. Economic Geography. 68:272-89. July 1992.

    Argues that cargo port traffic became more concentrated because of containerization, larger ships and trains, and computerization of freight tracking and billing.
    WATER RESOURCES.

11. Lambert, Jeremiah D.; O'Neill, James Richard. **PRIVATIZATION OF MUNICIPAL HYDROELECTRIC FACILITIES UNDER CURRENT LAW**. Public Utilities Fortnightly: 121:11-17. February 4, 1988.

    Examines leveraged lease financing of hydropower facilities as an alternative to municipal bond financing.
    WATER RESOURCES.

12. Le, Blanc Louis A. **THE IMPACT OF INFORMATION TECHNOLOGY ON MARITIME SAFETY: THE EFFECT OF GOVERNMENT POLICY**. Journal of the Transportation Research Forum. 29:403-12 no 2. 1989.

Describes a U.S. Coast Guard vessel movement reporting system, a traffic service for navigators on the lower Mississippi River.
WATER RESOURCES.

13. Maio, D. **PORT NEEDS STUDY (VESSEL TRAFFIC SERVICES BENEFITS): STUDY OVERVIEW**. Washington, DC: U.S. Department of Transportation; 20p. 1991.

Documents the benefits and costs of potential U.S. Coast Guard Vessel Traffic Services (VTS) in selected U.S. deep water ports on the Atlantic, Gulf, and Pacific coasts. Prepared for the U.S. Coast Guard. Topics include casualties and risk, environmental and marine life loss and cleanup activities.
WATER RESOURCES.

14. Maniatis, Melina Ed. **STORMWATER MANAGEMENT**. Management Information Service Report. 22:1-15. November 1990.

Tracking of rainwater runoff is the issue presented, with case studies of Bellevue, Washington; Cincinnati, Ohio; Asheville, North Carolina; and Port Orange, Florida.
WATER RESOURCES/WATER SUPPLY.

15. Marsalek, J.; Schilling, K. E.; Porter, E. **STORMWATER MANAGEMENT TECHNOLOGY: RECENT DEVELOPMENTS AND EXPERIENCE**. Urban Water Infrastructure: Proceedings of a NATO Workshop. Isle of Man, Canada: National Water Resources Institute. 1990.

During the last 20 years, urban stormwater management has evolved from fast removal of runoff to comprehensive and cost-effective management approaches providing not only flood protection and drainage convenience, but also minimizing runoff impacts on the receiving waters. Modern stormwater management approaches, which are based on implementation of stormwater quantity and quality controls in various parts of urban catchments and their drainage systems, are reviewed.
WATER RESOURCES.

16. Olson, David J. **GOVERNANCE OF U.S. PUBLIC PORTS: A PRELIMINARY SURVEY OF KEY ISSUES**. Washington, DC: Marine Port Board Governance Roundtable. November 1992.

WATER RESOURCES.

17. Raftelis, George A. **THE ARTHUR YOUNG GUIDE TO WATER AND WASTEWATER FINANCE AND PRICING**. Washington, DC: Lewis Publishers. 1991.

This guide provides a review of financing and pricing strategies for the provision of wastewater services. Financing mechanisms described include bonds, short-term financing, credit enhancements, capital recovery charges, and privatization. The wastewater pricing process is discussed, including identification of revenue requirements, costing of services, designing water and wastewater rate structures, and the comparison for rates among different utilities. An appendix provides calculations of capital recovery charges under alternative approaches.
WATER RESOURCES/WASTEWATER TREATMENT.

18. Roesner, L. A.; Walesh, S. G. **URBAN WATER RESOURCES ISSUES IN THE 21ST CENTURY**. Journal of Professional Issues in Engineering. New York, NY: American Society of Civil Engineers. 1988.

The Urban Water Resources Research Council identifies four critical engineering issues that must be addressed in the 21st century: water supply, storm water management, combined sewer systems, and engineering education.
WATER RESOURCES/WATER SUPPLY.

19. Rosen, Michael D.; Sexton, Richard J. **IRRIGATION DISTRICTS AND WATER MARKETS: AN APPLICATION OF COOPERATIVE DECISION MAKING THEORY**. Land Economics; 69(1), pages 39-53. February 1993.

Water supply organizations control a large portion of agricultural water rights in the western U.S. This paper applies cooperative and club theory models to analyze the response of these organizations to potential rural-to-urban water transfers.
WATER RESOURCES.

20. Schilling, Kyle; Copeland, Claudia; Dixon, Joseph; Smyth, James; Vincent, Mary; and Peterson, Janice. **THE NATION'S PUBLIC WORKS: REPORT ON WATER RESOURCES**. Washington, DC: National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining water resources as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's water resources.
WATER RESOURCES*

21. Stavins, Robert N.; Jaffe, Adam B. **UNINTENDED IMPACTS OF PUBLIC INVESTMENTS ON PRIVATE DECISIONS: THE DEPLETION OF FORESTED WETLANDS**. American Economic Review; 80(3), pages 337-52. June 1990.

By affecting relative economic returns, infrastructure investments can induce major changes in private land use. The authors find that 30 percent of forested wetland depletion in the Mississippi Valley has resulted from private decisions induced by federal flood-control projects, despite explicit federal policy to preserve wetlands. The model aggregates individual land-use decisions using a parametric distribution of unobserved land quality; dynamic simulations are used to quantify the impacts on wetlands of federal projects and other factors.
WATER RESOURCES.

22. Transportation Research Board, National Research Council. **INTERIM REPORT: IMPEDIMENTS TO LANDSIDE ACCESS TO U.S. GENERAL CARGO PORTS**. Washington, DC: U.S. Government Printing Office. 1991.

This report assesses the adequacy of landside access to U.S. general cargo ports. It reviews the current bottlenecks at U.S. ports and it identifies several options that would help balance the national interest with state and metropolitan area priorities.
WATER RESOURCES.

23. Transportation Research Board, National Research Council. **LANDSIDE ACCESS TO U.S. PORTS**. Washington, DC: National Academy Press. 1993.

U.S. seaports have become critical transfer points in the intermodal network that moves the nation's international cargo. The efficiency of this intermodal connection could be threatened, by increasing bottlenecks in the landside transportation system. This report identifies land use, environmental, and institutional impediments to improved landside transportation and suggests ways to over come these impediments.
WATER RESOURCES.

24. The Universities Council on Water Resources. **WATER RESOURCES UPDATE: WATER RESOURCES INFRASTRUCTURE**. Carbondale, IL: 1991(Issue No. 86).

    Several recent studies have highlighted the crisis in the U.S. infrastructure needs as an issue of major economic importance. Fiscal concerns, as well as institutional and organizational bureaucracy, have been raised. Drinking water distribution systems, wastewater treatment, irrigation, and water transportation are integral parts of the infrastructure. This volume presents an overview in five papers of federal strategies and options for national infrastructure renewal. The evaluations and management of water distribution systems are examined and implications explored for future research and practice.
    WATER RESOURCES.

25. U.S. Army Corps of Engineers. **NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT: THE REPORT TO U.S. CONGRESS**. Washington, DC: Water Resources Support Center, Institute for Water Resources. September 1994.

    This report is one of 17 reports that will be produced under the National Study of Water Management During Drought with the objective of finding better ways to manage water during drought. The report includes the main technical summary of the innovative approaches that were developed and used during the National Drought Study, conducted under the authority of Sections 707 and 729 of the Water Resources Development Act of 1986. The innovative approaches under the National Drought Study include improved computer modeling, new organizational and management approaches, and incentive approaches to water management.
    WATER RESOURCES*

26. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **VISION 21: A STRATEGIC ASSESSMENT OF THE NATION'S WATER RESOURCES NEEDS**. Fort Belvoir, VA: March 1990.

    This draft report by the U.S. Army Corps of Engineers surveys the current trends and policy issues likely to affect water resources planning, management, and development until the end of this century. Water resources as related to economic productivity, intergovernmental relations, environmental management are examined. The report also discusses water uses, water sources, and the impact of climate change. The report concludes with an assessment of water resource trends and policy implications.
    WATER RESOURCES.

27. U.S. Bureau of Reclamation. **HYDROPOWER 2002: RECLAMATION'S ENERGY INITIATIVE**. Washington, DC: xxi+93p: 1991.

Achievements of the Bureau of Reclamation in the further development of hydroelectric energy and strategies for meeting future energy needs in an environmentally acceptable manner through improvements in hydropower projects and effective management.
WATER RESOURCES.

28. U.S. General Accounting Office. **WATER RESOURCES: FACTORS THAT LEAD TO SUCCESSFUL COST SHARING IN CORPS PROJECTS**. Washington, DC: August 1993.

    This GAO report examines the three primary factors that lead to successful cost sharing in Corps projects. These factors are 1) good communications between the Corps and sponsor, 2) the sponsor's significant involvement in decisions and activities, and 3) the Corps' responsiveness to the sponsor's concerns about cost sharing. The report presents background information on proposed civil works construction projects and five appendices displaying various graphics, charts, and tables regarding Corps activities.
    WATER RESOURCES.

29. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Energy and Power. **NATIONAL ENERGY STRATEGY: HEARINGS: PARTS. 1-7, FEBRUARY 20-SEPTEMBER 20, 1991.** 102nd Cong., 1st sess., 7pts. Washington, DC: 1991.

    Testimony covers a variety of issues: oil and gas, motor vehicle fuel consumption, electric utilities, fuel efficiency, alternative fuels, electricity regulation, transmission access, strategic petroleum reserve, gas pipelines, gasoline pump labeling, hydropower, global warming, and oil policy.
    WATER RESOURCES.

30. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Energy And Power. **STATE CONTROL OF WATER RESOURCES: HEARING, JUNE 4, 1991, ON H.R. 649, A BILL TO AMEND THE FEDERAL POWER ACT**. 102nd Cong., 1st sess., iii+150p. Washington, DC: 1992.

    Proposed legislation that gives the state greater control over stream flow at national hydroelectric facilities.
    WATER RESOURCES.

31. U.S. House of Representatives, Committee on Merchant Marine and Fisheries. **NATIONAL CLEAN WATER INVESTMENT CORPORATION AND OPTIONS FOR CLEAN WATER FUNDING: HEARING, AUGUST 11, 1992, BEFORE THE SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT AND THE SUBCOMMITTEE ON OCEANOGRAPHY, GREAT LAKES AND THE OUTER CONTINENTAL SHELF ON THE FUTURE COURSE OF THE FEDERAL CLEAN WATER ACT AND A PROPOSAL TO ESTABLISH A NATIONAL CLEAN WATER INVESTMENT CORPORATION**. 102nd Cong., 2d sess., v+138p. Washington, DC: 1992.

    Discusses financing state and municipal water pollution control projects. Proposes charging fees for wastewater discharges and for pesticide and fertilizer use to set up the corporation.
    WASTEWATER TREATMENT/WATER RESOURCES.

32. U.S. Senate, Committee on Environment and Public Works, Subcommittee on Water Resources, Transportation, and Infrastructure. **WATER RESOURCES INFRASTRUCTURE: NEEDS**

AND IMPACTS: HEARING, MARCH 4, 1992. 102d Cong., 2d sess., iii+71p. Washington, DC: 1992.

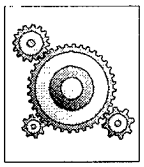
Potential federal initiatives in water surface transportation. Covers improvements in rivers, canals, and other waterways, ports and terminals, and integrated and inter-modal systems. WATER RESOURCES.

33. Vallianos, L.; Stakhiv, E. Z. **DEVELOPING A FEDERAL INFRASTRUCTURE STRATEGY**. Water Resources Update. Water Resources Infrastructure. Issue No. 86, Autumn, 1991. p 15-19. 4 ref.

Within the federal infrastructure establishment there is an increasing awareness of the desirability of strengthening agency linkages and broadening the scope of interagency coordination. Among the basic initial objectives are the enhancement of interagency exchanges of information and sharing of strategies, procedures, and resources (such as research-laboratory facilities).
WATER RESOURCES.

34. Wanielista, Martin P. **STORMWATER MANAGEMENT**. New York, NY: J. Wiley & Sons. 1993.

WATER RESOURCES.



8. SOLID WASTE

1. Achs, Nicole. **ALL DRESSED UP AND NOWHERE TO GO: THE COLLECTION PROGRAMS ARE IN PLACE, THE RECYCLABLES HAVE BEEN SEPARATED; NOW WHAT?** American City and County; 106:26-7+. November 1991.

   Discusses concerns over the growing gap between successful collection programs and availability of recycling facilities in U.S. cities.
   SOLID WASTE.

2. Alter, Harvey. **COST OF RECYCLING MUNICIPAL SOLID WASTE WITH AND WITHOUT A CONCURRENT BEVERAGE CONTAINER DEPOSIT LAW.** Journal of Consumer Affairs; 27(1), pages 166-86. June 1993.

   The purpose of this article is to contribute to the literature on the effect of beverage container deposit legislation (BCDL) on the cost and amount of the household portion of municipal solid waste recycled. A U.S. General Accounting Office report concluded that dual systems cost more than either alone and that the combination diverts a greater amount of solid waste from landfills, a conclusion supported by this analysis.
   SOLID WASTE.

3. Anderson, Deborah D.; Burnham, Laurie (Procter & Gamble, Cincinnati, OH). **TOWARD SUSTAINABLE WASTE MANAGEMENT.** Issues Science Technical v9, n1, p65(8). September 1992.

   Technology development and environmental concerns will shape the future of industrial waste management policies. Improvements will come as waste management plans and policies are developed and implemented. These policies might include the options of source reduction, waste reprocessing, and waste-to-energy conversions in landfills and incinerators.
   SOLID WASTE*

4. Berenyi, Eileen B.; Gould, Robert N. **RESOURCE RECOVERY YEARBOOK, 1993-94: DIRECTORY & GUIDE.** New York, NY: Governmental Advisory Associates, Inc.; 6th ed. xxxiv+670p. 1993.

   Technical and economic overview of waste-to-energy efforts and practices; provides specific data on 325 resource recovery facilities.
   SOLID WASTE.

5. Bernstein, Norman W. **TO CLEAN UP LANDFILLS, THE LEADER SHOULD BE MUNICIPALITIES USING ECONOMIC INCENTIVES TO SETTLE.** Environmental Law Reporter; 19:10012-15. January 1989.

   The issue of this paper is contaminated municipal landfill sites. It urges municipalities to take the initiative in developing settlements with polluting companies. New York City is presented as a case study.
   SOLID WASTE/HAZARDOUS WASTE.

6. Carolan, Milou. **RECYCLING SOLID WASTE**. Management Information Service Report. 21:1-14. June 1989.

Provides case studies of local solid waste management initiatives in Newark, New Jersey; South Berwick, Maine; and San Jose, California.
SOLID WASTE.

7. Carolan, Milou. **REGIONAL APPROACHES TO ENVIRONMENTAL MANAGEMENT**. Public Management. 72:15-20. March 1990.

Cooperation of local authorities on the city and county level in the area of solid waste disposal.
SOLID WASTE.

8. Chertow, Marian R. **GARBAGE SOLUTIONS: A PUBLIC OFFICIAL'S GUIDE TO RECYCLING ALTERNATIVE SOLID WASTE MANAGEMENT TECHNOLOGIES**. Washington, DC: U.S. Conference of Mayors. 1989.

SOLID WASTE.

9. Darcy, William R. **THE ARGUMENTS FOR PUBLIC OWNERSHIP OF MATERIALS RECOVERY FACILITIES**. Resource Recycling; 10:57-9. June 1991.

Cost and other efficiencies associated with government ownership of municipal recycling services are discussed.
SOLID WASTE.

10. Fishbein, Bette K.; Gelb, Caroline. **MAKING LESS GARBAGE: A PLANNING GUIDE FOR COMMUNITIES**. xii+179p. 1992.

Describes municipal planning to reduce the amount and toxicity of waste within existing government and institutional programs.
SOLID WASTE/HAZARDOUS WASTE.

11. Gomez-Ibanez, Jose A.; Meyer, John R.; Luberoff, David E. (Harvard University). **SOLID WASTE DISPOSAL: PUBLIC OR PRIVATE?** CHEMTECH. v22, n2, p78(8). February 1992.

An emerging interest in privatization, based primarily on the belief that private interests operate with greater efficiency than the government, opens the entire prospect of infrastructure privatization. Examined are solid-waste disposal facilities, a business traditionally owned and operated by the private sector as a means of testing this hypothesis, including the evolution of the solid-waste disposal industry, the investment required for the infrastructure, the relative operating cost-efficiency of private vs. government management, problems in establishing disposal sites, and the pricing and regulation of rates.
SOLID WASTE*

12. Gottlieb, Robert (Planning Advisory Service). **SOLID WASTE MANAGEMENT: PLANNING ISSUES AND OPPORTUNITIES**. 71p. 1990.

This report presents options, legislation, and case studies of solid waste management. Topics include incineration, landfills, reduction, reuse, and recycling.
SOLID WASTE.

13. International City/County Management Association, Municipal Data Service. **COSTS AND FINANCING OF SOLID WASTE COLLECTION**. 1991.

Residential, industrial, and commercial waste collection programs in U.S. municipalities are discussed. Costs include personnel, equipment, supplies, contract services, and recycling and hazardous waste programs. Funding includes user fees, special tax levies, and payment from other governments.
SOLID WASTE.

14. Jenkins, Robin R. **THE ECONOMICS OF SOLID WASTE REDUCTION: THE IMPACT OF USER FEES. NEW HORIZONS IN ENVIRONMENTAL ECONOMICS**. Brookfield, CT: E. Elgar Pub. 1993.

SOLID WASTE.

15. Kashmanian, Richard M.; Spencer, Robert L. (Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency). **COST CONSIDERATIONS OF MUNICIPAL SOLID WASTE COMPOST: PRODUCTION VERSUS MARKET PRICES**. Compost Sci Util. v1, n1, p20(18). 1993.

The need to develop a variety of markets for composting facility end-products in the U.S. is critical to the future growth potential for composting and its success. Composting facilities should contrast the costs for building or improving their composting programs to the associated economic returns. Most facilities are making modifications in order to improve both facility operation and compost quality. These modifications cover type of feedstock, front-end processes, composting systems, and final compost processing.
SOLID WASTE.

16. Klein, Yehuda L.; Robison, H. David. **SOLID WASTE DISPOSAL COSTS, PRODUCT PRICES, AND INCENTIVES FOR WASTE REDUCTION**. Atlantic Economic Journal; 21(1), pages 56-65. March 1993.

This paper uses a standard input-output technique to examine the impact of solid waste disposal costs on product prices for the years 1977, 1982, and 1985. Unlike air and water pollution, solid waste disposal is an example where markets, at least partially, deal with externality problems. As the cost of using land as a disposal site rises, firms are encouraged to improve efficiency, explore new technologies, and recycle materials to reduce the volume of wastes generated. Further, because the cost of waste disposal directly affects the price of the product, waste disposal costs also affect consumer demand.
SOLID WASTE.

17. Lawson, P. S. **MUNICIPAL SOLID WASTE CONVERSION TO ENERGY**. Biomass & Bioenergy. 1992.2(1-6).

In recent years it has been recognized by an increasing number of nations that there is considerable energy potential within MSW. As a result many countries have established R&D programs to examine methods of exploiting this potential. The International Energy Agency's

MSW Conversion Activity was set up in 1986 to provide an infrastructure for sharing information and coordinating work in this area internationally. This paper describes the achievements of the Activity and discusses work proposed for the future.
SOLID WASTE.

18. Lucido, Salvadore J. **LANDFILL MANAGEMENT**. Management Information Service Report; 22:1-16. October 1990.

This report covers landfill siting. Covers public opposition and siting considerations, public and private landfilling, new technologies, and benefits and problems of landfill closure.
SOLID WASTE/HAZARDOUS WASTE.

19. Magnuson, Anne. **COMPOSTING: DIRTY WORD OR WASTE SOLUTION?** American City and County; 107:28-30+. May 1992.

This article provides examples of mixed organic waste composting facilities being used to process municipal solid waste.
SOLID WASTE.

20. McCarthy, James E. **INTERSTATE SHIPMENT OF MUNICIPAL SOLID WASTE.** Washington, DC: U.S. Congressional Research Service, The Library of Congress. August 1993.

Reports on a telephone survey of state waste management officials to determine the total amount of solid waste crossing state lines for disposal, the origins and destinations of such waste, and recent trends in waste shipments.
SOLID WASTE.

21. McMahon, Jim (Independent Institute, Golden CO). **A RECYCLING STRATEGY FOR ANYTOWN, U.S.A.** BioCycle. v32, n8, p72(2). August 1991.

An eight-point program outlines a successful municipal recycling strategy with the inherent ability to adapt its outcome to any location.
SOLID WASTE.

22. Menell, Peter S. **OPTIMAL MULTI-TIER REGULATION: AN APPLICATION TO MUNICIPAL SOLID WASTE**. Cambridge, MA: Center for Science & International Affairs, John F. Kennedy School of Government. 1991.

SOLID WASTE.

23. Meyers, Jonathan Phillip. **CONFRONTING THE GARBAGE CRISIS: INCREASED FEDERAL INVOLVEMENT AS A MEANS OF ADDRESSING MUNICIPAL SOLID WASTE DISPOSAL**. Georgetown Law Journal. 79:567-90. February 1991.

Discusses proposed amendments to the U.S. Resource Conservation and Recovery Act of 1976, which establishes state guidelines, to parallel federal statutes. Focuses on landfills and interstate waste shipping.
SOLID WASTE*

24. Migden, Janine L. **STATE POLICIES ON WASTE TO ENERGY FACILITIES**. Public Utilities Fortnightly. 126:26-30. September 13, 1990.

Overview of individual states' cogeneration and small power production policies.
SOLID WASTE.

25. Monk, Randall B. **A STATUS REPORT ON MUNICIPAL SOLID WASTE COMPOSTING.** Resource Recycling; 11:46+. July 1992.

Issues discussed include: comparative technologies, odor control, and linking composting programs with recycling.
SOLID WASTE.

26. Morris, Glenn E.; Byrd, Denise C. **UNIT PRICING FOR SOLID WASTE COLLECTION.** Popular Government. 56:37-44. September 1990.

Examines experiences of 16 U.S. municipalities using a system of charges per unit of generated waste.
SOLID WASTE.

27. National Governors' Association, National Task Force on Solid Waste Management. **CURBING WASTE IN A THROWAWAY WORLD: REPORT OF THE TASK FORCE ON SOLID WASTE MANAGEMENT**. Annapolis Junction, Maryland: 1990.

This report discusses the work of the National Governors' Association Task Force on Solid Waste Management, charged with investigating solid waste issues and developing national goals and strategies for improving the nation's waste management system. This report sets goals for reducing waste generation, increasing recycling rates, and reducing the problems stemming from interstate shipment of solid waste. Separate chapters are devoted to source reduction, recycling, waste-to-energy facilities, alternative disposal technologies, interstate transport, comprehensive planning, and facility siting.
SOLID WASTE*

28. Opaluch, James J. **EVALUATING IMPACTS FROM NOXIOUS FACILITIES: INCLUDING PUBLIC PREFERENCES IN CURRENT SITING MECHANISMS**. Journal of Environmental Economics and Management; 24(1), pages 41-59. January 1993.

This paper describes an approach to facility siting that ranks potential sites in terms of their social impacts. A contingent choice survey based on paired comparisons is used to construct a utility index to rank sites consistent with predicting results of a hypothetical referendum based on the attributes of the sites.
SOLID WASTE/HAZARDOUS WASTE.

29. Powell, Jerry. **JUST THE FACTS: RELEVANT DATA ON MRF OPERATIONS AND COSTS**. Resource Recycling; 11:34+. May 1992.

Summarizes a 1991 Environmental Protection Agency report on materials recovery facilities (MRF).
SOLID WASTE.

30. Prince, Greg. **YES, IN THEIR BACKYARD AND EVERYBODY ELSE'S**. Beverage World. 109:22-3+. June 1990.

Report on a roundtable discussion by representatives of major packaging groups and beverage trade associations on easing the solid waste crisis, held in Washington, D.C., March 1990.
SOLID WASTE.

31. Roberts, Roland K.; Douglas, Peggy V.; Park, William M. **ESTIMATING EXTERNAL COSTS OF MUNICIPAL LANDFILL SITING THROUGH CONTINGENT VALUATION ANALYSIS: A CASE STUDY**. Southern Journal of Agricultural Economics; 23(2), pages 155-65. December 1991.

Much of the solid waste stream in the United States is generated by metropolitan areas, while associated landfills are often located in adjacent rural communities. Landfill disposal of municipal solid waste often creates external costs to nearby residents. Contingent valuation was used to estimate external costs of siting a landfill in the Carter community of Knox County, Tennessee.
SOLID WASTE.

32. Rubin, Marc. **SANITATION COLLECTION AND DISPOSAL**. Government Accounting Standards Board. 1991.

This report looks at production and reporting Service Efforts and Accomplishments indicators relating to the government's provision of sanitation collection and disposal services.
SOLID WASTE*

33. R.W. Beck and Associates. **THE NATION'S PUBLIC WORKS: REPORT ON SOLID WASTE**. Washington, DC: National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining solid waste as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's solid waste.
SOLID WASTE*

34. Swallow, Stephen K.; Opaluch, James J.; Weaver, Thomas F. **SITING NOXIOUS FACILITIES: AN APPROACH THAT INTEGRATES TECHNICAL, ECONOMIC, AND POLITICAL CONSIDERATIONS**. Land Economics; 68(3), pages 283-301. August 1992.

This paper develops an approach that integrates the technical, economic, and political concerns relevant to siting decisions, beginning with identification of alternative sites and extending through selection of the final site. The approach uses utility theory to structure crucial public input for use in a centralized process.
SOLID WASTE/HAZARDOUS WASTE.

35. U.S. Congressional Office of Technology Assessment. **FACING AMERICA'S TRASH: WHAT NEXT FOR MUNICIPAL SOLID WASTE?** 1989.

Presents options for a national policy based on the dual strategies of MSW prevention and better management. Also includes options to address increased interstate shipments of waste and unfinished federal guidelines for landfills and incinerators.
SOLID WASTE.

36. U.S. Environmental Protection Agency. **FOCUSING ON THE GARBAGE CRISIS**. EPA Journal. 15:10-52. March 1989.

Recycling, landfills and incinerators, source reduction, and other aspects of solid waste control are discussed. Various viewpoints and local solutions to the garbage problem are presented.
SOLID WASTE.

37. U.S. Environmental Protection Agency. **REPORT TO CONGRESS: SOLID WASTE DISPOSAL IN THE UNITED STATES: VOLUMES 1 AND 2.** Washington, DC: October 1988.

Volume I presents conclusions and recommendations of a Subtitle D study to evaluate the adequacy of the program. Objectives addressed include disposal of nonhazardous solid waste, which includes municipal solid waste, oil and gas waste, and industrial waste, at landfills, waste piles, land application units, and surface impoundments. Volume II contains results of data collection efforts for Volume I and presents study methodology and data collection results for Subtitle D wastes, Subtitle D facilities, and Subtitle D state programs.
SOLID WASTE.

38. U.S. Environmental Protection Agency, Office of Solid Waste. **ADDENDUM TO THE REGULATORY IMPACT ANALYSIS FOR THE FINAL CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS**. Washington, DC: August 1991.

Represents EPA's best efforts to quantify costs, economic impacts, and benefits of regulatory options relating to Subtitle D criteria for municipal solid waste landfills.
SOLID WASTE.

39. U.S. Environmental Protection Agency, Office of Solid Waste. **DECISION-MAKERS GUIDE TO SOLID WASTE MANAGEMENT**. Washington, DC: November 1989.

Presents problems and possible solutions for waste management issues to be addressed by policy makers. Introduces concept of integrated waste management by providing an overview of major municipal waste management while also highlighting program options and listing criteria for evaluating alternatives.
SOLID WASTE.

40. U.S. Environmental Protection Agency, Office of Solid Waste. **SOLID WASTE DILEMMA: AN AGENDA FOR ACTION (BACKGROUND DOCUMENT, APPENDICES, AND FINAL REPORT)**. Washington, DC: August 15, 1988.

The background document describes municipal solid waste and presents a strategy to improve management of wastes. The document also presents the analysis behind recommended actions in a summary fashion. Compiles options of potential research, development, and demonstration activities to provide data for solutions. The appendices supplement the

background document by summarizing various components of the municipal solid waste stream.
SOLID WASTE.

41. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **CHARACTERIZATION OF MUNICIPAL SOLID WASTE IN THE UNITED STATES: 1990 UPDATE**. Washington, DC: 103p+v.p. 1990.

    Provides solid waste estimates by weight, volume, and composition and includes projections of generation and management for the years 1995-2010.
    SOLID WASTE.

42. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SITES FOR OUR SOLID WASTE: A GUIDEBOOK FOR EFFECTIVE PUBLIC INVOLVEMENT**. Washington, DC: vi+110p: 1990.

    Recommendations for appropriate handling of the public risk vs. public benefit dilemma.
    SOLID WASTE.

43. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **TECHNOLOGY TRANSFER NEEDS ASSESSMENT, 1990**. Washington, DC: 83p: 1990.

    Technology needed for better waste disposal under Superfund, hazardous waste, and underground storage tank programs.
    SOLID WASTE/HAZARDOUS WASTE.

44. U.S. Environmental Protection Agency, Office of Solid Waste, Municipal Solid Waste Task Force. **THE SOLID WASTE DILEMMA: AN AGENDA FOR ACTION: FINAL REPORT OF THE MUNICIPAL SOLID WASTE TASK FORCE**. Washington, DC: Environmental Protection Agency. 1989.

    The Agenda for Action offers a number of concrete suggestions to curb U.S. generated solid waste, not only for EPA but also government at all levels, industry, and private citizens.
    SOLID WASTE*

45. U.S. House of Representatives, Committee on Agriculture, Subcommittee on Department Operations, Research, and Foreign Agriculture. **RECYCLABLE MATERIALS SCIENCE AND TECHNOLOGY DEVELOPMENT ACT OF 1989: HEARING, NOVEMBER 16, 1989, ON H.R. 500.** Washington, DC: 101st Cong., 1st sess., iii+156p. 1990.

    Recycling degradable and non-degradable materials with some emphasis on efforts to develop solid waste composting technology.
    SOLID WASTE.

46. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Transportation and Hazardous Materials. **MUNICIPAL SOLID WASTE DISPOSAL CRISIS: HEARING, JUNE 22, 1989, ON H.R. 2099 AND H.R. 2723, BILLS TO PROHIBIT THE DISPOSAL OF SOLID WASTE IN ANY STATE OTHER THAN THE STATE IN WHICH THE WASTE WAS GENERATED**. Washington, DC: 101st Cong., 1st sess., iii+270p. 1989.

Proposes amending the Resource Conservation and Recovery Act to improve procedures for the implementation of state compacts providing for the establishment and operation of regional disposal facilities.
SOLID WASTE.

47. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Transportation, Tourism, and Hazardous Materials. **MUNICIPAL INCINERATOR ASH: HEARING, APRIL 13, 1988, ON H.R. 2517 [AND OTHER BILLS], BILLS TO REDUCE THE HAZARDS ASSOCIATED WITH MUNICIPAL INCINERATOR ASH AND TO AMEND SUBTITLE D OF THE SOLID WASTE DISPOSAL ACT TO PROVIDE FOR SAFE MANAGEMENT AND REGULATION OF MUNICIPAL SOLID WASTE INCINERATORS**. Washington, DC: 100th Cong., 2d sess., iii+274p. 1989.

SOLID WASTE/HAZARDOUS WASTE.

48. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Transportation And Hazardous Materials. **RECYCLING OF MUNICIPAL SOLID WASTE: HEARINGS, JULY 12-13, 1989, ON H.R. 1593 [AND OTHER BILLS]**. Washington, DC: 101st Cong., 1st sess., iv+635p. 1989.

Recycling or disposal of hazardous materials is discussed, focusing on alternatives to landfilling, oil and car battery recycling, and the role of the EPA.
SOLID WASTE/HAZARDOUS WASTE.

49. U.S. House of Representatives, Committee on Science, Space and Technology, Subcommittee on Natural Resources, Agriculture, Research, and Environment. **SOLID WASTE REDUCTION, RECYCLING, POLLUTION PREVENTION: HEARING, JANUARY 29, 1990.** Washington, DC: 101st Cong., 2d sess., iii+216p, no. 107. 1990.

Makes reference to several legislative initiatives, including H.R. 568, the National Beverage Container Reuse and Recycling Act, and H.R. 3736, the Waste Export Control Act.
SOLID WASTE.

50. U.S. Senate, Committee on Environment and Public Works. **A LEGISLATIVE HISTORY OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED, TOGETHER WITH A SECTION BY SECTION INDEX: JUNE 1991.** Washington, DC: 102nd Cong., 1st sess. 1991.

Covers topics related to the Office of Solid Waste, including authorities of the Administrator and Interagency Coordinating Committee, hazardous waste management; state or regional solid waste plans; duties of the Secretary of Commerce in resource and recovery; federal responsibilities; miscellaneous provisions; research development, demonstration, and information; regulation of underground storage tanks.
SOLID WASTE.

51. U.S. Senate Committee on Environment and Public Works, Subcommittee On Environmental Protection. **AMENDING THE SOLID WASTE DISPOSAL ACT: HEARING, JUNE 21, 1989, ON S. 1112, MUNICIPAL SOLID WASTE SOURCE REDUCTION AND RECYCLING ACT AND S. 1113, WASTE MINIMIZATION AND CONTROL ACT OF 1989**. Washington, DC: 101st Cong., 1st sess., iii+256p. 1989.

Proposed mandatory state planning, standards and operating permits for waste management facilities, promotion of more durable, less toxic products, and increased recycling programs.
SOLID WASTE.

52. U.S. Senate, Committee on Environment and Public Works, Subcommittee on Environmental Protection. **INTERSTATE TRANSPORT AND DISPOSAL OF SOLID WASTE: HEARING, JULY 18, 1990**. iii+251p: Washington, DC: 1990.

Role of state and federal governments in restricting solid waste importing in light of decline of availability of landfills.
SOLID WASTE.

53. U.S. Senate, Select Committee on Indian Affairs. **WORKSHOP ON SOLID WASTE DISPOSAL ON INDIAN LANDS, JULY 29, 1991**. Washington, DC: 102d Cong., 1st sess., iii+96p. 1992.

Federal regulations governing the design, siting, and operations of solid waste facilities and their applicability to Indian lands.
SOLID WASTE.

54. Walker, Jana L.; Gover, Kevin. **COMMERCIAL SOLID AND HAZARDOUS WASTE DISPOSAL PROJECTS ON INDIAN LANDS**. Yale Journal on Regulation; 10(1), pages 229-62. December 1993.

This article analyzes the controversial issue of using Indian reservations as sites for commercial solid and hazardous waste facilities and provides a model for planning, developing, and regulating commercial waste projects on Indian lands. The article concludes that, under certain circumstances, and with an adequate regulatory program, a waste disposal project may be a viable and appropriate form of industrial development for some tribes and can provide opportunities for economic development on some reservations.
SOLID WASTE/HAZARDOUS WASTE.

55. Watson, Tom. **SOLID WASTE COMPOSTING AIMS FOR THE MAINSTREAM: ALTHOUGH SOLID WASTE COMPOSTING ISN'T NEW IN EUROPE, IT'S RECEIVING INCREASING ATTENTION IN THE U.S.** Resource Recycling; 9:30+. July 1990.

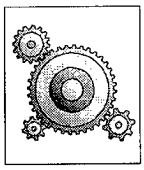
Includes a list of selected municipal solid waste composting facilities and system vendors.
SOLID WASTE.

56. Williams, Susan. **TRASH TO CASH: NEW BUSINESS OPPORTUNITIES IN THE POST CONSUMER WASTE STREAM.** vii+317p. 1991.

Presented on industry-by-industry assessment of the volume and value of recoverable materials in municipal solid waste and identification of companies presently engaged in recycling operations. Initiatives in the aluminum, glass, steel, paper, and plastics industries are discussed, including discussion of composting and waste-to-energy alternatives.
SOLID WASTE.

57. Williams, Susan. **WASTE TO ENERGY: STATUS REPORT: 1992**. Independent Energy; 22:53+. July 1992.

Viability as a component of an integrated waste disposal program, prospects for growth, despite contract cancellations and the downturn in awards for new facilities.
SOLID WASTE.



9. HAZARDOUS WASTE

1. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON HAZARDOUS WASTE**. Washington, DC: National Council on Public Works. 1987.

   This report was prepared to assist the National Council on Public Works in examining hazardous waste management as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's management of hazardous waste.
   HAZARDOUS WASTE*

2. Bernstein, Norman W. **TO CLEAN UP LANDFILLS, THE LEADER SHOULD BE MUNICIPALITIES USING ECONOMIC INCENTIVES TO SETTLE**. Environmental Law Reporter; 19:10012-15. January 1989.

   The issue of this paper is contaminated municipal landfill sites. It urges municipalities to take the initiative in developing settlements with polluting companies. New York City is presented as a case study.
   SOLID WASTE/HAZARDOUS WASTE.

3. Church, Thomas W. Takamura, Robert T. **CLEANING UP THE MESS: IMPLEMENTATION STRATEGIES IN SUPERFUND**. Washington, DC: Brookings Books. 1993.

   The objective of this book was to learn about the strategies used by the U.S. Environmental Protection Agency(EPA) to get individuals, corporations, and units of state and local government to pay millions of dollars to clean up environmental problems that these parties had a role in creating.
   HAZARDOUS WASTE*

4. Clough, Jack. **A LEGISLATIVE PERSPECTIVE ON AN INTEGRATED WASTE MANAGEMENT STRATEGY**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating Insurance and Risk Management for Hazardous Wastes. Norwell, MA: Kluwer Academic; pp. 317-26. 1990.

   HAZARDOUS WASTE.

5. Collin, Robert W. **WASTE SITING DECISIONS AND COMMUNITIES OF COLOR: A CALL FOR RESEARCH.** Journal of the Community Development Society; 23:1-10 no 2. 1992.

   Reviews Greenpeace and EPA reports indicating that hazardous waste sites are located disproportionately in Black and Hispanic communities.
   HAZARDOUS WASTE.

6. Fishbein, Bette K.; Gelb, Caroline. **MAKING LESS GARBAGE: A PLANNING GUIDE FOR COMMUNITIES**. xii+179p. 1992.

   Describes municipal planning to reduce the amount and toxicity of waste within existing government and institutional programs.
   SOLID WASTE/HAZARDOUS WASTE.

7. Fitzgerald, Michael R. **FEDERALISM AND THE ENVIRONMENT: THE VIEW FROM THE STATES**. State and Local Government Review; 20:98-104. September 1988.

This report discusses hazardous waste management and site treatment facilities.
HAZARDOUS WASTE.

8. Fortuna, Richard. **RISK MANAGEMENT ISSUES ASSOCIATED WITH MANAGING HAZARDOUS WASTE SITES**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating Insurance and Risk Management for Hazardous Wastes. Norwell, MA: Kluwer Academic; pages 169-83. 1990.

   HAZARDOUS WASTE.

9. Greenberg, Maurice R. **FINANCING THE CLEANUP OF HAZARDOUS WASTE: THE NATIONAL ENVIRONMENTAL TRUST FUND**. Environmental Claims Journal; 1:421-7. June 1989.

   Proposed flat fee approach to the current situation in hazardous waste management.
   HAZARDOUS WASTE.

10. Gregory, Robin. **INCENTIVES POLICIES TO SITE HAZARDOUS WASTE FACILITIES.** Risk Analysis; 11:667-75. December 1991.

    Examines effectiveness of various incentives to stimulate agreement between waste producers and communities.
    HAZARDOUS WASTE.

11. Kunreuther, Howard; Easterling, Douglas. **ARE RISK BENEFIT TRADEOFFS POSSIBLE IN SITING HAZARDOUS FACILITIES?** American Economic Review; 80(2), pages 252-56. May 1990.

    HAZARDOUS WASTE.

12. Kunreuther, Howard; et al. **SITING NOXIOUS FACILITIES: A TEST OF THE FACILITY SITING CREDO**. Risk Analysis; 13:301-18. June 1993.

    Examines waste facilities siting cases in Canada and the U.S. using guidelines developed at a seminar in 1990. Argues for establishing trust between developer and host community, meeting community needs through appropriate design, and public participation.
    HAZARDOUS WASTE.

13. Lake, R. W.; Disch, L. **STRUCTURAL CONSTRAINTS AND PLURALIST CONTRADICTIONS IN HAZARDOUS WASTE REGULATION**. Environment and Planning A; 24(5), pages 663-81. May 1992.

    HAZARDOUS WASTE.

14. Lucido, Salvadore J. **LANDFILL MANAGEMENT**. Management Information Service Report; 22:1-16. October 1990.

    This report covers landfill siting. Covers public opposition and siting considerations, public and private landfilling, new technologies, and benefits and problems of landfill closure.
    SOLID WASTE/HAZARDOUS WASTE.

15. Mason, Robert J. **STRUCTURED SETTLEMENTS: A NEW INCENTIVE TO PROMOTE PRIVATE PARTY SUPERFUND CLEANUPS**. Environmental Claims Journal; 2:493-516. June 1990.

Results of the 1988 U.S. EPA study, "An analysis of alternative cleanup financing mechanisms for their potential application to CERCLA settlements."
HAZARDOUS WASTE.

16. McNiel, Douglas W.; Foshee, Andrew W. **HAZARDOUS WASTE DISPOSAL: A COMPARATIVE ANALYSIS OF REGULATION, TAXES AND SUBSIDIES**. Journal of Economics and Finance;16(2), pages 91-101. June 1992.

This paper contains a critique of existing legislation which deals with hazardous waste disposal and expands on the efforts made by the Office of Technology Assessment and other economists to develop a public policy which will deal effectively with the problems associated with hazardous waste generation and disposal. A new policy is set forth here which encourages both waste reduction and safe disposal while providing revenue to pay for cleanups at Superfund sites.
HAZARDOUS WASTE.

17. McNiel, Douglas W.; Foshee, Andrew W. **SUPERFUND FINANCING ALTERNATIVES**. Policy Studies Review; 7:751-60. June 1988.

Evaluates the taxes levied for funding the Comprehensive Environmental Response, Compensation, and Liability Act, and several alternative tax policies.
HAZARDOUS WASTE.

18. Michaels, R. Gregory; Smith, V. Kerry. **MARKET SEGMENTATION AND VALUING AMENITIES WITH HEDONIC MODELS: THE CASE OF HAZARDOUS WASTE SITES**. Journal of Urban Economics; 28(2), pages 223-42. September 1990.

This paper proposes a new method for defining the market used in estimating a hedonic price function. It investigates the feasibility of acquiring realtors' evaluations of the specialized submarkets in a large market, suburban Boston. It uses the hedonic property value model to estimate how households value the avoidance of living near landfills containing hazardous wastes.
HAZARDOUS WASTE.

19. Nakamura, Robert T.; Church, Thomas W.; Cooper, Phillip J. **ENVIRONMENTAL DISPUTE RESOLUTION AND HAZARDOUS WASTE CLEANUPS: A CAUTIONARY TALE OF POLICY IMPLEMENTATION**. Journal of Policy Analysis and Management; 10(2), pages 204-21. March 1991.

HAZARDOUS WASTE.

20. National Governors' Association. **HAZARDOUS WASTE MANAGEMENT IN THE STATES: A REVIEW OF THE CAPACITY ASSURANCE PROCESS**. Annapolis Junction, Maryland: 1992.

This report provides an overview of information received from the first Capacity Assurance Plans (CAPs) in 1989, including the amount of hazardous waste generated, projected future

volumes, and data on interstate shipments. It also describes the law and its implementation; EPA's guidance for completion and submission of a CAP; and state plans for creating new capacity.
HAZARDOUS WASTE*

21. Novick, Sheldon. **AN ENVIRONMENTAL PERSPECTIVE ON AN INTEGRATED WASTE MANAGEMENT STRATEGY**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating Insurance and Risk Management for Hazardous Wastes. Norwell, MA: Kluwer Academic; pp. 217-239. 1990.

    HAZARDOUS WASTE.

22. O'Leary, Rosemary. **WILL HAZARDOUS WASTE CLEANUP COSTS CRIPPLE OUR STATE AND LOCAL GOVERNMENTS?** State and Local Government Review; 22:84-9. March 1990.

    Implications of recent statutory changes and judicial decisions.
    HAZARDOUS WASTE.

23. Opaluch, James J. **EVALUATING IMPACTS FROM NOXIOUS FACILITIES: INCLUDING PUBLIC PREFERENCES IN CURRENT SITING MECHANISMS**. Journal of Environmental Economics and Management; 24(1), pages 41-59. January 1993.

    This paper describes an approach to facility siting that ranks potential sites in terms of their social impacts. A contingent choice survey based on paired comparisons is used to construct a utility index to rank sites consistent with predicting results of a hypothetical referendum based on the attributes of the sites.
    SOLID WASTE/HAZARDOUS WASTE.

24. Peretz, Jean H. (University of Tennessee). **EQUITY UNDER AND STATE RESPONSES TO THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986**. Policy Sciences; 25(2), pages 191-209. May 1992.

    The author examines equity and reviews hazardous waste management in a federalism context to discern the relationship between EPA and the states. The author focuses on the different roles EPA and the states perceived for the other during implementation of Section 104(k). The author concludes with an evaluation of how equity was handled under the new legislation and what remains to be done.
    HAZARDOUS WASTE.

25. Reed, Brian E.; Sack, William A. **HAZARDOUS AND INDUSTRIAL WASTES.** 1992.

    Focuses on waste treatment and site remediation technology, including sludge treatment, solids disposal, groundwater flow, recycling, and extracting energy from waste.
    HAZARDOUS WASTE.

26. Reitze, Arnold W. Jr; Davis, Andrew N. **RECONSIDERING OCEAN INCINERATION AS PART OF A U.S. HAZARDOUS WASTE MANAGEMENT PROGRAM: SEPARATING THE RHETORIC FROM THE REALITY.** Boston College Environmental Affairs Law Review; 17:687-798. June 1990.

Considers disposal options and the health and environmental impact of land-based and ocean incineration.
HAZARDOUS WASTE.

27. Rice, Steven (BASF Corp, Parsippany, NJ). **WASTE MANAGEMENT: THE LONG VIEW**. CHEMTECH. v21, n9, p543(4). September 1991.

    Long-term planning is needed on the part of industry to better deal with waste management and the increasingly stringent regulations that are being enacted to deal with industrial wastes. Future regulations will require better identification and reporting strategies, so the costs of complying with these regulations and of responding to negative public pressure can be decreased by limiting the amount of waste generated.
    HAZARDOUS WASTE*

28. Rosenthal, Isadore; Johnson, Lynn. **AN INDUSTRIAL PERSPECTIVE ON AN INTEGRATED WASTE MANAGEMENT STRATEGY**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA Dordrecht and London: Kluwer Academic. 1990.

    HAZARDOUS WASTE.

29. Scanlon, Raymond D. **HAZARDOUS MATERIALS, HAZARDOUS WASTE: LOCAL MANAGEMENT OPTIONS**. Washington, DC: ICMA Publications. 1987.

    This book explains the complex maze of federal regulations regarding hazardous materials and hazardous waste. It shows how local officials can work with industries to minimize hazardous wastes, improve transportation safety in and near the community, solve facilities siting problems, and plan for accidents prevention and emergency response.
    HAZARDOUS WASTE.

30. Schroeder, Peter. **MANAGING EXISTING HAZARDOUS WASTE FACILITIES: RISK ASSESSMENT ISSUES**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA: Dordrecht and London: Kluwer Academic. 1990.

    HAZARDOUS WASTE.

31. Seif, James; Voltaggio, Thomas. **RISK MANAGEMENT ISSUES ASSOCIATED WITH CLEANING UP INACTIVE HAZARDOUS WASTE SITES**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA: Dordrecht and London: Kluwer Academic. 1990.

    HAZARDOUS WASTE.

32. Swallow, Stephen K.; Opaluch, James J.; Weaver, Thomas F. **SITING NOXIOUS FACILITIES: AN APPROACH THAT INTEGRATES TECHNICAL, ECONOMIC, AND POLITICAL CONSIDERATIONS**. Land Economics; 68(3), pages 283-301. August 1992.

    This paper develops an approach that integrates the technical, economic, and political concerns relevant to siting decisions, beginning with identification of alternative sites and

extending through selection of the final site. The approach uses utility theory to structure crucial public input for use in a centralized process.
SOLID WASTE/HAZARDOUS WASTE.

33. U.S. Congressional Office of Technology Assessment. **PARTNERSHIPS UNDER PRESSURE: MANAGING COMMERCIAL LOW LEVEL RADIOACTIVE WASTE.** 1989.OTA-O-426

Overview of progress made by nine compacts and remaining unaffiliated states in developing disposal facilities mandated by the Low-Level Radioactive Waste Policy Amendments Act of 1985.
HAZARDOUS WASTE.

34. U.S. Environmental Protection Agency. **AN ANALYSIS OF STATE SUPERFUND PROGRAMS: 50 STATE STUDY**. Washington, DC: vi+216p: 1989.

This report emphasizes the cleanup of hazardous waste sites. An overview of activities and capabilities, statutes, program organization, funding, enforcement, policies and criteria, and public participation is provided.
HAZARDOUS WASTE.

35. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **COMMERCIAL TREATMENT/RECOVERY DATA SET**. Washington, DC: May 1990.

Outlines the commercial treatment/recovery capacity database. Contains data sets on incineration and reuse of fuel, as well as other treatment systems input into the database. Data are derived from the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities.
HAZARDOUS WASTE.

36. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **NATIONAL SURVEY OF HAZARDOUS WASTE GENERATORS, AND TREATMENT, STORAGE, DISPOSAL, AND RECYCLING FACILITIES IN 1986: HAZARDOUS WASTE GENERATION AND MANAGEMENT**. Washington, DC: October 15, 1991.

Presents findings of two extensive surveys conducted by mail during a 3-year period to obtain detailed information concerning hazardous waste generation and management practices.
HAZARDOUS WASTE*

37. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SUMMARY REPORT OF CAPACITY AT COMMERCIAL FACILITIES, VOLS 1-2.** Washington, DC: January 31, 1989.

Provides capacity data on commercial hazardous waste management facilities in all states as derived from EPA's Treatment, Disposal, and Recycling Facilities Survey, conducted in 1987. Covers commercial system capacity, captive system capacity, and onsite system capacity.
HAZARDOUS WASTE.

38. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **THE NATION'S HAZARDOUS WASTE MANAGEMENT PROGRAM AT A CROSSROADS: THE RCRA IMPLEMENTATION STUDY**. Washington, DC: 1990.

Discusses the Resource Conservation and Recovery Act, its progress since its enactment in 1976, and key issues for the 1990s.
HAZARDOUS WASTE.

39. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SUMMARY REPORT OF CAPACITY AT LIMITED COMMERCIAL AND COMPANY CAPTIVE FACILITIES: VOLS 1-2**. Washington, DC: February 15, 1989.

Provides capacity data on limited commercial and company captive hazardous waste management facilities in all states. Data are designed to be used with the Biennial Report on waste generated to support development of States' Capacity Assurance Plan.
HAZARDOUS WASTE.

40. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **TECHNOLOGY TRANSFER NEEDS ASSESSMENT, 1990**. Washington, DC: 83p: 1990.

Technology needed for better waste disposal under Superfund, hazardous waste, and underground storage tank programs.
SOLID WASTE/HAZARDOUS WASTE.

41. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Oversight and Investigations. **GROUNDWATER MONITORING AT RCRA LAND DISPOSAL FACILITIES: HEARING, APRIL 27, 1989.** Washington, DC: 101st Cong., 1st sess., iii+357p. 1989.

Commercial and private land disposal facilities regulated under the Resource Conservation and Recovery Act. Focuses on pollution of drinking water at hazardous waste sites and cleanup efforts.
HAZARDOUS WASTE.

42. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Transportation and Hazardous Materials. **HAZARDOUS WASTE REDUCTION ACT: HEARING, APRIL 21, 1988, ON H.R. 2800, A BILL TO IMPROVE ENVIRONMENTAL PROTECTION AGENCY DATA COLLECTION AND DISSEMINATION REGARDING REDUCTION OF TOXIC CHEMICAL EMISSIONS.** Washington, DC: 100th Cong., 2d sess., iii+299p. 1989.

Includes discussion of the establishment of a clearinghouse of information, building a database, and provision of government technical assistance to states.
HAZARDOUS WASTE.

43. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Transportation, Tourism, and Hazardous Materials. **MUNICIPAL INCINERATOR ASH: HEARING, APRIL 13, 1988, ON H.R. 2517 [AND OTHER BILLS], BILLS TO REDUCE THE HAZARDS ASSOCIATED WITH MUNICIPAL INCINERATOR ASH AND TO AMEND SUBTITLE D OF THE SOLID WASTE DISPOSAL ACT TO**

PROVIDE FOR SAFE MANAGEMENT AND REGULATION OF MUNICIPAL SOLID WASTE INCINERATORS. Washington, DC: 100th Cong., 2d sess., iii+274p. 1989.

SOLID WASTE/HAZARDOUS WASTE.

44. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Transportation And Hazardous Materials. **RECYCLING OF MUNICIPAL SOLID WASTE: HEARINGS, JULY 12-13, 1989, ON H.R. 1593 [AND OTHER BILLS]**. Washington, DC: 101st Cong., 1st sess., iv+635p. 1989.

Recycling or disposal of hazardous materials is discussed, focusing on alternatives to landfilling, oil and car battery recycling, and the role of the EPA.
SOLID WASTE/HAZARDOUS WASTE.

45. U.S. House of Representatives, Committee on Government Operations Environment, Energy, And Natural Resources Subcommittee. **REVIEW OF EPA'S CAPACITY ASSURANCE PROGRAM: HEARING, MAY 2, 1991.** Washington, DC: 102nd Cong., 1st sess., iv+332p. 1992.

Problems with hazardous waste site data reporting requirements are discussed. Refers to the provision which was incorporated into the 1986 reauthorization of Superfund, requiring every state to demonstrate to EPA that it has, or has access to, adequate disposal capacity for all of the hazardous waste projected to be generated in the state over the next 20 years or face a cutoff of its Superfund cleanup money.
HAZARDOUS WASTE.

46. U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Water Resources. **STATUS OF THE SUPERFUND HAZARDOUS WASTE CLEANUP PROGRAM AND THE IMPLEMENTATION OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA): HEARING, JULY 7, 1988**. Washington, DC: 100th Cong, 2d sess., iii+113p. 1988.

Revisions to the National Contingency Plan, EPA's enforcement and cost recovery activities, the impact of EPA activities under the act, revisions to the hazardous ranking system, and EPA's deferred listing policy.
HAZARDOUS WASTE.

47. U.S. National Institute for Occupational Safety And Health. **HAZARDOUS WASTE BIBLIOGRAPHY**. Atlanta, GA: 1989.

Includes selected hazardous waste publications of the U.S. Institute for Occupational Safety and Health.
HAZARDOUS WASTE.

48. Wagner, Travis P. **THE HAZARDOUS WASTE Q&A: AN IN-DEPTH GUIDE TO THE RESOURCE CONSERVATION AND RECOVERY ACT AND THE HAZARDOUS MATERIALS TRANSPORTATION ACT**. xx+404p. 1990.

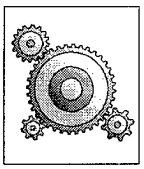
Partial contents of this report include: waste identification and classification; generators; groundwater monitoring; land disposal restrictions; corrective action; enforcement; state authorization.
HAZARDOUS WASTE.

49. Walker, Jana L.; Gover, Kevin. **COMMERCIAL SOLID AND HAZARDOUS WASTE DISPOSAL PROJECTS ON INDIAN LANDS**. Yale Journal on Regulation; 10(1), pages 229-62. December 1993.

This article analyzes the controversial issue of using Indian reservations as sites for commercial solid and hazardous waste facilities and provides a model for planning, developing, and regulating commercial waste projects on Indian lands. The article concludes that, under certain circumstances, and with an adequate regulatory program, a waste disposal project may be a viable and appropriate form of industrial development for some tribes and can provide opportunities for economic development on some reservations.
SOLID WASTE/HAZARDOUS WASTE.

50. Weidenbaum, Murray. **PROTECTING THE ENVIRONMENT**. Society ; 27:49-56. November 1989.

Topics presented include economic considerations; economic solutions to hazardous waste problems; economic incentives needed; and a birth control approach to pollution.
HAZARDOUS WASTE.



B. SORTED BY AUTHOR

1. Aaron, Henry J.; Schultze, Charles L. **SETTING DOMESTIC PRIORITIES: WHAT CAN GOVERNMENT DO?** xii+318p. 1992.

This book investigates whether new or improved government interventions can address social policy more effectively in the areas of: homelessness, crime, families, young children, research, and infrastructure.
GENERAL.

2. Aaronson, RJ. **WHERE IS THE AVIATION TRUST FUND?** Vital Speeches. Mount Pleasant, SC: City News Publishing Company. 1990.

This speech discusses the positive and negative elements of air transportation infrastructure, suggesting that deregulation resulted in the highly successful hub and spoke concept, quieter, more fuel-efficient jets, lower fares, and an increase in projected airport building and renovation. Attempts by government to re-regulate the airline industry could jeopardize this growth. Such problems as inadequate airport capacity, unreliable equipment and outmoded technology could be best approached through increased economic support by governmental agencies without legislative restrictions.
AIR TRANSPORTATION.

3. Achs, Nicole. **ALL DRESSED UP AND NOWHERE TO GO: THE COLLECTION PROGRAMS ARE IN PLACE, THE RECYCLABLES HAVE BEEN SEPARATED; NOW WHAT?** American City and County; 106:26-7+. November 1991.

Discusses concerns over the growing gap between successful collection programs and availability of recycling facilities in U.S. cities.
SOLID WASTE.

4. Adams, Charles F.; Merget, Astrid E. **EARMARKING REVENUES FOR PUBLIC WORKS PROJECTS**. Washington, DC: National Council on Public Works Improvement. 1987.

Drawing on information from scholarly journals, professional reports, government statistics, and a series of interviews with state and local officials, this report examines the theory and practice of earmarking revenues from several perspectives.
GENERAL.

5. Administrative Conference of the United States, Office of the Chairman. **NEGOTIATED RULEMAKING SOURCEBOOK**. Washington, DC: 1990.

This document reviews the methods of Negotiated Rulemaking, the idea that in certain situations it is possible to bring together representatives of an agency and various interest groups to negotiate the text of a proposed regulation.
GENERAL.

6. Advisory Committee on Highway Policy 2020 Transportation Program. **"BEYOND GRIDLOCK": THE FUTURE OF MOBILITY AS THE PUBLIC SEES IT**. Washington, DC: 1988.

This report summarizes the findings from an unprecedented series of 65 public forums held all across the United States between August 1987 and May 1988. The public forums were an element of the initial fact-finding state of Transportation 2020.

HIGHWAYS.

7. Aggarwal, Raj. **THE EXPORT OF HIGH VALUE ADDED PRODUCTS: THE ROLE OF INTERNATIONAL PORT AND CARRIER SERVICES**. Journal of Global Marketing. 2:65-80 no 4. 1989.

   This report describes the efforts/interaction of ports and carriers handling U.S. imports to improve the efficiency of trade.
   WATER RESOURCES.

8. Alter, Harvey. **COST OF RECYCLING MUNICIPAL SOLID WASTE WITH AND WITHOUT A CONCURRENT BEVERAGE CONTAINER DEPOSIT LAW**. Journal of Consumer Affairs; 27(1), pages 166-86. June 1993.

   The purpose of this article is to contribute to the literature on the effect of beverage container deposit legislation (BCDL) on the cost and amount of the household portion of municipal solid waste recycled. A U.S. General Accounting Office report concluded that dual systems cost more than either alone and that the combination diverts a greater amount of solid waste from landfills, a conclusion supported by this analysis.
   SOLID WASTE.

9. Altshuler, Alan A.; Gomez-Ibanez, Jose A. **REGULATION FOR REVENUE: THE POLITICAL ECONOMY OF LAND USE EXACTIONS**. Washington, DC/Cambridge, MA: Brookings Institution/Lincoln Institute of Land Policy. 1993.

   Examines the political economy of land use exactions--government-mandated expenditures that real estate developers must make for the provision of public facilities or services as a condition for receiving permits. Identifies broad developments contributing to the recent surge in exaction usage in the United States. Examines the evolution in exaction use and current practice. Considers the political forces encouraging the use of exactions as well as the legal constraints on their use.
   GENERAL.

10. American Association of State Highway and Transportation Officials. **A NEW FOCUS FOR AMERICA'S HIGHWAYS: RECOMMENDATIONS ON THE FEDERAL-AID HIGHWAY PROGRAM**. Washington, DC: 1985.

    This document updates the comprehensive highway policy statement, "A Program for American Highways in the 1980s."
    HIGHWAYS.

11. American Association of State Highway and Transportation Officials. **A REPORT ON THE HIGHWAY PROGRAM CAPACITY OF STATE HIGHWAY AND TRANSPORTATION DEPARTMENTS**. Washington, DC: 1992.

    The primary purposes of the survey were to develop information on: the expectations of the states on their use of the $18 billion federal-aid highway funding for FY 1993; the capability of the states to utilize highway funding at the full funding levels under the Intermodal Surface Transportation Efficiency Act for FY 1994; and the capability of the states to use additional highway funding in FY 1993, 1994, 1995, and 1996 if it should become available.
    HIGHWAYS.

12. American Association of State Highway and Transportation Officials. **A REPORT ON READY-TO-GO PROJECTS OF THE STATE HIGHWAY AND TRANSPORTATION DEPARTMENTS**. Washington, DC: 1993.

The survey was undertaken to identify projects that are in a ready-to-go status within the state departments of highways and transportation, which could be put to contract within 30-90 days to create jobs in 1993 as part of a possible federal counter-cyclical program.
HIGHWAYS.

13. American Association of State Highway and Transportation Officials. **A STUDY ON FUTURE DIRECTIONS OF PUBLIC TRANSPORTATION IN THE UNITED STATES**. Washington, DC: 1985.

This is a comprehensive study of the current problems facing public transportation. It examines innovative actions being adopted throughout the U.S. to solve these problems, and identifies the key components of a national and state public transportation strategy.
GENERAL.

14. American Association of State Highway and Transportation Officials. **AASHTO TRANSPORTATION POLICY BOOK**. Washington, DC: 1993.

The AASHTO 1993 Transportation Policy Book contains all of the existing transportation policies officially adopted by the American Association of State Highway and Transportation Officials through October 1992. Policy Position Statements on each of the major transportation modes are included.
GENERAL.

15. American Association of State Highway and Transportation Officials. **BEYOND THE HORIZON: THE FUTURE OF THE NATION'S AIR TRANSPORTATION SYSTEM 1988-2020**. Washington, DC: 1989.

This report was developed to provide an aviation component for the AASHTO Transportation 2020 Program effort. Major work elements of this effort were: evaluation of the requirements for the nation's air transportation system through the year 2020; and a review of existing AASHTO aviation polices.
AIR TRANSPORTATION.

16. American Association of State Highway and Transportation Officials. **GOING AND GROWING: AN OVERVIEW OF THE RELATIONSHIP BETWEEN TRANSPORTATION AND GROWTH IN AMERICA**. Washington, DC: 1990.

This overview summary is intended to show the linkage between transportation and economic growth.
GENERAL.

17. American Association of State Highway and Transportation Officials. **HIGHWAY NEEDS, STRUCTURAL ISSUES AND HIGHWAY OPERATIONS: APPENDIX 1 TO THE BOTTOM LINE**. Washington, DC: 1988.

The purpose of this report is to describe the process used in producing the needs assessment survey of state transportation agencies and to interpret the results.
HIGHWAYS.

18. American Association of State Highway and Transportation Officials. **INNOVATION: A STRATEGY FOR RESEARCH, DEVELOPMENT, AND TECHNOLOGY TRANSFER**. Washington, DC: 1989.

    The report addresses three major objectives: to evaluate the issues that will affect the future of highway and transportation research; to recommend positions for consideration by AASHTO; and to consider current and prospective programs of research and provide AASHTO with the information needed to determine priorities.
    GENERAL.

19. American Association of State Highway and Transportation Officials. **KEEPING AMERICA MOVING: THE BOTTOM LINE : EXECUTIVE SUMMARY : A SUMMARY OF SURFACE TRANSPORTATION INVESTMENT REQUIREMENTS**. Washington, DC: 1988.

    This report is part of Transportation 2020, an unprecedented effort initiated by American Association of State Highway and Transportation Officials (AASHTO) to develop a national consensus on a future national surface transportation program. This report examines several alternatives for the surface transportation system of the future, the implication for users, and funding options each would require. Included in this report are AASHTO best estimates of combined Federal, State, and local government investment requirements for highways and public transportation.
    HIGHWAYS*

20. American Association of State Highway and Transportation Officials. **NEW TRANSPORTATION CONCEPTS FOR A NEW CENTURY**. Washington, DC: 1989.

    This report summarizes recommended improvements to the national transportation system by the American Association of State and Transportation Officials. The report concludes that the nation invests much less in transportation than it did over the past two decades and that the nation continues to invest less than what is needed to maintain current services.
    GENERAL*

21. American Association of State Highway and Transportation Officials. **PUBLIC TRANSPORTATION NEEDS: APPENDIX 2 TO THE BOTTOM LINE**. Washington, DC: 1988.

    This AASHTO report analyzes existing public transit data to estimate future capital and operating condition, performance, and funding requirements at interim time periods through the year 2020. Transit systems are divided into three categories for comparison, 1) systems serving urbanized areas over 200,000 in population, systems serving urbanized areas of 50,000 to 200,000 in population, 3) specialized and rural transit systems funded through Section 16(b)(2) and Section 18. In general, the report concludes that projected funding will be insufficient to pay for the capital costs of the nation's transit systems. Data is presented on deferred capital needs, capital costs verses funding, projected new start accomplishments, and

potential annual shortfalls with status quo funding, with fare increases, and with fare and funding increases.
MASS TRANSIT.

22. American Association of State Highway and Transportation Officials. **TRANSPORTATION: KEY TO A BETTER FUTURE. THE RELATIONSHIP OF TRANSPORTATION INVESTMENTS TO ECONOMIC GROWTH: A SPECIAL COMMITTEE REPORT.** Washington, DC: 1990.

This report examines the relationship between transportation and economic growth in America. It points out that less than one percent of the nation's economic resources are invested in transportation each year, about half that of just 25 years ago, and that recent findings show it is probably not a coincidence that the nation's rate of growth in productivity has been cut in half at about the same time that the level of national resources devoted to investment in infrastructure has dropped sharply.
GENERAL*

23. American Association of State Highway and Transportation Officials. **UNDERSTANDING THE HIGHWAY FINANCE EVOLUTION/REVOLUTION**. Washington, DC: 1987.

This document reviews the discussions of the National Conference on State Highway Finance meeting entitled "Understanding the Highway Finance Evolution/Revolution." Papers were presented addressing five major funding techniques: user fees, nonuser fees, special benefit fees, private financing, and debt financing.
HIGHWAYS.

24. American Association of State Highway and Transportation Officials. **WATER TRANSPORTATION REPORT: A SUMMARY OF MAJOR ISSUES AFFECTING THE NATION'S WATER TRANSPORTATION SYSTEM**. Washington, DC: 1989.
This report identifies major issues which affect the nation's water transportation system.
WATER RESOURCES.

25. American Association of State Highway and Transportation Officials, Standing Committee on Highway Traffic Safety. **HIGHWAY SAFETY STRATEGIC PLAN 1991-2000**. Washington, DC.

This report gives an overview of highway safety problems and presents a long-term strategy and plan that will guide the Standing Committee on Highway Traffic Safety in the 1990s.
HIGHWAYS.

26. American Association of State Highway and Transportation Officials, Standing Committee on Public Transportation. **SURVEY OF STATE INVOLVEMENT IN PUBLIC TRANSPORTATION**. Washington, DC.

This survey tracks the growing role of states in public transportation. The survey identifies the categories of funding provided, state technical assistance activities, and the use of oil overcharge funds.
MASS TRANSIT.

27. American Association of State Highway and Transportation Officials, Standing Committee on Water Transportation. **SURVEY OF STATE FUNDING OF LANDSIDE PORT**

FACILITIES, CARGO TERMINALS AND HARBOR IMPROVEMENTS PROJECTS, 1977-1988. Washington, DC: 1989.

This survey provides information on how state governments conduct needed port and terminal development and harbor improvement projects in light of increasing costs and changing federal and state responsibilities.
WATER RESOURCES.

28. American Planning Association. **SYMPOSIUM: DEVELOPMENT IMPACT FEES**. Journal of the American Planning Association; 54:3-90 Winter 1988.

Issues surrounding fees assessed on developers to finance infrastructure improvement.
GENERAL.

29. American Road and Transportation Builders Association. **ENHANCING U.S. COMPETITIVENESS THROUGH HIGHWAY INVESTMENT**. Transportation Builder, Washington, DC: 1990.

It is noted that in this decade, the U.S. ability to compete in world markets will be strongly put to the test. Countries that sustain a high level of public investment relative to output experience higher productivity growth than other countries. The U.S. has a low public investment ratio of 0.3% and an inferior productivity growth of 0.6% per year. A simulation of the likely economic effects of a significant increase in federal highway spending proposed by the American Road and Transportation Builders Association is reported.
HIGHWAYS.

30. American Road and Transportation Builders Association. **THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991**. Washington, DC: 1991.

This report reviews the effects of the Intermodal Surface Transportation Efficiency Act of 1991. This law is described as the most sweeping revision of federal surface transportation programs in 35 years.
HIGHWAYS/MASS TRANSIT.

31. American Road and Transportation Builders Association; Mudge, R.; Aschauer, DA. **ENHANCING U.S. COMPETITIVENESS THROUGH HIGHWAY INVESTMENT: A STRATEGY FOR ECONOMIC GROWTH**. Bethesda, MD: Apogee Research, Inc. 1990.

Recent research provides persuasive evidence that the slowdown in public works investment in the United States over the past quarter century may well be the most significant single force behind the relative decline in U.S. productivity. This paper utilizes Dr. Aschauer's work to quantify the potential economic effects of implementing the $25 billion per year increase in federal highway and bridge investment that has been proposed by the American Road and Transportation Builders Association (ARTBA). The discussion explains how, and why, transportation infrastructure plays a key role in encouraging greater private sector productivity.
HIGHWAYS*

32. American Trucking Association. **ROAD WORK**. Transportation Executive Update. 1. 1990.

This article discusses the ideas proposed in a study produced by the Brookings Institution entitled Road Work: A New Highway Pricing & Investment Policy, by Kenneth A. Small, Clifford Winston, and Carol A. Evans. The authors propose a pricing and investment policy that would enable roads to be nearly completely supported by user fees. To cover truck damage to roads, the authors suggest pavement-wear taxes based on axle weight.
HIGHWAYS.

33. American Water Works Association. **WATER UTILITY ACCOUNTING**. 1980.

Calls for tracking the physical condition of assets in order to establish a maintenance program. Emphasizes that the cost of not maintaing a project should include those costs incident upon an interruption of service supplied by the facility. Generally concusrs in the recommendations from the National Association of Regulatory Utility Commissioners and the National Council on Governmental Accounting.
WATER SUPPLY

34. Anderson, Deborah D.; Burnham, Laurie (Procter & Gamble, Cincinnati, OH). **TOWARD SUSTAINABLE WASTE MANAGEMENT**. Issues Sci Technol. v9, n1, p65(8). September 1992.

Technology development and environmental concerns will shape the future of industrial waste management policies. Improvements will come as waste management plans and policies are developed and implemented. These policies might include the options of source reduction, waste reprocessing, and waste-to-energy conversions in landfills and incinerators.
SOLID WASTE*

35. Angell, Cynthia; Shorter, Charles A. **IMPACT FEES: PRIVATE SECTOR PARTICIPATION IN INFRASTRUCTURE FINANCING.** Government Finance Review; 4:19-21. October 1988.

Reprinted from Real Estate Report, vol. 17, no. 1. this report presents findings from a survey of programs. It covers 43 U.S. communities: focusing on San Francisco, Palm Beach County, Florida, Montgomery County, Maryland, and Boston.
GENERAL.

36. Apogee Research, Inc. **AMERICA'S ENVIRONMENTAL INFRASTRUCTURE: A WATER AND WASTEWATER INVESTMENT STUDY**. Washington, DC: Clean Water Council. December 1990.

This report presents new insights into the extent to which water and wastewater treatment infrastructure supports economic growth and productivity throughout the nation. It documents recent underinvestment in water and wastewater facilities, relative to independent assessments of "needs" in greater detail on a state-by-state basis. Finally, this report presents several options to address the projected shortfall in the level of investment in water and wastewater infrastructure.
WASTEWATER TREATMENT*/WATER SUPPLY.

37. Apogee Research, Inc. **FINANCING INFRASTRUCTURE: INNOVATIONS AT THE LOCAL LEVEL**. Washington, DC: National League of Cities.

This study examined 24 case studies of locally financed infrastructure development. The case studies were selected to illustrate a range of financing techniques suited to infrastructure expansion and rejuvenation.
GENERAL*

38. Apogee Research, Inc. **THE FULL COSTS OF TRANSPORTATION: A REVIEW OF THE LITERATURE**. Cambridge, MA: Conservation Law Foundation. 1993.

This literature review, prepared by Apogee Research, Inc. concentrates on literature discussing the total costs of public transit transportation. Apogee's review of studies on transportation costs found that the literature can be grouped into four major categories: User Cost Studies, Cost Allocation Studies, Externality Studies, and Total Cost Studies.
HIGHWAYS*

39. Apogee Research, Inc. **HIGHWAY INVESTMENT & U.S. COMPETITIVENESS: HOW THE U.S. COMPARES TO JAPAN, GERMANY, AND KOREA**. Bethesda, MD: American Road & Transportation Builders Association. 1991.

Recent empirical research suggests there is a strong link between national investment in public capital stock such as highways and bridges and national productivity performance. This study compares U.S. highway investment and competitiveness with several of our major economic competitors.
HIGHWAYS.

40. Apogee Research, Inc. **THE JOBS IMPACT OF AN EXPANDED FEDERAL HIGHWAY PROGRAM**. Washington, DC: American Road and Transportation Builders Association. 1991.

This analysis, prepared by Apogee Research, Inc., estimates the number of new jobs that would be created by the American Road & Transportation Builders Association proposal to increase annual federal highway investment by $25 billion.
HIGHWAYS.

41. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON HAZARDOUS WASTE**. Washington, DC: National Council on Public Works. 1987.

This report was prepared to assist the National Council on Public Works in examining hazardous waste management as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's management of hazardous waste.
HAZARDOUS WASTE*

42. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON AIRPORT AND AIRWAYS**. Washington, DC: National Council on Public Works Improvement.

This report was prepared to assist the National Council on Public Works Improvement in examining airports and airways as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's airports and airways.
AIR TRANSPORTATION*

43. Apogee Research, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON WASTEWATER MANAGEMENT**. Washington, DC: National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining wastewater management as an issue in the nation's public works improvement program and to make a detailed assessment of the state of the nation's wastewater management.
WASTEWATER TREATMENT*

44. Apogee Research, Inc. **PUBLIC WORKS ISSUES PAPER: GOVERNMENT ROLES**. Washington, DC: National Council on Public Works. 1987.

This paper, prepared for the National Council on Public Works Improvement, reviews the principles for government role assignment including evidence of the effectiveness of financing mechanisms.
GENERAL*

45. Apogee Research, Inc. **THE SUSQUEHANNA VALLEY REGIONAL AIRPORT AUTHORITY (SVRAA) AVIATION NEEDS STUDY**. Bethesda, MD: May 1994.

This study is designed to examine the long-term air transportation needs, both operational and economic, of the South Central Pennsylvania region. The study focuses on examining long-term demand and capacity at Harrisonburg International Airport (HIA), the region's primary commercial service airport. In addition, it considers the role of the region's other airports relative to HIA. This report describes recent trends in the air transportation industry, demand and capacity at HIA and other regional airports, and the economic value of aviation in the Susquehanna Valley.
AIR TRANSPORTATION.

46. Arnott, Richard J.; Stiglitz, Joseph E. **CONGESTION PRICING TO IMPROVE AIR TRAVEL SAFETY**. Moses, Leon N.//Savage, Ian, ed., Transportation Safety in an Age of Deregulation. New York, NY: Oxford University Press; pages 167-85. 1989.

AIR TRANSPORTATION.

47. Aschauer, David Alan. **INFRASTRUCTURE: AMERICA'S THIRD DEFICIT**. Challenge; 34:39-45. March 1991.

This article contends that declining U.S. public investment is a major cause of the economy's faltering productivity, profitability, and private sector capital formation.
GENERAL.

48. Aschauer, David Alan. **INFRASTRUCTURE ENHANCES NATIONAL COMPETITIVENESS**. Constructor (Associated General Contractors of America). Washington, DC: Associated General Contractors of America. 1989.

This article examines factors that might account for U.S. competitiveness problems and what role the government might play in promoting international competitiveness. A potential "supply-side" avenue by which public policy may be able to exert influence on the process of

economic expansion in the U.S. is public investment in a basic infrastructure of roads, highways, mass transit, airports, port facilities, and similar structures.
GENERAL.

49. Aschauer, David Alan. **IS PUBLIC EXPENDITURE PRODUCTIVE?** Journal of Monetary Economics; 23(2), pages 177-200. March 1989.

    This paper considers the relationship between aggregate productivity and stock and flow government-spending variables.
    GENERAL*

50. Associated General Contractors of America. **AMERICA'S INFRASTRUCTURE: EFFECTS OF CONSTRUCTION SPENDING**. 1984.

    This report examines the effects a significant (16%) increase in public construction would have on the federal budget and the U.S. economy as well as industrial production and employment.
    GENERAL*

51. Associated General Contractors of America. **AMERICA'S INFRASTRUCTURE - A PLAN TO REBUILD**. Washington, DC.

    The Associated General Contractors of America research reveals a minimum necessary capital investment of approximately $3.03 trillion. While the time frame for addressing such needs varies in the individual infrastructure categories, a weighted average indicates that most investment is projected to be necessary within the next 19 years.
    GENERAL*

52. Associated General Contractors of America. **FINANCING THE REBUILDING**. Constructor. 1989.

    State revolving loan funds (SRFs) were established in order for states to be able to fund infrastructure improvements. The establishment and administration of an SRF in Texas is discussed in this article. It illustrates how a successful SRF works. The Texas State Water Pollution Control Revolving Fund came into existence on June 17, 1987 by an act of the state legislature. It is a perpetual fund through which the Texas Water Development Board (TWDB) provides low interest loans to Texas communities for construction of wastewater treatment facilities. The fund is managed by the state with minimal federal oversight.
    WASTEWATER TREATMENT.

53. Association of Metropolitan Sewerage Agencies. **APPROACHES TO COMBINED SEWER OVERFLOW PROGRAM DEVELOPMENT: A CSO ASSESSMENT REPORT**. November 1994.

    This comprehensive report discusses CSO control programs in twenty-one communities. The information assists in characterizing the site-specific nature of CSOs, placing CSOs in context with other water quality issues and understanding water quality goals and the processes used to establish the basis for CSO control programs. The report examines options for CSO controls and associated costs of programs by factually describing effective CSO control efforts that are completed or underway nationally.
    WATER RESOURCES*

54. Ausubel, J. H.; Herman, R. **CITIES AND THEIR VITAL SYSTEMS INFRASTRUCTURE. PAST, PRESENT AND FUTURE**. Washington, DC: National Academy of Engineering. 1988.

The subject of the book is infrastructure, the built environment in which society lives, the way it is used, and how it may evolve in the future. The chapters in the book show vividly that the overall problems of the physical infrastructure and the human activity associated with it present both an overwhelming and an inviting task for researchers and practicing engineers. GENERAL.

55. Azad, Bizhan; Jacobs, Michael Department of Urban Studies and Planning. **INFRASTRUCTURE FINANCE AND INSTITUTIONS, A REVIEW OF INTERNATIONAL EXPERIENCE**. Massachusetts Institute of Technology.

This report reviews the international experiences in financial mechanisms and institutional arrangements that offer innovative solutions to infrastructure problems in the United States. It stresses the importance of using a demand rather than a needs approach to assess infrastructure projects and financing tools.
GENERAL*

56. Ball, James T. **TRANSPORTATION: NEW SYSTEMS FOR THE NEW CENTURY**. Civil Engineering-ASCE. v60, n10, p54(3). October 1990.

An integrated transportation system will be needed in the 21st century to alleviate traffic congestion and improve transportation safety. To this end, a solution is proposed based on three steps: a North American high-speed rail system consisting of both steel rail and magnetic levitation; new regional airports linked with this new rail system; and a highway safety program designed to separate large-truck traffic from smaller vehicles.
HIGHWAYS/MASS TRANSIT.

57. Batey, Peter W. J.; Madden, Moss; Scholefield, Graham. **SOCIO ECONOMIC IMPACT ASSESSMENT OF LARGE SCALE PROJECTS USING INPUT OUTPUT ANALYSIS: A CASE STUDY OF AN AIRPORT**. Regional Studies; 27(3), pages 179-91. 1993.

This paper focuses upon the methodological issues that are encountered in measuring the socio-economic impacts of a large-scale infrastructure investment. Focusing on the example of airport expansion, the paper demonstrates how an appropriate impact assessment model can be developed, based on the principles of extended input-output analysis.
AIR TRANSPORTATION.

58. Bell, J. M. (ed).; Bates, M. H.; Selton, S. P. **ENVIRONMENTAL ENGINEERING INFRASTRUCTURE: PROBLEMS AND NEEDS**. PROCEEDINGS OF THE 41st INDUSTRIAL WASTE CONFERENCE. Stillwater, OK: School of Civil Engineering, Oklahoma State University. 1987.

Environmental infrastructure includes a wide variety of public services such as water supply, water and wastewater treatment, air pollution control, and solid and hazardous waste treatment and disposal. The failure of any environmental infrastructure is potentially harmful to a wide segment of society and may have far reaching ramifications. A contributing factor to the failure of many ancient societies was their inability to deal with the byproducts of their

growth; for example, often disease occurred because of improper use of the land, improper use of the water, or both.
GENERAL.

59. Berenyi, Eileen B.; Gould, Robert N. **RESOURCE RECOVERY YEARBOOK, 1993-94: DIRECTORY & GUIDE**. New York, NY: Governmental Advisory Associates, Inc.; 6th ed. xxxiv+670p. 1993.

    Technical and economic overview of waste-to-energy efforts and practices; provides specific data on 325 resource recovery facilities.
    SOLID WASTE.

60. Berger, Bernard B. **THE URBAN WASTEWATER INFRASTRUCTURE**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988.

    WASTEWATER TREATMENT.

61. Bernardeau, Christine; Mudge, Richard. **CURRENT LITERATURE ON HIGHWAY INVESTMENT AND ECONOMIC DEVELOPMENT**. Washington, DC: Transportation Research Board, National Research Council. 1989.

    This report surveys current literature on the relationship between highway investment and economic productivity. The report includes an analysis of the economic models currently used to discuss the relationship between economic productivity and highway investment, recommendations for future economic methodologies, a bibliography, a synopsis of selected papers, and a summary of selected papers.
    HIGHWAYS.

62. Bernstein, Norman W. **TO CLEAN UP LANDFILLS, THE LEADER SHOULD BE MUNICIPALITIES USING ECONOMIC INCENTIVES TO SETTLE**. Environmental Law Reporter; 19:10012-15. January 1989.

    The issue of this paper is contaminated municipal landfill sites. It urges municipalities to take the initiative in developing settlements with polluting companies. New York City is presented as a case study.
    SOLID WASTE/HAZARDOUS WASTE.

63. Berry, John M. **INFRASTRUCTURE NEEDS WORK, BUT CRISIS TALK IS EXCESSIVE.** Financier; 13:7-11. March 1989.

    Discusses the extent of deterioration of U.S. infrastructure, particularly in the context of transportation needs: highways, railways, and airports.
    GENERAL.

64. Blaesser, Brian W.; Kentopp, Christine M. **IMPACT FEES: THE "SECOND GENERATION"**. Washington University Journal of Urban and Contemporary Law; 38:55-113. September 1990.

Discusses the experiences in several U.S. states since the 1980s. Examines original and new legislation, court decisions, and implementation issues of local government techniques for funding capital facilities needed to serve new development.
GENERAL.

65. Blinder, AS. **ECONOMIC VIEWPOINT: ARE CRUMBLING HIGHWAYS GIVING PRODUCTIVITY A FLAT?** Business Week. 3067. 1988.

This article notes America's slipping productivity growth rate, and notes a hypothesis offered by a recent study which relates it to America's failure to maintain infrastructure. The study suggests that America's failure to maintain an adequate growth in such aspects as highways, mass transit, airports, and sewers may underlie the much-lamented but poorly understood productivity slowdown.
HIGHWAYS.

66. Blodgett, John E. **ECONOMIC AND ENVIRONMENTAL POLICYMAKING: TWO-STEPPING TO A WALTZ**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

This report summarizes the costs of pollution control mandates and explores interactions of economic and environmental policies and programs.
GENERAL.

67. Blodgett, John E. **MUNICIPAL ENVIRONMENTAL SERVICES**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

Reviews environmental services provided by local governments, including drinking water supply, wastewater treatment, and trash collection.
GENERAL.

68. Bourey, James M. **MANAGING GROWTH AND INFRASTRUCTURE DEVELOPMENT**. Capital Projects: New Strategies for Planning, Management, and Finance. Washington, DC: International City Management Association. 1989.

GENERAL.

69. Boyle, Wayne. **EIGHT WAYS TO FINANCE TRANSIT: A POLICYMAKER'S GUIDE**. Denver, Colorado: National Conference of State Legislatures. 1994.

State and local governments are being called upon to assume a greater share of the ever-increasing costs of public transportation. This report examines the alternative private-sector sources used to help meet these costs. Each of nine chapters includes a particular financing method, examples of it in action, a case study showing all stages of development and a discussion of related issues.
MASS TRANSIT.

70. Brain, SM. **AMERICA'S INFRASTRUCTURE: THE KEY TO OUR QUALITY OF LIFE.** Constructor (Associated General Contractors of America). 1989

This article examines what has caused the decline in infrastructure investment and, consequently, in our quality of life. The detailed discussion covers water pollution and

wastewater treatment project needs; disposal of solid waste and hazardous waste; the deterioration of public buildings; and the U.S. transportation network deterioration from aging and underinvestment, including statistics on the nation's deteriorating highways, deficient bridges, and airport congestion, and the need for expansion and modernization of the nation's ports and waterways.
GENERAL.

71. Bridges, Sara VanMeter. **A LOCAL GOVERNMENT PERSPECTIVE ON FINANCING INFRASTRUCTURE.** Journal of Planning Literature; 6:202-9. November 1991.

    Examines influences on state and local government programs.
    GENERAL.

72. Bumgarner, Mary; Martinez, Vazquez Jorge; Sjoquist, David L. **MUNICIPAL CAPITAL MAINTENANCE AND FISCAL DISTRESS**. Review of Economics and Statistics; 73(1), pages 33-39. February 1991.

    This paper formalizes and empirically tests the hypothesis that deficient maintenance of public infrastructure is caused by fiscal distress. The authors utilize a production-decision framework in which public officials combine maintenance and new capital to produce a desired level of capital services.
    GENERAL.

73. Burnaby, Priscilla; Herhold, Susan. **SERVICE EFFORTS AND ACCOMPLISHMENTS REPORTING: ITS TIME HAS COME -- WATER AND WASTEWATER TREATMENT**. Government Accounting Standards Board. 1990.

    This report examines performance indicators and reporting for drinking water, wastewater treatment, and storm drainage.
    WASTEWATER TREATMENT/WATER SUPPLY*

74. Burwell, David. **MOVING INTO THE FUTURE: YOU CAN'T GET THERE FROM HERE BY FOLLOWING THE PRESIDENT'S PROPOSAL FOR REAUTHORIZATION OF THE SURFACE TRANSPORTATION ASSISTANCE ACT: BUT THERE IS AN ALTERNATE ROUTE.** Environmental Forum; 8:12-17. July 1991.

    Critiques the present transportation infrastructure and examines areas for reform. Emphasizes the lack of adequate mass transit and overspending on highway system.
    GENERAL.

75. Bush, George. **EXECUTIVE ORDER 12803: INFRASTRUCTURE PRIVATIZATION, APRIL 30, 1992.** Weekly Compilation of Presidential Documents; 28:733-5. May 4, 1992.

    Eases restrictions on the sale or lease of federally financed assets owned by state or local governments.
    GENERAL.

76. Busson, Terry; Hackett Judith. **STATE ASSISTANCE FOR LOCAL PUBLIC WORKS**. The Council of State Governments. 1987.

    This report examines the role of the state in providing public assistance to local governments for public works and provides a wealth of facts, figures and insights about state assistance for

This report examines the role of the state in providing public assistance to local governments for public works and provides a wealth of facts, figures and insights about state assistance for local public works. It gives an authoritative picture of the diversity of the states and regions, the evolving state role in infrastructure assistance, and timely information about innovative state approaches.
GENERAL*

77. Campbell, Harrison S. Jr; Giertz, J. Fred. **IMPACT FEES FOR DEVELOPING INFRASTRUCTURE.** Policy Forum; 3:[1-4] no 1. 1990.

One-time charges applied by local governments to new developments are examined. Their use, distribution, effect on economic development, and relation to other sources of revenue are discussed.
GENERAL.

78. Cantor, David J. **HIGHWAY CONSTRUCTION: ITS IMPACT ON THE ECONOMY.** Washington, DC: Congressional Research Service. 1993.

HIGHWAYS.

79. Carolan, Milou. **RECYCLING SOLID WASTE.** Management Information Service Report. 21:1-14. June 1989.

Provides case studies of local solid waste management initiatives in Newark, New Jersey; South Berwick, Maine; and San Jose, California.
SOLID WASTE.

80. Carolan, Milou. **REGIONAL APPROACHES TO ENVIRONMENTAL MANAGEMENT.** Public Management. 72:15-20. March 1990.

Cooperation of local authorities on the city and county level in the area of solid waste disposal.
SOLID WASTE.

81. Casey, P. **EFFLUENT FEES: POLICY CONSIDERATIONS ON A SOURCE OF REVENUE FOR INFRASTRUCTURE FINANCING.** Springfield, VA: National Technical Information Service. August 1988.

This paper discusses the experience of effluent fees in Europe, and proposes an effluent fee program that would provide needed capital to the State Revolving Fund. The fee would be tied into the National Pollutant Discharge Elimination System permits through gradual implementation. Various options for settling the fee and enforcement procedures are also discussed.
WASTEWATER TREATMENT.

82. Chase, Robert A. **"FRAGILE FOUNDATIONS": PUBLIC INFRASTRUCTURE AND ECONOMIC DEVELOPMENT.** Pacific Northwest Executive; 7:9-15. April 1991.

Discussion of public works investment as an economic stimulant in the U.S. Pacific Northwest.
GENERAL.

83. Chertow, Marian R. **GARBAGE SOLUTIONS: A PUBLIC OFFICIAL'S GUIDE TO RECYCLING ALTERNATIVE SOLID WASTE MANAGEMENT TECHNOLOGIES**. Washington, DC: U.S. Conference of Mayors. 1989.

SOLID WASTE.

84. Choate, Pat; Walter, Susan. **AMERICA IN RUINS: THE DECAYING INFRASTRUCTURE**. 1983.

America's public facilities are wearing out faster than they are being replaced. The deteriorated condition of basic facilities that underpin the economy will prove a critical bottleneck to national economic renewal during this decade unless we can find ways to finance public works.
GENERAL*

85. Church, Thomas W. Takamura, Robert T. **CLEANING UP THE MESS: IMPLEMENTATION STRATEGIES IN SUPERFUND**. Washington, DC: Brookings Books. 1993.

The objective of this book was to learn about the strategies used by the U.S. Environmental Protection Agency(EPA) to get individuals, corporations, and units of state and local government to pay millions of dollars to clean up environmental problems that these parties had a role in creating.
HAZARDOUS WASTE*

86. Civil Engineering Research Foundation. **FEDERAL RESEARCH: OPPORTUNITIES FOR THE DESIGN AND CONSTRUCTION INDUSTRY**. Washington, DC 1992.

This study examined existing methods for transfer of technology from the federal laboratories; examples of promising technologies with significant potential for the designing and construction industry; mechanisms for improving transfer of federal technology to the design and construction industry.
GENERAL.

87. Civil Engineering Research Foundation. **SETTING A NATIONAL RESEARCH AGENDA FOR THE CIVIL ENGINEERING PROFESSION: EXECUTIVE SUMMARY**. Washington, DC: 1991.

This report is a specific blueprint for all civil engineering organizations to identify where and how to gather resources and to use them in bringing innovation and improvements to the design, construction and environmental industries.
GENERAL.

88. Civil Engineering Research Foundation. **SUMMARY REPORT ON THE CREATION OF A HIGHWAY INNOVATIVE TECHNOLOGY EVALUATION CENTER(HITEC)**. Washington, DC: 1992.

This paper is a summary of the Workshop on Implementing Innovative Highway Technology. The primary goal of the workshop was to enable participants, on the basis of their collective experience and expertise, to provide guidance and recommendations regarding critical

operational, marketing, and financial/ legal parameters for an independent innovative highway technology evaluation center.
HIGHWAYS.

89. Clark, R. M.; Lykins, B. W.; Goodrich, J. A. **INFRASTRUCTURE AND MAINTENANCE OF WATER QUALITY**. Cincinnati, OH: U.S. Environmental Protection Agency, Water Engineering Research Lab. September 1985.

This paper analyzes the various factors that influence repair and replacement decisions in water distribution systems and the problems surrounding maintenance of water quality. Concern over maintenance of water quality in distribution systems and a growing awareness of the apparent decay of America's infrastructure has motivated EPA's Drinking Water Research Division to sponsor a series of projects dealing with the repair and rehabilitation of drinking water distribution systems.
WATER SUPPLY.

90. Clinton, William J. **EXECUTIVE ORDER 12893: PRINCIPLES FOR FEDERAL INFRASTRUCTURE INVESTMENTS, 26 JANUARY 1994.** Washington, DC: Weekly Compilation of Presidential Documents. January 30, 1994.

Represents first time that a uniform set of investment principles were formally articulated by the Executive Branch for consistent application across range of federal public works agencies, categories, and programs. Requires that "major" agency direct spending and grants for infrastructure be subjected to a benefit-cost analysis, with full analysis of alternatives including pricing, demand management, and privatization. Encompasses infrastructure investments for both capital and operation/maintenance programs, with primary focus on capital spending. Federal infrastructure covered include transportation, water resources, energy, and environmental protection programs.
GENERAL.

91. Clinton, William J. **EXECUTIVE ORDER 12866: REGULATORY PLANNING AND REVIEW, 30 SEPTEMBER 1993.** Washington, DC: Weekly Compilation of Presidential Documents. October 4, 1993

Establishes a program to reform the regulatory process. Requires all proposed regulatory actions having an economic impact of $100 million or more to be subjected to a broad benefit-coast analysis, compared with alternatives to regulation, and implemented only if net benefits are maximized. Also requires agencies to develop regulatory plans which lay out goal, legal basis, statement of need and schedule of action for all proposed regulations, and establishes a centralized review process for regulatory issues.
GENERAL.

92. Collin, Robert W. **WASTE SITING DECISIONS AND COMMUNITIES OF COLOR: A CALL FOR RESEARCH.** Journal of the Community Development Society; 23:1-10 no 2. 1992.

Reviews Greenpeace and EPA reports indicating that hazardous waste sites are located disproportionately in Black and Hispanic communities.
HAZARDOUS WASTE.

93. Colman, William. **THE PUBLIC WORKS RESPONSIBILITIES OF FEDERAL, STATE, AND LOCAL GOVERNMENTS AND THE PRIVATE SECTOR**. Washington, DC: National Council on Public Works Improvement. 1986.

This final report for the National Council on Public Works Improvement presents information, ideas, and recommendations about the respective responsibilities of federal, state, and local governments in policy formation, financing, and managing public works.
GENERAL*

94. Colodny, E. I. **AVIATION'S PERSPECTIVE: MOVING AMERICA: A LOOK AHEAD TO THE 21ST CENTURY**. Washington, DC: U.S. Department of Transportation. 1989.

Edwin I. Colodny, president of U.S.AIR, Incorporated, emphasizes that aviation today is truly mass transportation. He predicts that air traffic will grow by 25% in the next century and calls for increased aviation infrastructure to meet this need. He recommends: retention of user fees in airport and airway capital development; assignment of capital spending to airport capacity expansions and new airports, with consideration of environmental aspects; acceleration of the National Airspace System plan to modernize air traffic control systems and surveillance and weather technology; and allocation of additional resources to research and development to increase capacity.
AIR TRANSPORTATION.

95. Consad Research Corporation. **A STUDY OF PUBLIC WORKS INVESTMENT IN THE UNITED STATES**. Washington, DC: U.S. Government Printing Office. 1990.

This report, prepared for the U.S. Department of Commerce, examines the long-term characteristics of federal, state, and local public works investment spending.
GENERAL*

96. Copeland, Claudia. **CLEAN WATER ACT REAUTHORIZATION: ISSUE BRIEF**. Washington, DC: U.S. Congressional Research Service, The Library of Congress.

Covers priority issues in the Clean Water Act reauthorization, including municipal wastewater treatment programs and impacts on small communities.
WASTEWATER TREATMENT.

97. Copeland, Claudia. **CLEAN WATER ACT LEGISLATION: SUMMARY OF S. 1114**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. June 1993.

This CRS report summarizes legislation introduced by Max Baucus and John Chafee to reauthorize the Clean Water Act, S. 1114. The report includes an introduction that places the bill within a legislative and political context and introduces the Clean Water Act. Each section of the bill is summarized separately.
WASTEWATER TREATMENT.

98. Copeland, Claudia. **WASTEWATER TREATMENT: OVERVIEW AND BACKGROUND**. Washington, DC: U.S. Congressional Research Service, The Library of Congress. February 1993.

The availability of funding for the construction of municipal sewage treatment plants continues to be a major concern of cities and states and will be a key issue for reauthorization of the Clean Water Act.
WASTEWATER TREATMENT.

99. Craig, Thomas. **AIR TRAFFIC CONGESTION: PROBLEMS AND PROSPECTS**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

    AIR TRANSPORTATION.

100. Cristofano, Sam M.; Foster, William S. **MANAGEMENT OF LOCAL PUBLIC WORKS**. Washington, DC: ICMA Publications. 1986.

    Covers management of the public works function in local government: organization and management, information systems, finance and budgeting, planning, personnel practices and productivity, communications management, and liability. It shows how basic principles apply to the management of technical areas.
    GENERAL.

101. Cromwell, Brian A. **THE IMPACT OF CAPITAL GRANTS ON MAINTENANCE IN THE LOCAL PUBLIC SECTOR**. Cleveland, OH: Federal Reserve Bank of Cleveland; 45p. 1988.
    Based on an analysis of data on the maintenance practices of privately and publicly owned local mass transit systems. Examines whether state and federal grant policies induce local governments to substitute new investment for the maintenance of existing capital, resulting in excessive deterioration of public infrastructure.
    MASS TRANSIT.

102. Cromwell, Brian A. **PUBLIC SECTOR MAINTENANCE: THE CASE OF LOCAL MASS TRANSIT**. National Tax Journal; 44(2), pages 199-212. June 1991.

    This paper explores maintenance practices in the local public sector and their relationship to state and federal grant policies. If state and federal grant policies induce local governments to substitute new investment for the maintenance of existing capital, excessive deterioration of public infrastructure may result. Using a new data set on the maintenance policies of local mass-transit providers, it shows that private owners of transit capital equipment devote significantly greater resources to maintenance than do public owners of similar capital.
    MASS TRANSIT.

103. Cross, Ted; Palmer, D. **PASSENGER TRANSPORT:THE NEW FRAMEWORK. PAPERS PRESENTED AT A CONFERENCE HELD IN APRIL 1993. CHAPTER 4. EXTRACTING MONEY FROM THE SYSTEM: PRIVATE FUNDING OF TRANSPORT INFRASTRUCTURE INVESTMENT**. Hertfordshire, England: Construction Industry Conference Centre. 1993.

    The history of private funding for transport infrastructure is outlined. Different approaches to private sector funding are considered including developers contributions. The advantages to

the private sector of investing in such projects are discussed, and the problems encountered are highlighted.
MASS TRANSIT.

104. Cuciti, Peggy. **PLANNING FOR INFRASTRUCTURE: A HANDBOOK FOR STATE & LOCAL OFFICIALS**. Boulder, CO: University of Colorado. 1985.

Information is offered to aid state and local officials interested in analyzing infrastructure needs within their communities. Conceptual, methodological, and procedural issues that must be confronted in any analysis of infrastructure are addressed. A comprehensive infrastructure review consists of eight tasks, which are outlined and applied to analysis of highways, bridges, mass transit, water supply, and wastewater collection/treatment needs.
GENERAL.

105. Darcy, William R. **THE ARGUMENTS FOR PUBLIC OWNERSHIP OF MATERIALS RECOVERY FACILITIES**. Resource Recycling; 10:57-9. June 1991.

Cost and other efficiencies associated with government ownership of municipal recycling services are discussed.
SOLID WASTE.

106. Delmar, Clare; Menendez, Aurelio. **INFRASTRUCTURE FINANCE IN THE UNITED STATES: ISSUES AND MECHANISMS**. National Council on Public Works Improvement. 1986.

This report explores the area of financing infrastructure expenditures. It provides a normative framework for analyzing and evaluating methods for financing infrastructure according the general principles of need, demand, public goods, capital goods, efficiency, and equity.
GENERAL*

107. Deno, Kevin T. **THE EFFECT OF PUBLIC CAPITAL ON U.S. MANUFACTURING ACTIVITY: 1970 TO 1978**. Southern Economic Journal; 55(2), pages 400-411. October 1988.

The effect of various types of public capital on manufacturing firm's variable input demand and output supply decisions is derived via the estimation of a normalized translog profit function. The time-series-cross-section sample consists of manufacturing data from thirty-six standard metropolitan statistical areas for the 1970-78 time period. The findings indicate that concern over declining public infrastructure is well founded.
GENERAL.

108. Diewert, W. Erwin. **THE MEASUREMENT OF THE ECONOMIC BENEFITS OF INFRASTRUCTURE SERVICES**. Berlin, Germany Springer-Verlag. 1986.

GENERAL.

109. Dimeo, Jean. **THE AGONY OF THE STREET. SPECIAL REPORT**. American City and County. 1991.

Compelling statistics are quoted to show how the nation's infrastructure is deteriorating. Inefficient roads cost Americans billions of dollars and hours in wasted time every year. The

costs of inefficient roads and airports are noted, and declining support for railroads and mass transit are pointed out. The reasons for the underinvestment in the infrastructure are discussed. Some possible solutions to the problem are noted.
GENERAL.

110. Dimeo, Jean. **THE SURFACE TRANSPORTATION ACT: WILL IT BE ENOUGH?** American City and County. 107:26-8+. January 1992.

The likely impact and effectiveness of federal legislation in mass transit and highway development is discussed.
GENERAL.

111. Dorris, Virginia Kent. **CAN PUBLIC WORKS SAVE THE NATION? AN UPDATED VERSION OF THE WORKS PROGRESS ADMINISTRATION PURPORTS TO TACKLE BOTH THE INFRASTRUCTURE AND UNEMPLOYMENT PROBLEMS.** American City and County; 107:36-8+. August 1992.

Program proposals and financing options at the federal, state, and local level are presented.
GENERAL.

112. Downs, Anthony. **STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION**. Washington, DC: Brookings Books. 1992.

This book analyzes the likely effects of adopting each of the anticongestion remedies that has been seriously proposed. They include raising gasoline taxes, building more high-occupancy-vehicle lanes, better coordinating traffic lights on city arterials, and constructing new residential and commercial subdivisions at higher average population densities. Before discussing how each remedy would affect congestion, the author presents several principles about how congestion actually occurs. In the final chapter, the author summarizes his findings about congestion's causes and possible means of ameliorating it.
HIGHWAYS.

113. Duffy-Deno, Kevin T.; Eberts, Randall W. **PUBLIC INFRASTRUCTURE AND REGIONAL ECONOMIC DEVELOPMENT: A SIMULTANEOUS EQUATIONS APPROACH.** Journal of Urban Economics. November 1991.

This paper estimates the effect of public capital stock on regional income. The study employs a system of two equations that incorporate three dimensions of the relationship between public infrastructure investment and regional income: public infrastructure as an input into the production process, public investment as a construction or "public works" activity, and public infrastructure as a consumption good in the median household's utility function. Public capital stock estimates are based on the perpetual inventory technique for a sample of metropolitan areas. A two-stage least-squares method is used to estimate the relationship between metropolitan personal income and local public capital stock.
GENERAL.

114. Eberts, Randall W. **CROSS SECTIONAL ANALYSIS OF PUBLIC INFRASTRUCTURE AND REGIONAL PRODUCTIVITY GROWTH.** Cleveland, OH: Federal Reserve Bank Of Cleveland Research Dept; 28p. 1990.

This study tests the relationship between local capital stock and regional manufacturing outputs, inputs, and productivity using data for 36 U.S. metropolitan areas, 1965-77.
GENERAL.

115. Eberts, Randall W. **PUBLIC INFRASTRUCTURE AND REGIONAL ECONOMIC DEVELOPMENT.** Federal Reserve Bank of Cleveland Economic Review. 26:15-27 no 1. 1990.

Analyzes the effectiveness of public works investment.
GENERAL.

116. Eberts, Randall W.; Fox, William F. **THE EFFECT OF FEDERAL POLICIES ON LOCAL PUBLIC INFRASTRUCTURE INVESTMENT**. Public Finance Quarterly; 20(4), pages 557-71; Cleveland, OH: Federal Reserve Bank of Cleveland. October 1992.

This report examines the relationship between federal tax policies and municipal infrastructure investment. The report contains discussions of federal tax policies, demand and supply of municipal debt, and demand for public infrastructure. Data is included about public capital investment.
GENERAL.

117. Eggers, WD. **PRIVATIZATION OPPORTUNITIES FOR STATES**. Los Angeles, CA: The Reason Foundation. 1993.

This report discusses the advantages of privatization, privatization techniques, and privatization opportunities. The following areas are discussed: road and rest area maintenance; public transit; motor vehicle registry; fleet operations and maintenance; airports; highways and bridges; turnpikes; and ports.
GENERAL.

118. Eisner, Robert. **INFRASTRUCTURE AND REGIONAL ECONOMIC PERFORMANCE: COMMENT**. New England Economic Review; 0(0), pages 47-58. September 1991.

The author takes the substantial body of data put together by Munnell and Cook for 48 states over the years 1970 to 1986 and uses the data in pooled time series regressions, in pooled cross sections, and finally in distributed-lag investment functions. The author's results support Munnell's finding that states that have more capital have greater output, even after taking into account both their amounts of labor (nonagricultural employment) and private capital.
GENERAL.

119. Enhance Reinsurance Company. **INFRASTRUCTURE INVESTMENT, AN HISTORICAL OVERVIEW**. New York, NY: Enhance Financial Services Group, Inc. 1991.

GENERAL.

120. Enis, Charles R.; Morash, Edward A. **INFRASTRUCTURE TAXES, INVESTMENT POLICY, AND INTERMODAL COMPETITION FOR THE TRANSPORTATION INDUSTRIES**. Journal of Economics and Business. February 1993.

The study provides a market-based methodology to empirically determine the net economic effects of a major highway user tax-infrastructure improvement package on the competitive

balance between the trucking and rail industries and on the competitiveness of different types of motor carriers. Based on the findings, the economic implications for management and future public policy actions are presented.
HIGHWAYS.

121. Eno Transportation Foundation, Inc. **TRANSPORTATION IN AMERICA**. 1992 (10th EDITION).
GENERAL.

122. Ernst & Young. **ERNST AND YOUNG 1992 NATIONAL WATER AND WASTEWATER RATE SURVEY**. Charlotte, NC: 1992.

WASTEWATER TREATMENT/WATER SUPPLY.

123. Evans, Carol A.; Small, Kenneth A.; Winston, Clifford. **ROAD WORK: A NEW HIGHWAY PRICING AND INVESTMENT POLICY**. xii+128p. 1989.

This essay proposes a new highway policy to meet the goals of efficiency, equity, and financial soundness. The proposed policy is based on efficient pricing to regulate demand for highway services and efficient investment to minimize the total cost of providing them. Topics covered include: U.S. interstate highway system, pavement wear and road durability, economic effects of investment in durability, heavy vehicle user charges, congestion and highway capacity.
HIGHWAYS.

124. Fawson, Chris; Giroux, Gary. **AN EMPIRICAL EXTENSION OF THE MUNICIPAL MONOPOLY MODEL TO PROVISION OF COMMUNITY INFRASTRUCTURE [BUREAUCRACY AND THE DIVISIBILITY OF LOCAL PUBLIC OUTPUT].** Public Choice; 57(1), pages 79-83. April 1988.

GENERAL.

125. Ferguson, Bruce K. **URBAN STORMWATER MANAGEMENT BIBLIOGRAPHY**. 15p. 1989.

This report focuses on the technical tracking of volumes of water. Environmental hydrology, runoff from individual storms, conveyance and erosion control, flood control, stormwater facilities, and other issues are discussed.
WATER RESOURCES.

126. Fishbein, Bette K.; Gelb, Caroline. **MAKING LESS GARBAGE: A PLANNING GUIDE FOR COMMUNITIES**. xii+179p. 1992.

Describes municipal planning to reduce the amount and toxicity of waste within existing government and institutional programs.
SOLID WASTE/HAZARDOUS WASTE.

127. Fitzgerald, Michael R. **FEDERALISM AND THE ENVIRONMENT: THE VIEW FROM THE STATES**. State and Local Government Review; 20:98-104. September 1988.

This report discusses hazardous waste management and site treatment facilities.
HAZARDOUS WASTE.

128. Fitzgerald, Randall. **WHEN GOVERNMENT GOES PRIVATE: SUCCESSFUL ALTERNATIVES TO PUBLIC SERVICES.** Pacific Research Institute for Public Policy; 330p. 1988.

Profiles successful privatization efforts of U.S. local governments. Partial contents include: Rebuilding our infrastructure; Unleashing our hoarded assets and; Privatizing federal spending.
GENERAL.

129. Fortuna, Richard. **RISK MANAGEMENT ISSUES ASSOCIATED WITH MANAGING HAZARDOUS WASTE SITES**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating Insurance and Risk Management for Hazardous Wastes. Norwell, MA: Kluwer Academic; pages 169-83. 1990.

HAZARDOUS WASTE.

130. Fouracre, P. **THE ROLE OF INFRASTRUCTURE IN IMPROVING PUBLIC TRANSPORT PERFORMANCE**. Brussels, Belgium: Transport and Road Research Laboratory and the International Union of Public Transport. 1991.

MASS TRANSIT.

131. Fox, William F.; Smith, Tim R. **PUBLIC INFRASTRUCTURE POLICY AND ECONOMIC DEVELOPMENT.** Federal Reserve Bank of Kansas City Economic Review; 75:49-59. March 1990.

Examines the slowdown in state and local spending; how the linkage between public infrastructure and economic development depends on location; and options available to deliver services more efficiently.
GENERAL.

132. Frank, J. E.; Falconer, M. K. **THE MEASUREMENT OF INFRASTRUCTURE CAPACITY: THEORY, DATA STRUCTURES, AND ANALYTICS**. Computers, Environment, and Urban Systems. 14(4: 283-297)

GENERAL.

133. Frayer, Eric R.; Libby, Lori B. **CAPITAL IMPROVEMENT FINANCING, 1991**. Baseline Data Report; 24:1-11. January 1992.

Issues influencing local government infrastructure financing are presented.
GENERAL.

134. Fruin, Jerry E.; Baumel, C. Phillip. **HOW MUCH TRANSPORTATION INFRASTRUCTURE DOES RURAL AMERICA NEED?** St: Paul MN: Department of Agricultural and Applied Economics, College of Agriculture, University of Minnesota; 25p. 1992.

The investment needed to maintain and improve freight and passenger services, railroads, roads, and waterways is described.
GENERAL.

135. Fujii, Edwin; Im, Eric; Mak, James. **THE ECONOMICS OF DIRECT FLIGHTS**. Journal of Transport Economics and Policy; 26(2), pages 185-95. May 1992.

Many tourist industry officials lobby their local governments to invest in airport infrastructure in order to accommodate direct flights. The authors evaluate the impact of the recent introduction of direct flights from the West Coast of the U.S. to Hawaii's neighboring islands, bypassing the previous hub, Honolulu. They find a significant, though modest, increase in travel to the neighboring islands.
AIR TRANSPORTATION.

136. Fuller, Stephen; Grant, Warren. **EFFECT OF LOCK DELAY ON GRAIN MARKETING COSTS: AN EXAMINATION OF THE UPPER MISSISSIPPI AND ILLINOIS WATERWAYS**. Logistics and Transportation Review; 29(1), pages 81-95. March 1993.

The paper evaluates the effect of lock delay on the efficiency of marketing the north central U.S.'s corn and soybean production via the upper Mississippi and Illinois waterways. The analysis is accomplished with a multicommodity least-cost network flow model. Lock delay was found to have an important effect on the cost of barging the region's surplus grain production. If the lock and dam system on the upper Mississippi and Illinois waterways is not continually upgraded, grain is redirected to less efficient modes, thus increasing the cost of marketing the region's grain surplus. These increased costs need to be weighed against the costs of upgrading lock capacity.
WATER RESOURCES.

137. Gakenheimer, Ralph. **INFRASTRUCTURE SHORTFALL: THE INSTITUTIONAL PROBLEMS.** Journal of the American Planning Association; 55:14-23. December 1989.

Based on a conference paper, issues presented include: new building rather than rebuilding, politics, costs, technological aspects, and other factors.
GENERAL.

138. Garcia, Mila Teresa; McGuire, Therese J. **THE CONTRIBUTION OF PUBLICLY-PROVIDED INPUTS TO STATES' ECONOMIES**. Regional Science and Urban Economics; 22(2), pages 229-41. June 1992.

The authors specify a regional production function that, in addition to labor and private capital, includes two publicly provided inputs--highways and education. They employ a panel data set consisting of annual observations on the 48 contiguous states from 1969 to 1983 to estimate input elasticity coefficients under a specification that allows for differences over time and across states.
GENERAL.

139. Gelpe, Marcia R. **POLLUTION CONTROL LAWS AGAINST PUBLIC FACILITIES.** Harvard Environmental Law Review; 13:69-146 no 1. 1989.

Examines remedies imposed against publicly owned treatment works, primarily actions brought under the Clean Water Act.

GENERAL.

140. Giglio, Joseph M. **FINANCING URBAN TRANSPORTATION**. Civil Engineering. New York, NY: American Society of Civil Engineers. 1989.

It is noted that innovative financing approaches are essential if further deterioration of the transit infrastructure is to be halted. The National Council on Public Works Improvement endorsed the principle that users should pay a greater share of the cost of infrastructure service. Significant elements of these systems serve identifiable customers; use can be measured and priced to support the system. It also recommended that federal user fees be used to maintain threshold service levels and to guarantee a minimum level of service where users cannot afford maintenance costs. A critical component of the user fee principle is the spending of trust funds earmarked for specific infrastructure purposes.
MASS TRANSIT*

141. Giglio, Joseph M. **INFRASTRUCTURE IN TROUBLE**. Capital projects: New strategies for planning, management, and finance. Matzer, John, Jr. ed. Washington, DC: International City Management Association. 1989.

This paper presents the findings of a two-year study by the National Council on Public Works Improvement entitled, *Fragile Foundations: A Report on America's Public Works*. A report card is included with a grade and explanation for each infrastructure category: highways, mass transit, aviation, water resources, water supply, wastewater, solid waste, and hazardous waste. The paper judges current infrastructure investment to be inadequate, and advises a higher level of investment. The paper concludes with a discussion of the importance of state roles in infrastructure investment.
GENERAL.

142. Gilbreath, Jan. **FINANCING ENVIRONMENTAL AND INFRASTRUCTURE NEEDS ON THE TEXAS-MEXICO BORDER: WILL THE MEXICAN-U.S. INTEGRATED BORDER PLAN HELP?** Journal of Environment and Development. v1, n1, p151(25). June 1992.

The growing industrial base along the U.S.-Mexican border has created infrastructure and natural resource strains that threaten regional economic growth. The response of the U.S. and Mexican governments to such concerns was to create an integrated border environmental plan that addresses some, but not all, of the border's infrastructure and environmental needs.
GENERAL.

143. Gillette, Becky. **EVERYTHING'S DUCKY: MORE AND MORE AMERICAN CITIES AND COUNTIES ARE OPTING FOR WASTEWATER TREATMENT FACILITIES THAT ESCHEW EXPENSIVE TECHNOLOGY**. American City and County; 108:36-8+. February 1993.

The use of aquatic plants in artificially created marshlands are discussed as a means of wastewater purification.
WASTEWATER TREATMENT.

144. Giraudo, John P. **BREAKING FREE OF FEDERAL GRANT RESTRICTIONS: MAKING INFRASTRUCTURE PRIVATIZATION A REAL OPTION**. Los Angeles, CA: Reason Foundation. 1991.

Interest in privatizing airports, highways, wastewater treatment plants, and other state and local infrastructure has been increasing. However, most such facilities have been built in part with federal grants and all such grants contain a variety of restrictions. In many cases, most recently with respect to airports, the granting agency has interpreted the grant agreements as prohibiting the sale of the asset in question. An accurate reading of recently adopted law on the subject, however, would avoid this impasse.
GENERAL.

145. Giraudo, John P. **PRIVATIZING INFRASTRUCTURE: BREAKING FREE OF FEDERAL GRANT RESTRICTIONS**. Municipal Finance Journal; 12:45-58. September 1991.

Presents obstacles to the sale of municipal infrastructures growing out of federal control of funding.
GENERAL.

146. Goetz, Andrew R. **AIR PASSENGER TRANSPORTATION AND GROWTH IN THE U.S. URBAN SYSTEM, 1950-1987**. Growth and Change; 23(2), pages 217-38. March 1992.

AIR TRANSPORTATION.

147. Golaszewski, Richard. **AVIATION INFRASTRUCTURE: A TIME FOR PERESTROIKA?** Logistics and Transportation Review; 28(1), pages 75-101. March 1992.

This paper reviews financing mechanisms for airports and air traffic control. Cost allocation and pricing systems (residual costs and compensatory systems) are analyzed. A change to Hopkinson tariffs and from centralized planning to more market-based approaches is advocated.
AIR TRANSPORTATION.

148. Goldman, H. J.; Mackenzie, D. **INFRASTRUCTURE FINANCING: REALITIES AND PERSPECTIVES**. Journal-Water Pollution Control Federation JWPFA5, Vol. 61, No. 2, p 176-179. February 1989.

The elimination of federal funding and major changes in tax-exempt bond markets have forced government and the private sector to create a new array of financing options. Given this expanded array of options and resources and the new entries into financial management, capital planning is essential; financial considerations have been raised to a significantly higher priority, and must be viewed in both policy and management contexts.
GENERAL.

149. Gole, Barbara S. **ACCOUNTING FOR OUR INFRASTRUCTURE**. Capital Projects: New Strategies for Planning, Management, and Finance. Matzer, John Jr. ed. Washington, DC: International City Management Association. 1989.

This paper discusses the current efforts by the Government Accounting Standards Board to determine the proper accounting for public infrastructure. The paper investigates whether or not the reporting of public capital assets should be based on historical cost data or other variables such as current economic value, service capacity, condition, age, and maintenance needs. The practicality of implementing an infrastructure-management system is examined based on the author's own experience.
GENERAL.

150. Gomez-Ibanez, Jose A.; Meyer, John R. **GOING PRIVATE: THE INTERNATIONAL EXPERIENCE WITH TRANSPORT PRIVATIZATION**. Washington, DC: Brookings Institution. 1993.

This paper presents a review and analysis of existing public-private partnerships. Several key topics relating to privatization are discussed: varieties of privatization, motives and objections to privatization, and prospects and opportunities for privatization. Five basic lessons or themes are presented in the analysis: 1) competition is especially important in encouraging the cost savings or efficiencies that often motivate privatization; 2) privatization is easier to carry out when the efficiency gains are large; 3) privatization is easier to implement when there are not too many redistributions or transfers linked to it; 4) privatization works best when associated with fewer controversial consequences; and 5) privatization is easier when the activity or services approximately covers its costs.
GENERAL.

151. Gomez-Ibanez, Jose A.; Meyer, John R. **POLITICAL ECONOMY OF TRANSPORT PRIVATIZATION: SUCCESSES, FAILURES AND LESSONS FROM DEVELOPED AND DEVELOPING COUNTRIES, FINAL REPORT**. Washington, DC: U.S. Department of Transportation. 1992.

The report examines the conditions favorable for successful privatization of transportation facilities or services by analyzing the experiences with privatization in a variety of developed and developing countries. Particular attention is devoted to privatization of urban bus transit services and high-performance toll highways; for these two modes, the experiences in the United States, Europe, and developing countries are considered.
GENERAL.

152. Gomez-Ibanez, Jose A.; Meyer, John R.; Luberoff, David E. (Harvard University). **SOLID WASTE DISPOSAL: PUBLIC OR PRIVATE?** CHEMTECH. v22, n2, p78(8). February 1992.

An emerging interest in privatization, based primarily on the belief that private interests operate with greater efficiency than the government, opens the entire prospect of infrastructure privatization. Examined are solid-waste disposal facilities, a business traditionally owned and operated by the private sector as a means of testing this hypothesis, including the evolution of the solid-waste disposal industry, the investment required for the infrastructure, the relative operating cost-efficiency of private vs. government management, problems in establishing disposal sites, and the pricing and regulation of rates.
SOLID WASTE*

153. Gomez-Ibanez, Jose A.; Meyer, John R.; Luberoff, D. E. **THE PROSPECTS FOR PRIVATIZING INFRASTRUCTURE**. Journal of Transport Economics and Policy. London, England London School of Economics. 1991.

This paper explores the prospects for privatization by examining the U.S. experience with two categories of infrastructure: toll roads and solid waste disposal facilities. Both are capital intensive, but historically in the U.S. they have had different levels of private sector involvement.
GENERAL*

154. Goodrich, James A.; Mayo, Francis T. **ENVIRONMENTAL REGULATION: ITS IMPACT ON INFRASTRUCTURE DECISION MAKING**. First International Conference on Underground Infrastructure Research. Cincinnati, OH U.S. Environmental Protection Agency. 1989.

This paper discusses a number of laws and regulations and their effect on increasing the environmental infrastructure, including treatment plants, distribution systems, and wastewater systems. The Safe Drinking Water Act and Clean Water Act, and their ensuing regulations, are highlighted.
GENERAL.

155. Gottlieb, Robert (Planning Advisory Service). **SOLID WASTE MANAGEMENT: PLANNING ISSUES AND OPPORTUNITIES**. 71p. 1990.

This report presents options, legislation, and case studies of solid waste management. Topics include incineration, landfills, reduction, reuse, and recycling.
SOLID WASTE.

156. Gramlich, Edward M. (The University of Michigan). **INFRASTRUCTURE INVESTMENT: A REVIEW ESSAY**. Journal of Economic Literature; V. 33, N. 3: 1176-1196. September 1994.

This essay reviews the correlation between the decline of U.S. productivity and the drop in U.S. infrastructure investment since the late 1960's. Gramlich defines infrastructure capital, discusses changes in infrastructure investment and their impacts, and analyzes policy alternatives. Gramlich considers the evidence of an infrastructure shortage to be inconclusive. He advocates a diminished role of federal grant programs, allowing states and localities to maintain their own revenue sources and determine their own infrastructure priorities. Quantitative data on U.S. productivity and infrastructure investment is included.
GENERAL*

157. Greenberg, Maurice R. **FINANCING THE CLEANUP OF HAZARDOUS WASTE: THE NATIONAL ENVIRONMENTAL TRUST FUND**. Environmental Claims Journal; 1:421-7. June 1989.

Proposed flat fee approach to the current situation in hazardous waste management.
HAZARDOUS WASTE.

158. Gregory, Robin. **INCENTIVES POLICIES TO SITE HAZARDOUS WASTE FACILITIES**. Risk Analysis; 11:667-75. December 1991.

Examines effectiveness of various incentives to stimulate agreement between waste producers and communities.
HAZARDOUS WASTE.

159. Grigg, N. S. **APPROPRIATE TECHNOLOGY IN INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT**. Hydraulic Engineering: Proceedings of the 1991 National Conference: American Society of Civil Engineers. New York, NY: Colorado State University. 1991.

One reason for the use of the term appropriate technology is to draw attention to the need to meet human needs by providing facilities that work well in different cultural settings at reasonable cost. Often these facilities fall within the broad categories of public works infrastructure: roads, transportation, water, waste management, energy, and buildings. Infrastructure management is the application of the principles of management to making infrastructure systems perform well. Tasks involved include: planning, programming, and budgeting; organizing and managing work; supporting management decisions; and operations, financial, project, and maintenance management.
GENERAL.

160. Grigg, N. S. **URBAN WATER INFRASTRUCTURE: PLANNING, MANAGEMENT, AND OPERATIONS**. Fort Collins, CO: John Wiley and Sons. 1986.

This book, written for engineers, planners, and managers, describes potential solutions to the infrastructure problem. Topics covered in the 11 chapters are: managing urban water systems, cooperation and integration in the urban water system, urban water supply systems, wastewater management systems, stormwater and combined sewer systems, planning and management essentials, engineering essentials, computer-based decision support systems, managing operations and maintenance, automating operations of urban water systems, and future issues in urban water management.
WASTEWATER TREATMENT/WATER SUPPLY.

161. Grigg, N. S.; Schilling, K. E.; Porter, E. **DIMENSIONS AND CHALLENGES OF THE U.S. WATER SUPPLY INDUSTRY**. Urban Water Infrastructure, Proceedings of a NATO workshop. Isle of Man: International School for Water Resources, Colorado State University. 1990.

Statistics of the U.S. water supply industry are presented. Sources include the U.S. Environmental Protection Agency and the American Water Works Association. Statistics include: operational data, financial operations, industry employment, infrastructure data and water quality.
WATER SUPPLY.

162. Grizzle, Charles L. **FINANCING ENVIRONMENTAL INFRASTRUCTURE: A NATIONAL CHALLENGE**. Municipal Finance Journal; 10:231-9. September 1989.

Discusses problems at the local level due to the expansion of environmental programs and activities and reviews the use of public/private partnerships as an alternative financing mechanism.
GENERAL.

163. Grosshuesch, Peter; Plavin, David. **AIRPORT INFRASTRUCTURE**. Transportation Law Journal, V. 20, NO. 1, P. 141-152. 1991.

Covers economic impact of the new Denver airport, and the impact of air transportation on the New York City area economy.
AIR TRANSPORTATION.

164. Haimes, Y. Y. **OPTIONS FOR NATIONAL INFRASTRUCTURE RENEWAL**. Water Resources Update: Water Resources Infrastructure. Issue No. 86, p. 11-14. 1991.

Recently, several commissions have independently studied three critical national issues: the nation's deteriorating physical infrastructure, the nation's mismanagement of hazardous waste, and the nation's inadequate supply of trained engineers. The physical infrastructure is deteriorating at an exceedingly dangerous rate. This neglect and mismanagement stem from several trends: fiscal constraints, drifting objectives and priorities, lack of accountability, and a diminishment of engineering expertise.
GENERAL.

165. Hamilton, Joel R.; Whittlesey, Norman K.; Halverson, Philip. **INTERRUPTIBLE WATER MARKETS IN THE PACIFIC NORTHWEST**. American Journal of Agricultural Economics; 71(1), pages 63-75. February 1989.

This paper analyzes the potential for using a market to shift water from irrigation to hydropower use in periods of low river flow in the Snake River basin of Idaho. The water could be used for irrigation in most years, but in dry years would be very valuable for firming up electric power supplies. A model of crop growth and water use is utilized to estimate farmer responses and resulting farm income losses due to market-restricted irrigation water supplies.
WATER SUPPLY.

166. Hanson, Royce. **THE NEXT GENERATION IN THE MANAGEMENT OF PUBLIC WORKS: GETTING SOME OF IT TOGETHER**. 1986.

The new generation of general managers needs to adapt to change. Engineers and public works directors must begin to think of themselves not only as builders but maintainers and managers as well.
GENERAL*

167. Hanson, Royce. **PERSPECTIVES ON URBAN INFRASTRUCTURE**. Committee on National Urban Policy, National Research Council. 1984.

This report serves to layout a basis for a research agenda on solvent policy issues concerning urban infrastructure and to identify and discuss major policy concerns.
GENERAL*

168. Hanson, Royce. **WATER SUPPLY AND DISTRIBUTION: THE NEXT 50 YEARS**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

WATER SUPPLY/WATER RESOURCES.

169. Hardaway, R. M. **AIRPORT REGULATION, LAW, AND PUBLIC POLICY: THE MANAGEMENT AND GROWTH OF INFRASTRUCTURE**. Contributing authors: J. Spensley, S. Hamilton ,. M. Bell, J. Haidar, and G. K. Scott. Westport, CT: Quorum Books. 1991.

The dramatic rise in air traffic, together with rapid residential and commercial development around our metropolitan areas, has strained the capacity of airports to serve the public safely and efficiently. This book explores this problem in depth. Drawing on both the hands-on expertise of professionals in the field and a thorough grounding in law and public policy, it

looks at the laws governing airport development and addresses the complex regulatory and policy issues surrounding the construction, expansion, and operations of airports.
AIR TRANSPORTATION.

170. Harleman, Donald R. F. **CUTTING THE WASTE IN WASTEWATER CLEANUPS: RATHER THAN MANDATE TECHNOLOGICAL FIXES TO WATER POLLUTION PROBLEMS, CONGRESS SHOULD LET COASTAL COMMUNITIES USE INNOVATIVE APPROACHES TO SOLVE THEM.** Technology Review: 93:60-8. April 1990.

Municipal cost problems in meeting EPA requirements.
WASTEWATER TREATMENT.

171. Hasnath, Syed Abu; Chatterjee, Latta. **PUBLIC CONSTRUCTION IN THE UNITED STATES: AN ANALYSIS OF EXPENDITURE PATTERNS.** Annals of Regional Science; 24:133-45. March 1990.

Presents federal, state, and local expenditures for building new fixed capital stocks and their maintenance, 1957-85.
GENERAL.

172. Hass, Nancy; Reingold, Jennifer. **PSST, WANNA BUY A BRIDGE? PRIVATIZATION IN AMERICA**. Financial World; 162:30-41. August 3, 1993.

Four articles discuss increasing privatization as a way to cope with local government fiscal crises in the U.S. and Canada.
GENERAL.

173. Hatry, Harry P.; Millar, Annie P. **GUIDE TO SETTING PRIORITIES FOR CAPITAL INVESTMENT**. Washington, DC: Urban Institute Press. 1984; Guide to Managing Urban Capital Series, Vol. 5.

This report focuses on the part of the capital planning and budgeting process in local government that occurs from the time that operating agencies submit the capital project proposal until the time that elected officials make their final selections.
GENERAL.

174. Hatry, Harry P.; Steinthal, Bruce G. **GUIDE TO SELECTING MAINTENANCE STRATEGIES FOR CAPITAL FACILITIES**. Washington, DC: Urban Institute Press. 1984; Guide to Managing Urban Capital Series, Vol. 4.

This report focuses on the process by which local governments, especially their operating agencies, select the type and amount of maintenance for their capital facilities.
GENERAL.

175. Hatry, Harry P.; Sullivan, Jonathan M. **SERVICE EFFORTS AND ACCOMPLISHMENTS REPORTING: ITS TIME HAS COME**. Washington, DC: Governmental Accounting Standards Board.

This study investigates the effectiveness of Service Efforts and Accomplishment (SEA) indicators.
GENERAL.

176. Hawkins, Russell Ed.; Benedict, Leah Ed. **ENVIRONMENTAL PARTNERSHIPS: PUBLIC AND PRIVATE PERSPECTIVES.** Management Information Service Report; 22:1-24. September 1990.

Private sector involvement in the financing and managing of local environmental infrastructure.
GENERAL.

177. Hayes, Douglas L. **THE ALL AMERICAN CANAL LINING PROJECT: A CATALYST FOR RATIONAL AND COMPREHENSIVE GROUND WATER MANAGEMENT OF THE UNITED STATES MEXICO BORDER**. Natural Resources Journal; 31(4), pages 803-27. September 1991.

WATER RESOURCES.

178. Heilman, J. G.; Johnson, G. W. **THE POLITICS AND ECONOMICS OF PRIVATIZATION: THE CASE OF WASTEWATER TREATMENT**. xiv+235p. 1992.

Examines public-private partnerships in infrastructure development through case studies of three U.S. sewage treatment projects: Auburn, Alabama; Mount Vernon, Illinois; the Western Carolina Regional Sewer Authority (South Carolina).
WASTEWATER TREATMENT.

179. Heilman, J. G.; Johnson, G. W. **SYSTEM AND PROCESS IN CAPITAL-INTENSIVE PRIVATIZATION: A COMPARATIVE CASE STUDY OF MUNICIPAL WASTEWATER TREATMENT WORKS**. Policy Studies Review.1989.Vol 8,Issue 3.

Capital-intensive privatization (CIP) is an option for infrastructure project development. Advocates claim that CIP generates cost savings through efficiencies inherent in the coordinated design, construction, and operation of facilities. The present paper assesses these claims in the field of municipal wastewater treatment facilities (WIWs). It presents case-study results and aggregate data on seven of the first privatized WIWs, and on seven comparable grant-funded facilities. It concludes that CIP changes the system of players and the processes through which they interact.
WASTEWATER TREATMENT.

180. Holcombe, Randall G. **PRIVATIZATION OF MUNICIPAL WASTEWATER TREATMENT**. Public Budgeting and Finance; 11(3), pages 28-42. September 1991.

Privatization of wastewater treatment facilities was encouraged by changes in the law and in the attitude of government officials during the early 1980s. The idea was for localities to benefit from the efficiency gains expected when operations were transferred from municipal administration to a profit-making organization. However, significant differences between the ideal and reality often existed, particularly when contracts all but eliminated the profit motive.
WASTEWATER TREATMENT*

181. Holcombe, Randall G. **REVOLVING FUND FINANCE: THE CASE OF WASTEWATER TREATMENT**. Public Budgeting and Finance; 12(3), pages 50-65. September 1992.

This article examines the general topic of revolving fund finance by looking at the specific case of wastewater treatment. The analysis that follows focuses on the organization and administration of the fund to see what types of benefits are generated for the future rather than the present.
WASTEWATER TREATMENT.

182. Holcombe, Randall G. **THE TAX COST OF PRIVATIZATION**. Southern Economic Journal; 56(3), pages 732-42. January 1990.

A substantial tax penalty must be incurred to privatize municipal government services. The municipality that chooses to privatize typically will have to forego tax-exempt financing, and the privatizing firm will have to pay income taxes on the income generated from the privatizing effort.
GENERAL.

183. Holtz, Eakin Douglas; Rosen, Harvey S. (Syracuse University). **MUNICIPAL CONSTRUCTION SPENDING: AN EMPIRICAL EXAMINATION**. Economics and Politics; 5(1), pages 61-84. March 1993.

We investigate several models of the determination of local public capital expenditures. Using Euler equation methods, the authors cannot reject the hypothesis that construction spending is determined by unconstrained, forward looking municipal planning. Consistent with this result, the stochastic structure of resource flows is an important feature of the determination of construction spending.
GENERAL.

184. Hopkins, T. D. **BENEFIT CHARGES FOR FINANCING INFRASTRUCTURE: REPORT TO THE CONGRESS**. Washington, DC: Office of Technology Assessment, U.S. Congress. August 1989.

Benefit-based charges have become an increasingly popular means to generate funds for operating and capital costs of public works. The report examines a variety of policy and implementation issues that deserve attention by those involved in decisions about adoption and retention of such charges.
GENERAL.

185. Hornbeck, J. F. **HIGHWAY PRIVATIZATION AND ISTEA: ECONOMIC POLICY AND FINANCING ISSUES**. Washington, DC: Congressional Research Service. 1992.

This CRS report analyzes issues involved with highway privatization. It begins with a history of toll roads and turnpikes. The report then discusses benefits and drawbacks of private sector highway financing and maintenance. The report also includes an analysis of economic models for privatization.
HIGHWAYS.

186. Hornbeck, J. F. **TRANSPORTATION INFRASTRUCTURE: ECONOMIC ISSUES AND PUBLIC POLICY ALTERNATIVES**. Washington, DC: Congressional Research Service. 1993.

This report discusses alternative perspectives to evaluating the transportation infrastructure issues within the context of Congress' economic policymaking function.
GENERAL.

187. Hoxworth, Dan. **IMPACT FEES: ISSUES AND CASE STUDIES**. Management Information Service Report; 23:1-26. December 1991.

Political and ethical issues, comparison of methods of developer financing, and a multijurisdictional study are described with case studies of Kansas City, Pasco County, Florida, and Lake Geneva, Wisconsin.
GENERAL.

188. Hulten, Charles R. **GETTING ON THE RIGHT ROAD: HIGHWAY POLICY IN THE 1990s**. American Enterprise; 2(3),pages 39-43. Washington, DC American Enterprise Institute. May 1991.

This article reviews the supply-side arguments linking transportation and productivity that are often used to support increased highway and public infrastructure spending. It theorizes that indirect impacts of transportation can be exaggerated by the methods used in the macroeconomic analysis of production. Because statistical estimates of production at the macro level are notoriously unstable, relatively small changes in estimation methods can produce vastly different results. The author's research shows that the same data set can produce estimates of public capital elasticity that vary enormously (from 3 percent to 21 percent) depending on which of two standard statistical techniques is used. The article suggests that the current approach to highway spending must be modified; incentives must be built into the new highway program to encourage more maintenance and repair, stimulate more private involvement in new highway construction, spur the adoption of advanced transportation technologies, and allow the use of tolls on congested roads and bridges.
HIGHWAYS.

189. Hulten, Charles R.; Schwab, Robert M. **ENDOGENOUS GROWTH, PUBLIC CAPITAL, AND THE CONVERGENCE OF REGIONAL MANUFACTURING INDUSTRIES: WORKING PAPER NO. 4538**. Cambridge, MA: National Bureau of Economic Research, Inc. November 1993.

Several explanations can be offered for the unbalanced growth of U.S. regional manufacturing industries in the decades after World War II. This paper compares alternative explanations of U.S. regional growth by testing their predictions about the productive efficiency of regional manufacturing industries. It finds little evidence that public capital externalities played a significant role in explaining the relative success of industries in the South and West. Instead, the main engine of differential regional manufacturing growth over the period 1970-1986 seems to be inter-regional flows of capital and labor.

190. Hulten, Charles R.; Schwab, Robert M. **INFRASTRUCTURE SPENDING: WHERE DO WE GO FROM HERE?** National Tax Journal, Vol. 46, No. 3.

This article discusses the main issues of the infrastructure debate of the 1990s, creating a framework for the discussion. The authors review four arguments for increased public investment: (1) shortsighted government policies allowed infrastructure spending to fall sharply and the nation's roads and bridges to deteriorate; (2) lower infrastructure spending in the past was a key reason that the economy performed so poorly during the last two decades;

(3) additional spending in the future will allowed the United States to grow much faster and to become more competitive in international markets; and (4) infrastructure spending should be included as a key part of short-term economic policy.
GENERAL.

191. Hulten, Charles R.; Schwab, Robert M. **IS AMERICA REALLY ON THE ROAD TO RUIN?** The Public's Capital; page 6-7. 1991.

This article reviews a report from the Congressional Budget Office showing that the rate of return to new public investment is low, while the rate of return to maintenance and rehabilitation is large, suggesting a possible over-investment in new public capital at the expense of sustaining the existing stock. It critiques the macro approach towards analysis of the productivity of public investment, and suggests that the link between public capital and private output is too complex to be captured by a simple regression analysis.
GENERAL.

192. Hulten, Charles R.; Schwab, Robert M. **IS THERE TOO LITTLE PUBLIC CAPITAL? INFRASTRUCTURE AND ECONOMIC GROWTH**. Washington, DC: American Enterprise Institute and The House Wednesday Group. 1991.

This article discusses the claims of economists who believe there is a significant underinvestment in highway infrastructure. It contrasts these views by citing economists who believe that the undersupply of highway infrastructure is due primarily to the failure to price the capital correctly, leading to excess demand and the failure to build durable highway infrastructure. The article also reviews the debate over the relationship between public infrastructure investments and economic growth. The authors conclude that while there is an important link between infrastructure and growth, the link is too poorly understood to justify the contention that a massive expansion of federal highway spending will lead to significant economic growth, particularly if this spending comes at the expense of other forms of capital formation.
GENERAL.

193. Hulten, Charles R.; Schwab, Robert M. **PUBLIC CAPITAL FORMATION AND THE GROWTH OF REGIONAL MANUFACTURING INDUSTRIES**. National Tax Journal; 44(4), Part 1, pages 121-34. December 1991.

The authors' purpose in this paper is to provide new estimates of the link between public infrastructure and economic performance by extending and updating their earlier work on regional manufacturing productivity. Their findings suggest that this link is weak.
GENERAL.

194. Hurley, J. M. **DEVELOPER FINANCING OF PUBLIC WASTEWATER SERVICE INFRASTRUCTURE**. Journal - Water Pollution Control Federation JWPFA5, Vol. 60, No. 5, p 608-613. May 1988.

With changes in the roles of federal, state, and local governments relative to infrastructure financing and the shift to greater use of public-private partnerships, developer financing has surfaced as an important means of providing major off-site public facilities for new development. In pursuit of the developer financing alternative, Anne Arundel County, Maryland, has defined terms for contract negotiations. The county has negotiated agreements

with developers that go beyond the traditional requirement for developers to construct and dedicate the on-site sewer lines necessary to serve their projects.
WASTEWATER TREATMENT.

195. Interagency Floodplain Management Review Committee. **SHARING THE CHALLENGE: FLOODPLAIN MANAGEMENT IN THE 21ST CENTURY**. June 1994.

This report by the Interagency Floodplain Management Review Committee proposes a better way to manage floodplains. It suggests runoff control, land use and ecosystem management measures that can reduce hazards associated with flooding. The report also proposes legislation to develop and fund a national Floodplain Management Program.
WATER RESOURCES*

196. International City/County Management Association, Municipal Data Service. **COSTS AND FINANCING OF SOLID WASTE COLLECTION**. 1991.

Residential, industrial, and commercial waste collection programs in U.S. municipalities are discussed. Costs include personnel, equipment, supplies, contract services, and recycling and hazardous waste programs. Funding includes user fees, special tax levies, and payment from other governments.
SOLID WASTE.

197. International City/County Management Association Municipal Data Service. **LOCAL GOVERNMENT INFRASTRUCTURE FINANCING**. 1993.

A special data issue, the report presents the results of a survey of 5,160 U.S. cities and counties regarding their methods of public works financing. It lists, by state, the responses of individual jurisdictions to survey questions about forms of financing, types of impact fees levied on developers, cost-shifting methods, and short-term financing mechanisms.
GENERAL.

198. Japan International Research Task Force, Civil Engineering Research Foundation. **TRANSFERRING RESEARCH INTO PRACTICE: LESSONS FROM JAPAN'S CONSTRUCTION INDUSTRY**. 1991.

This report summarizes the findings of the Japan Task Force (JTF). The JTF investigated the Japanese construction industry in 1990 in an attempt to understand the difference between the Japanese and the U.S. construction industry.
GENERAL.

199. Jenkins, Robin R. **THE ECONOMICS OF SOLID WASTE REDUCTION: THE IMPACT OF USER FEES. NEW HORIZONS IN ENVIRONMENTAL ECONOMICS**. Brookfield, CT: E. Elgar Pub. 1993.

SOLID WASTE.

200. Johnson, Gerald W.; Watson, Douglas J. (Auburn, AL). **PRIVATIZATION: PROVISION OR PRODUCTION OF SERVICES? TWO CASE STUDIES**. State and Local Government Review; 23:82-9. March 1991.

Evaluates methods of contracting out solid waste disposal and waste water management.
GENERAL.

201. Johnson, Thomas G. (Virginia Polytechnic Institute/U.S. Department of Agriculture). **LOCAL INFRASTRUCTURE INVESTMENT IN RURAL AMERICA.** 291p. 1988.

Based on a national symposium sponsored jointly by the Virginia Polytechnic Institute and State University and the U.S. Department of Agriculture's Extension Service, 1985, the report assesses decision-making models used in local planning and implementation of infrastructure investments.
GENERAL.

202. Johnson, Thomas G. **STATE RURAL TRANSPORTATION PROGRAMS IN AN ERA OF CONTRACTION. NEW ALLIANCES FOR RURAL AMERICA. BACKGROUND PAPER SUBMITTED TO THE TASK FORCE ON RURAL DEVELOPMENT.** Washington, DC: National Governors' Association. 1989.

This paper focuses on the role of transportation infrastructure and services in rural economic development. It examines the best methods of investing in transportation infrastructure in an era of fiscal austerity and economic decline in many rural areas.
GENERAL.

203. Joint Economic Committee, U. S. Congress. **PUBLIC INVESTMENT IN INFRASTRUCTURE.** Washington, DC: 1989.

GENERAL.

204. Kain, J. F.; Gittell, R.; Daniere, A.; Daniel, S.; Somerville, T. **INCREASING THE PRODUCTIVITY OF THE NATION'S URBAN TRANSPORTATION INFRASTRUCTURE: MEASURES TO INCREASE TRANSIT USE AND CARPOOLING: FINAL REPORT**. Washington, DC: U.S. Department of Transportation. January 1992.

The report surveys the growing use of bus and carpool priority measures to increase the productivity of the nation's transportation infrastructure. While it identifies a wide variety of priority measures, the report principally focuses on the planning and operation of exclusive and shared busways and high occupancy vehicle (HOV) facilities. It presents a variety of case studies describing the implementation of busways and transitways.
MASS TRANSIT.

205. Kaplan, Marshall. **INFRASTRUCTURE POLICY: REPETITIVE STUDIES, UNEVEN RESPONSE, NEXT STEPS**. Urban Affairs Quarterly, Vol. No. 25, Iss. No. 3, 371-388. March 1990.

Over the past 10 or 15 years, studies of the U.S. national infrastructure have agreed that the U.S. has not invested enough in bridges, roads, transit and water systems, and airports. Compensatory spending by state and local governments has not been uniform, and user fees and other financial innovations may be inequitable. A national infrastructure policy is needed.
GENERAL*

206. Kashmanian, Richard M.; Spencer, Robert L. (Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency). **COST CONSIDERATIONS OF MUNICIPAL SOLID WASTE COMPOST: PRODUCTION VERSUS MARKET PRICES**. Compost Sci Util. v1, n1, p20(18). 1993.

The need to develop a variety of markets for composting facility end-products in the U.S. is critical to the future growth potential for composting and its success. Composting facilities should contrast the costs for building or improving their composting programs to the associated economic returns. Most facilities are making modifications in order to improve both facility operation and compost quality. These modifications cover type of feedstock, front-end processes, composting systems, and final compost processing.
SOLID WASTE.

207. Keeler, Theodore E.; Ying, John S. **MEASURING THE BENEFITS OF A LARGE PUBLIC INVESTMENT: THE CASE OF THE U.S. FEDERAL AID HIGHWAY SYSTEM**. Journal of Public Economics; 36(1), pages 69-85. June 1988.

This paper analyzes an important component of the benefits of highway infrastructure investments in the United States. Specifically, it focuses on the effects of federal-aid investments since 1950 on costs and productivity of firms in the trucking industry. Using an econometric model of regional truck firm costs, the paper documents that the rapid growth of highways, which occurred between 1950 and 1973, had a strong and positive effect on productivity growth in trucking.
HIGHWAYS.

208. Kilgore, Roger T.; Zatz, Michael N.; Young, G. Kenneth. **THE RELATIONSHIP BETWEEN STANDARDS AND THE PERFORMANCE OF INFRASTRUCTURE**. Springfield, VA. GKY and Associates, Inc., for the U.S. Army Corps of Engineers, Institute for Water Resources. 1991.

An early background paper for the Federal Infrastructure Strategy (FIS) program which documents fundamental concepts related to infrastructure performance measures, standards, criteria and objectives. Includes analysis of three case studies on large airports, flood control, and waste to energy facilities
GENERAL.

209. Kim, H. Youn; Clark, Robert M. **ECONOMIES OF SCALE AND SCOPE IN WATER SUPPLY**. Regional Science and Urban Economics; 18(4), pages 479-502. November 1988.

This study examines the multiproduct nature of water supply relative to economies of scale and scope. The water utility is viewed as a multiproduct firm providing residential and non-residential services with spatial variation. The study finds there are no significant economies of scale in the utility's operation. The utility, however, enjoys considerable economies for non-residential water supply but suffers from diseconomies in residential supply. The economies of scale achieved in water treatment are mostly lost in the distribution of water. The utility on the whole experiences economies of scope associated with joint production of the two services. Furthermore, water utilities have no perceptible tendency to behave as a natural monopoly.
WATER SUPPLY.

210. Klein, Yehuda L.; Robison, H. David. **SOLID WASTE DISPOSAL COSTS, PRODUCT PRICES, AND INCENTIVES FOR WASTE REDUCTION**. Atlantic Economic Journal; 21(1), pages 56-65. March 1993.

This paper uses a standard input-output technique to examine the impact of solid waste disposal costs on product prices for the years 1977, 1982, and 1985. Unlike air and water pollution, solid waste disposal is an example where markets, at least partially, deal with externality problems. As the cost of using land as a disposal site rises, firms are encouraged to improve efficiency, explore new technologies, and recycle materials to reduce the volume of wastes generated. Further, because the cost of waste disposal directly affects the price of the product, waste disposal costs also affect consumer demand.
SOLID WASTE.

211. Koelemay, J. Douglas. **INFRASTRUCTURE INVESTMENT COMMISSION: INTERIM REPORT**. Washington, DC: Agenda Communications, Inc. 1992.

This report summarizes the work of the Commission to Promote Investment in America's Infrastructure. The Commission studied the feasibility and desirability of creating a type of infrastructure security to permit the investment of pension funds in funds used to design, plan, and construct infrastructure.
GENERAL.

212. Kracht, Jeffrey K.; Westerhoff, Garrett P. **WASTEWATER REUSE: INFRASTRUCTURE DEVELOPMENT BASED UPON LEASE PURCHASE FINANCING**. Conserv 90 The National Conference and Exposition Offering Water Supply Solutions for the 1990s. 1990.

The author suggests lease/purchase financing as an approach to funding wastewater reclamation facilities. The benefits and mechanism of lease/purchase financing are discussed.
WASTEWATER TREATMENT.

213. Kuby, Michael; Reid, Neil. **TECHNOLOGICAL CHANGE AND THE CONCENTRATION OF THE U.S. GENERAL CARGO PORT SYSTEM**. Economic Geography. 68:272-89. July 1992.

Argues that cargo port traffic became more concentrated because of containerization, larger ships and trains, and computerization of freight tracking and billing.
WATER RESOURCES.

214. Kunreuther, Howard; Easterling, Douglas. **ARE RISK BENEFIT TRADEOFFS POSSIBLE IN SITING HAZARDOUS FACILITIES?** American Economic Review; 80(2), pages 252-56. May 1990.

HAZARDOUS WASTE.

215. Kunreuther, Howard; et al. **SITING NOXIOUS FACILITIES: A TEST OF THE FACILITY SITING CREDO**. Risk Analysis; 13:301-18. June 1993.

Examines waste facilities siting cases in Canada and the U.S. using guidelines developed at a seminar in 1990. Argues for establishing trust between developer and host community, meeting community needs through appropriate design, and public participation.
HAZARDOUS WASTE.

216. Lake, R. W.; Disch, L. **STRUCTURAL CONSTRAINTS AND PLURALIST CONTRADICTIONS IN HAZARDOUS WASTE REGULATION**. Environment and Planning A; 24(5), pages 663-81. May 1992.

HAZARDOUS WASTE.

217. Lambert, Jeremiah D.; O'Neill, James Richard. **PRIVATIZATION OF MUNICIPAL HYDROELECTRIC FACILITIES UNDER CURRENT LAW**. Public Utilities Fortnightly: 121:11-17. February 4, 1988.

Examines leveraged lease financing of hydropower facilities as an alternative to municipal bond financing.
WATER RESOURCES.

218. Larson, TD. **WANTED: PLIABLE PARADIGMS FOR TRANSPORTATION INVESTMENT**. This paper appears in Transportation Research Board Special Report No: 237, Moving Urban America, Proceedings of a Conference. Washington, DC Transportation Research Board. 1993.

Applying the new directions embodied in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) demands a sea change in the way we think about transportation investments and the role they will play in society. That change in thinking and how it affects organizations charged with implementing this law are explored.
HIGHWAYS/MASS TRANSIT.

219. Lashar, JD. **HIGHWAY POLICY AT A CROSSROADS: OPTIONS FOR U.S. HIGHWAY AND INFRASTRUCTURE POLICY IN THE POST-INTERSTATE ERA**. Washington, DC: April 1990.

This Wednesday Group report summarizes a number of recent infrastructure studies, highlighting policy options for improving federal public works programs, particularly the highway program.
HIGHWAYS.

220. Lawson, P. S. **MUNICIPAL SOLID WASTE CONVERSION TO ENERGY**. Biomass & Bioenergy. 1992.2(1-6).

In recent years it has been recognized by an increasing number of nations that there is considerable energy potential within MSW. As a result many countries have established R&D programs to examine methods of exploiting this potential. The International Energy Agency's MSW Conversion Activity was set up in 1986 to provide an infrastructure for sharing information and coordinating work in this area internationally. This paper describes the achievements of the Activity and discusses work proposed for the future.
SOLID WASTE.

221. Le, Blanc Louis A. **THE IMPACT OF INFORMATION TECHNOLOGY ON MARITIME SAFETY: THE EFFECT OF GOVERNMENT POLICY**. Journal of the Transportation Research Forum. 29:403-12 no 2. 1989.

Describes a U.S. Coast Guard vessel movement reporting system, a traffic service for navigators on the lower Mississippi River.

WATER RESOURCES.

222. Ledebur, Larry et al. **CHANGING STATE ROLES IN PUBLIC WORKS**. National Council on Public Works Improvement. 1987.

This report studies how the state role has evolved in infrastructure development.
GENERAL*

223. Ledebur, Larry et al. **FEDERAL AND STATE ROLES IN INFRASTRUCTURE**. ASLAN Institute.

This report, prepared for the National Council on Public Works Improvement, examines the interplay between federal and state governments in financing infrastructure.
GENERAL*

224. Lemer, Andrew C. **MEASURING PERFORMANCE OF AIRPORT PASSENGER TERMINALS**. Transportation Research, Volume 26a, Issue 1, pages 37-45. 1992.

Performance of an airport passenger terminal generally has something to do with moving travelers and their bags between aircraft and ground transportation, but airport operators, travelers, airlines, and other users of the terminal have a range of concerns about comfort, convenience, costs, and ambiance that should accompany this movement and will assess performance in terms of such factors. The principle factors comprising a framework for describing airport passenger terminal performance are presented, focusing primarily on passengers, airlines, and the airport operator. Specific measures that may be used to assess performance within this framework are considered, along with computational tools that might be developed to support more systematic assessment of airport terminal investments and operating strategies.
AIR TRANSPORTATION.

225. Liner, B. **SHADOWS ON METROPOLITAN TRANSPORTATION FINANCING IN THE 90s**. Paper presented to the National Association of Regional Councils' Transportation Advocacy/Service Group, Federal Highway Administration, and Urban Mass Transportation Administration. Washington, D.C. The Urban Institute. 1990.

Stating that the transportation industry, while not asleep at the wheel, nonetheless has not yet fought on the new battlefront that includes the twin deficits (budget and trade) and other equally pressing functions (e.g., health care, day care, education), the author proposes "that the time has come to look for a way to make the case for transportation funding that achieves the desired result without going head-to-head against other governmental functions in some kind of zero-sum budget exercise."
GENERAL.

226. Lucido, Salvadore J. **LANDFILL MANAGEMENT**. Management Information Service Report; 22:1-16. October 1990.

This report covers landfill siting. Covers public opposition and siting considerations, public and private landfilling, new technologies, and benefits and problems of landfill closure.
SOLID WASTE/HAZARDOUS WASTE.

227. Luker, B. **PUBLIC INVESTMENT AND U.S. PRODUCTIVITY CHANGE: AN EVALUATION OF RECENT RESEARCH**. College Station, TX: Texas Transportation Institute. June 1992.

Recent research has uncovered an apparent relationship between rates of productivity growth and levels of investment in core infrastructure by the public sector. If valid, these findings account for most of the widely reported slowdown in U.S. rates of productivity growth in recent decades, and lend a measure of intrinsic worth to government intervention in the national economy more fundamental than a merely countercyclical role.
GENERAL.

228. Lurz, Bill; McLeister, Dan. **INFRASTRUCTURE: WHO SHOULD PAY?** Professional Builder. v55, p112(8). April 1990.

The maintenance and expansion of the nation's basic services, roads, schools, and utilities have been seriously underfunded. The taxpayer revolts of the 1970s, culminating in California's landmark Proposition 13, an essentially local issue which Reagan policies advanced to the national political stage in the 1980s, engendered the decline in infrastructure investment. Strapped by federal subsidy cutbacks, local governments are looking to private developers and builders to provide needed facilities and amenities through impact fees and land exactions.
GENERAL.

229. MacAuley, Patrick H. **FEDERAL CONSTRUCTION-RELATED EXPENDITURES, 1984 TO 1992.** Construction Review; 37:iii-viii. July 1991.

Covers military construction, highways and roads, hospitals and health facilities, conservation and development, sewage treatment facilities, federal industrial building, and housing; direct federal loans and loan guarantee programs.
GENERAL.

230. The MAGLEV Technology Advisory Committee and Grumman Corporation. **BENEFITS OF MAGNETICALLY LEVITATED HIGH-SPEED TRANSPORTATION FOR THE UNITED STATES**. 1989.

This report to the United States Senate Committee on Environment and Public Works examines the technical and economic feasibility of running MagLev transport systems along U.S. Interstate highway.
MASS TRANSIT*

231. Magnuson, Anne. **COMPOSTING: DIRTY WORD OR WASTE SOLUTION?** American City and County; 107:28-30+. May 1992.

This article provides examples of mixed organic waste composting facilities being used to process municipal solid waste.
SOLID WASTE.

232. Maio, D. **PORT NEEDS STUDY (VESSEL TRAFFIC SERVICES BENEFITS): STUDY OVERVIEW**. Washington, DC: U.S. Department of Transportation; 20p. 1991.

Documents the benefits and costs of potential U.S. Coast Guard Vessel Traffic Services (VTS) in selected U.S. deep water ports on the Atlantic, Gulf, and Pacific coasts. Prepared for the

U.S. Coast Guard. Topics include casualties and risk, environmental and marine life loss and cleanup activities.
WATER RESOURCES.

233. Mangravite, Frank; Moffitt, Patrick. **A PRIVATIZATION HOW-TO**. American City and County; 108:28+. March 1993.

Contract operations have become a popular alternative for many municipalities, but there are several important aspects of private contracting that should be considered: cost, personnel expertise, and regulatory liability considerations in contracting for water and wastewater facilities.
GENERAL.

234. Maniatis, Melina Ed. **STORMWATER MANAGEMENT**. Management Information Service Report. 22:1-15. November 1990.

Tracking of rainwater runoff is the issue presented, with case studies of Bellevue, Washington; Cincinnati, Ohio; Asheville, North Carolina; and Port Orange, Florida.
WATER RESOURCES/WATER SUPPLY.

235. Marland, Gregg; Weinberg, Alvin M. **LONGEVITY OF INFRASTRUCTURE**. Ausubel, Jesse H.; Herman, Robert. Cities and their Vital Systems: Infrastructure Past, Present, and Future. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

GENERAL.

236. Marsalek, J.; Schilling, K. E.; Porter, E. **STORMWATER MANAGEMENT TECHNOLOGY: RECENT DEVELOPMENTS AND EXPERIENCE**. Urban Water Infrastructure: Proceedings of a NATO Workshop. Isle of Man, Canada: National Water Resources Institute. 1990.

During the last 20 years, urban stormwater management has evolved from fast removal of runoff to comprehensive and cost-effective management approaches providing not only flood protection and drainage convenience, but also minimizing runoff impacts on the receiving waters. Modern stormwater management approaches, which are based on implementation of stormwater quantity and quality controls in various parts of urban catchments and their drainage systems, are reviewed.
WATER RESOURCES.

237. Marshall, Patrick G. **TRANSPORTATION: AMERICA'S "QUIET CRISIS"**. Editorial Research Reports. p 446-59. August 11, 1989.

Report discusses topics such as: the skies are friendlier than the airports; are railroads the victim of competitors' subsidies?; and obstacles to a balanced transportation policy.
GENERAL.

238. Mason, Robert J. **STRUCTURED SETTLEMENTS: A NEW INCENTIVE TO PROMOTE PRIVATE PARTY SUPERFUND CLEANUPS**. Environmental Claims Journal; 2:493-516. June 1990.

Results of the 1988 U.S. EPA study, *An Analysis of Alternative Cleanup Financing Mechanisms for Their Potential Application to CERCLA Settlements*.
HAZARDOUS WASTE.

239. Matzer, John Jr. **CAPITAL PROJECTS: NEW STRATEGIES FOR PLANNING, MANAGEMENT, AND FINANCE.** Practical Management Series; 228p. 1989.

City and county experiences with solving infrastructure problems are discussed.
GENERAL.

240. Mays, L. W. **WATER DISTRIBUTION SYSTEM INFRASTRUCTURE ANALYSIS.** Water Resources Update: Water Resources Infrastructure. Issue No. 86, Autumn, 1991. p 20-22. 4 ref.

An EPA survey concluded that the distribution facilities in water supply systems account for the largest cost item in future maintenance budgets. A survey of methods used by municipal water utilities was performed to (1) obtain failure data for water distribution system components; (2) examine the methods used by utilities to collect and maintain data on the maintenance, failure and repair of various components of water distribution systems; and (3) identify existing sources of computerized data bases that have been developed and maintained. A review of the literature revealed that there is currently no universally acceptable definition or measure of the reliability of water distribution systems.
WATER SUPPLY.

241. McCarthy, James E. **INTERSTATE SHIPMENT OF MUNICIPAL SOLID WASTE.** Washington, DC: U.S. Congressional Research Service, The Library of Congress. August 1993.

Reports on a telephone survey of state waste management officials to determine the total amount of solid waste crossing state lines for disposal, the origins and destinations of such waste, and recent trends in waste shipments.
SOLID WASTE.

242. McConnell, Virginia D.; Schwarz, Gregory E. **THE SUPPLY AND DEMAND FOR POLLUTION CONTROL: EVIDENCE FROM WASTEWATER TREATMENT.** Journal of Environmental Economics and Management; 23(1), pages 54-77. July 1992.

This paper analyzes the determination of pollution control from wastewater treatment plants as an economic decision facing local or regional regulators. Pollution control is measured by plant design effluent concentration levels and is fully endogenous in a supply-and-demand model of treatment choice. On the supply side, plant costs are a function of the design treatment level of the plant, and on the demand side, treatment level is a function of both the costs of control and the regional or regulatory preferences for control. The authors find evidence that the economic model of effluent choice by local regulators has a good deal of explanatory power.
WASTEWATER TREATMENT.

243. McDowell, Bruce D. **PUBLIC WORKS FOR TOMORROW.** Washington, DC: Intergovernmental Perspective; pages 23-25. 1992.

This article reviews studies that have examined the performance and maintenance of public works, including *Fragile Foundations* and *New Directions for the Nation's Public Works*. The article also outlines a strategy of federal interagency cooperation in infrastructure programs.
GENERAL.

244. McFarland, W. F.; Chui, M. K.; Memmott, J. L. **ASSESSMENT OF TRANSPORTATION INFRASTRUCTURE NEEDS: RESEARCH REPORT (FINAL)JAN 88-AUG 90**. U:S: Department of Transportation, Federal Highway Administration//Texas Department of Transportation: 1991.

Four reports recently published by the Federal Highway Administration (FHWA), the American Association of Highway and Transportation Officials (AASHTO), the National Council on Public Works Improvement, and the Congressional Budget Office (CBO) present information that is important in evaluating highway needs in the United States. The objective of the study is to provide a comparison and critique of the four reports. Special emphasis is placed on evaluating the rate-of-return analysis for highway investment in the CBO report.
HIGHWAYS.

245. McGough, Joseph T. Jr. **AGING INFRASTRUCTURE A NEED FOR FEDERAL FUNDING OF URBAN WATER SUPPLY SYSTEMS**. Proceedings AWWA Seminar on Developing Financial Programs In the 80's. 1984.

This paper discusses the need for federal involvement in water supply infrastructure financing. The author encourages expansion of the historic U.S. government role of funding new infrastructure construction, to one of also financing rehabilitation and replacement of existing structures. The deterioration of water supply structures in the northeastern United States is documented, and possible solutions for existing physical and financial problems of water supply systems are addressed.
WATER SUPPLY.

246. McGuire, Therese J. **HIGHWAYS AND MACROECONOMIC PRODUCTIVITY: PHASE TWO**. Chicago, IL: Institute of Government and Public Affairs. March 31, 1992.

This report, prepared for the Federal Highway Administration, U.S. Department of Transportation, addresses the question of whether or not the decline in public capital investment has caused the recent decline in private productivity. The report reviews current literature on the subject, presents new estimates, and recommends future research. The impact of specific types of public capital (i.e. highway, transit, water, sewer) on private output are compared.
GENERAL.

247. McMahon, Jim (Independent Institute, Golden CO). **A RECYCLING STRATEGY FOR ANYTOWN, U.S.A.** BioCycle. v32, n8, p72(2). August 1991.

An eight-point program outlines a successful municipal recycling strategy with the inherent ability to adapt its outcome to any location.
SOLID WASTE.

248. McNiel, Douglas W.; Foshee, Andrew W. **HAZARDOUS WASTE DISPOSAL: A COMPARATIVE ANALYSIS OF REGULATION, TAXES AND SUBSIDIES**. Journal of Economics and Finance;16(2), pages 91-101. June 1992.

This paper contains a critique of existing legislation which deals with hazardous waste disposal and expands on the efforts made by the Office of Technology Assessment and other economists to develop a public policy which will deal effectively with the problems associated with hazardous waste generation and disposal. A new policy is set forth here which encourages both waste reduction and safe disposal while providing revenue to pay for cleanups at Superfund sites.
HAZARDOUS WASTE.

249. McNiel, Douglas W.; Foshee, Andrew W. **SUPERFUND FINANCING ALTERNATIVES.** Policy Studies Review; 7:751-60. June 1988.

Evaluates the taxes levied for funding the Comprehensive Environmental Response, Compensation, and Liability Act, and several alternative tax policies.
HAZARDOUS WASTE.

250. Mead, K. M. **SURFACE TRANSPORTATION: BUDGET ISSUES AND OPTIMIZING INVESTMENT RETURNS.** Washington, DC: U.S. General Accounting Office. 1993.

This is the statement of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office (GAO), before the Subcommittee on Transportation, Committee on Appropriations, United States House of Representatives, on key issues affecting the implementation of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the results of some of GAO's past and ongoing work in the area of surface transportation infrastructure.
HIGHWAYS/MASS TRANSIT.

251. Megbolugbe, Isaac F. **DEVELOPER FINANCING OF MUNICIPAL WATER SUPPLY (AN ASSESSMENT OF SYSTEM-DEVELOPMENT CHARGES).** Proceedings of the AWWA Seminar on Capital Financing. Washington, DC: National Home Builders Association. 1990.

This paper gives a brief overview of some methods for financing public improvements before going on to address system development charges. The author concludes that system development charges are best used in high-growth areas.
WATER SUPPLY.

252. Menczer, WB. **BUS SUPPORT FACILITIES: CONDITIONS AND NEEDS.** Washington, DC: U.S. Department of Transportation, Federal Transit Administration. 1993.

This three chapter report focuses on the current condition of the nation's bus support facility infrastructure. The purpose of the study was to develop estimates of the current condition of the nation's transit bus maintenance facilities and the capital investment needs to assure that these facilities remain in good condition.
MASS TRANSIT.

253. Menell, Peter S. **OPTIMAL MULTI-TIER REGULATION: AN APPLICATION TO MUNICIPAL SOLID WASTE.** Cambridge, MA: Center for Science & International Affairs, John F. Kennedy School of Government. 1991.

SOLID WASTE.

254. Merwin, DP. **PUBLIC-PRIVATE PARTNERSHIPS: WAVE OF THE FUTURE?** Highway and Heavy Construction. Newton, MA: Cahners Publishing Company. 1989.

The public-private partnership is becoming the wave--perhaps the tidal wave--of the future. There are literally thousands of public-private partnerships as the trend grows toward government eschewing confrontational politics in favor of a spirit of cooperation in both private developments and, to an increasing degree, public services.
GENERAL.

255. Meyer, John R.; Strong, John S. **FROM CLOSED SET TO OPEN SET DEREGULATION: AN ASSESSMENT OF THE U.S. AIRLINE INDUSTRY**. Logistics and Transportation Review; 28(1), pages 1-21. March 1992.

Airline industry performance has been shaped by sustained growth, technological change, and varying aspects of governmental oversight. In the United States, deregulation initially was of a "closed set" nature, with competition limited to existing carriers and with residual economic regulation. Subsequently, "open set" deregulation emerged characterized by rapid entry and exit and little economic regulation. Industry prospects depend on financial performance, especially for capital investment, and public policy toward mergers, infrastructure, and international competition.
AIR TRANSPORTATION.

256. Meyers, Jonathan Phillip. **CONFRONTING THE GARBAGE CRISIS: INCREASED FEDERAL INVOLVEMENT AS A MEANS OF ADDRESSING MUNICIPAL SOLID WASTE DISPOSAL**. Georgetown Law Journal. 79:567-90. February 1991.

Discusses proposed amendments to the U.S. Resource Conservation and Recovery Act of 1976, which establishes state guidelines, to parallel federal statutes. Focuses on landfills and interstate waste shipping.
SOLID WASTE*

257. Michaels, R. Gregory; Smith, V. Kerry. **MARKET SEGMENTATION AND VALUING AMENITIES WITH HEDONIC MODELS: THE CASE OF HAZARDOUS WASTE SITES**. Journal of Urban Economics; 28(2), pages 223-42. September 1990.

This paper proposes a new method for defining the market used in estimating a hedonic price function. It investigates the feasibility of acquiring realtors' evaluations of the specialized submarkets in a large market, suburban Boston. It uses the hedonic property value model to estimate how households value the avoidance of living near landfills containing hazardous wastes.
HAZARDOUS WASTE.

258. Migden, Janine L. **STATE POLICIES ON WASTE TO ENERGY FACILITIES**. Public Utilities Fortnightly. 126:26-30. September 13, 1990.

Overview of individual states' cogeneration and small power production policies.
SOLID WASTE.

259. Monk, Randall B. **A STATUS REPORT ON MUNICIPAL SOLID WASTE COMPOSTING**. Resource Recycling; 11:46+. July 1992.

Issues discussed include: comparative technologies, odor control, and linking composting programs with recycling.
SOLID WASTE.

260. Montgomery, W. D. **LESSONS FROM THE PAST, OPPORTUNITIES FOR THE FUTURE: THE CHANGING ROLE OF PUBLIC INVESTMENT IN ECONOMIC GROWTH**. Washington, DC: Colloquium on the Nation's Infrastructure Policy. November 17, 1989.

GENERAL.

261. Moore, John L. **GOVERNING GUIDE: TRANSPORTATION: PLANNING THE FUTURE.** Governing ; 4:43+. December 1990.

Topics of the report include: challenges of the Administration's National Transportation Policy; and state and local responses to problems of infrastructure, traffic congestion, and funding. Includes remarks by New Jersey Commissioner of Transportation Thomas M. Downs, an overview of high-technology transportation developments, and sources of information.
GENERAL.

262. Morris, Glenn E.; Byrd, Denise C. **UNIT PRICING FOR SOLID WASTE COLLECTION**. Popular Government. 56:37-44. September 1990.

Examines experiences of 16 U.S. municipalities using a system of charges per unit of generated waste.
SOLID WASTE.

263. Moses, Leon N.; Savage, Ian. **AVIATION DEREGULATION AND SAFETY: THEORY AND EVIDENCE**. Journal of Transport Economics and Policy; 24(2), pages 171-88. May 1990.

There is a popular belief that the economic deregulation of the United States' airline industry has led to a denigration of its safety performance. This paper describes the academic evidence on the validity of this fear. The evidence is presented within a theoretical framework which describes the potential linkages between economic conditions and the safety performance of firms.
AIR TRANSPORTATION.

264. Municipal Finance Officers Association. **BUILDING PROSPERITY: FINANCING PUBLIC INFRASTRUCTURE FOR ECONOMIC DEVELOPMENT**. Government Finance Research Center. 1983.

This report surveys the irregular and complicated landscape of the needs for, and financing of, public works in this country, especially focusing on the role of the state and local governments.
GENERAL*

265. Munnell, Alicia H. **HOW DOES PUBLIC INFRASTRUCTURE AFFECT REGIONAL ECONOMIC PERFORMANCE?** New England Economic Review; 0(0), pages 11-32. Boston, MA: Federal Reserve Bank of Boston. September 1990.

This paper explores the impact of public capital on economic activity at the state and regional level. The author concludes that those states that have invested in infrastructure tend to have greater output, more private investment, and more employment growth.
GENERAL*

266. Munnell, Alicia H. **IS THERE A SHORTFALL IN PUBLIC CAPITAL INVESTMENT?** Proceedings of a Conference held at Harwich Port, Massachusetts. Boston, MA: Federal Reserve Bank of Boston; 249p. 1990.

Examines the extent to which the U.S. may be underinvesting in public infrastructure, potential economic consequences and suggested funding mechanisms. Includes a discussion of the effect on regional economic performance and prospects for privatizing infrastructure in light of experiences with roads and solid waste.
GENERAL.

267. Munnell, Alicia H. **POLICY WATCH: INFRASTRUCTURE INVESTMENT AND ECONOMIC GROWTH**. Journal of Economic Perspectives; 6(4), pages 189-98. Boston, MA: Federal Reserve Bank of Boston. September 1992.

This essay addresses the relationship between U.S. productivity and infrastructure investment. It begins with a history of the debate and discussion of the policy implications involved with the issue. The author then compares her previous work to that of David Aschauer. The author analyzes the arguments of her critics and draws conclusions about whether a higher level of infrastructure spending is warranted, given its impact on U.S. productivity.
GENERAL.

268. Munnell, Alicia H. **WHY HAS PRODUCTIVITY GROWTH DECLINED? PRODUCTIVITY AND PUBLIC INVESTMENT**. New England Economic Review; 0(0), pages 3-22. Boston, MA: Federal Reserve Bank of Boston. January 1990.

This study builds upon David Aschauer's insight and explores whether changes in the amount of public capital, combined with the growth of private capital and labor, can explain most of the slowdown. The author concludes that the main causes of the productivity slowdown could be behind us, as long as public infrastructure receives badly needed attention.
GENERAL.

269. Nakamura, Robert T.; Church, Thomas W.; Cooper, Phillip J. **ENVIRONMENTAL DISPUTE RESOLUTION AND HAZARDOUS WASTE CLEANUPS: A CAUTIONARY TALE OF POLICY IMPLEMENTATION**. Journal of Policy Analysis and Management; 10(2), pages 204-21. March 1991.

HAZARDOUS WASTE.

270. Nakicenovic, Nebojsa. **DYNAMICS AND REPLACEMENT OF U.S. TRANSPORT INFRASTRUCTURES**. Cities and their vital systems: Infrastructure past, present, and future. Ausubel, Jesse H.//Herman, Robert. ed. Washington, DC: National Academy Press. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

GENERAL.

271. National Association of Water Companies. **FINANCIAL AND OPERATING DATA: 1991 (INVESTOR-OWNED WATER UTILITIES)**. Washington, DC: 1991.

This report is based on the responses of 167 companies to the NAWC Economic Research Program survey of members. The data presented in this report are categorized by both type of customer and company size, reporting selected industry-wide data on water sales, customer profiles, and water supply source and plant expenditures. The financial summary includes additional statistics and regional breakdowns of data. It is important to note that the summarization of results by revenue classes does not explicitly recognize the effects of different operational methodologies and water supply sources on the financial data submitted by the individual companies.
WATER SUPPLY.

272. National Conference of State Legislature. **CAPITAL BUDGETING AND FINANCE: THE LEGISLATIVE ROLE**. 1987.

This report examines ways of strengthening legislative oversight of the state capital budgeting and finance process.
GENERAL*

273. National Council on Public Works Improvement. **FRAGILE FOUNDATIONS: A REPORT ON AMERICA'S PUBLIC WORKS. FINAL REPORT TO THE PRESIDENT AND THE CONGRESS**. Washington, DC: 1988.

This 3-part report presents the results of an assessment of the state of America's infrastructure. Part one summarizes the findings and conclusions about the capacity of the nation's infrastructure to support future economic growth. Part two provides a synthesis of major themes from extensive research conducted in the last two years. Part three presents appendices that analyze the performance of 8 major categories of public works and provides additional information.
GENERAL*

274. National Governors' Association. **HAZARDOUS WASTE MANAGEMENT IN THE STATES: A REVIEW OF THE CAPACITY ASSURANCE PROCESS**. Annapolis Junction, Maryland: 1992.

This report provides an overview of information received from the first Capacity Assurance Plans (CAPs) in 1989, including the amount of hazardous waste generated, projected future volumes, and data on interstate shipments. It also describes the law and its implementation; EPA's guidance for completion and submission of a CAP; and state plans for creating new capacity.
HAZARDOUS WASTE*

275. National Governors' Association, National Task Force on Solid Waste Management. **CURBING WASTE IN A THROWAWAY WORLD: REPORT OF THE TASK FORCE ON SOLID WASTE MANAGEMENT**. Annapolis Junction, Maryland: 1990.

This report discusses the work of the National Governors' Association Task Force on Solid Waste Management, charged with investigating solid waste issues and developing national goals and strategies for improving the nation's waste management system. This report sets goals for reducing waste generation, increasing recycling rates, and reducing the problems

stemming from interstate shipment of solid waste. Separate chapters are devoted to source reduction, recycling, waste-to-energy facilities, alternative disposal technologies, interstate transport, comprehensive planning, and facility siting.
SOLID WASTE*

276. National Governors' Association, Task Force on Transportation Infrastructure. **AMERICA IN TRANSITION: THE INTERNATIONAL FRONTIER: REPORT OF THE TASK FORCE ON TRANSPORTATION INFRASTRUCTURE**. Washington, DC: 1989.

GENERAL.

277. National League of Cities. **FINANCING INFRASTRUCTURE: INNOVATIONS AT THE LOCAL LEVEL**. Annapolis, MD: NLC Publications Center. 1987(ISBN 0-933729-30-8).

This study reviews 24 cases studies of locally financed infrastructure development. The studies were selected to illustrate a range of financing techniques suited to infrastructure expansion and rejuvenation.
GENERAL.

278. National Research Council, Building Research Board. **IN OUR OWN BACKYARD: PRINCIPLES FOR EFFECTIVE IMPROVEMENT OF THE NATION'S INFRASTRUCTURE**. Washington, DC: National Academy Press.

This report presents the state of the nation's infrastructure and suggestions for improvement from the National Research Council committee. The committee emphasized the local nature of urban infrastructure and reviewed the cites of Phoenix, Cincinnati, and Boston.
GENERAL.

279. National Research Council, Committee on Infrastructure Innovation. **INFRASTRUCTURE FOR THE 21ST CENTURY: FRAMEWORK FOR A RESEARCH AGENDA**. Washington, DC: 1987.

This report addresses issues regarding infrastructure technology: promising research areas for the technological improvement of infrastructure; and factors governing the adoption and carrying out a national research agenda to foster innovative research for infrastructure systems. The report recommends a two year implementation program for the development of a national strategy for infrastructure research and development. Efforts to strengthen and encourage existing modal research efforts are an essential to this activity.
GENERAL*

280. National Research Council, Committee on Measuring and Improving Infrastructure Performance. **ISSUES IN INFRASTRUCTURE PERFORMANCE MEASUREMENT: INTERIM REPORT OF A STUDY ON MEASURING AND IMPROVING INFRASTRUCTURE PERFORMANCE**. Washington, DC: National Academy Press. 1993.

This purpose of this study, which was conducted as an element of the U.S. Army Corps of Engineers Federal Infrastructure Strategy, was to develop an evaluation framework to measure and improve infrastructure performance.
GENERAL.

281. National Science Foundation. **CIVIL INFRASTRUCTURE SYSTEMS RESEARCH: STRATEGIC ISSUES**. Washington, DC: 1993.

The report concludes there is an urgent need to rebuild America. The nation must strive for intelligent renewal, a process that uses limited resources in a cost-effective manner.
GENERAL.

282. Neienhaus, Michael. **HIGHWAYS AND MACROECONOMIC PRODUCTIVITY PHASE ONE: THE CURRENT STATE OF RESEARCH**. Cambridge, MA: U.S. Department of Transportation, Volpe National Transportation Systems Center. 1991.

This report is the first of a two phase effort by the FHWA to investigate the relationship between highway infrastructure investment and macroeconomic growth and productivity. Phase one's objectives are 1) to examine the relationship between aggregate output, productivity on the one hand and public capital, public infrastructure on the other, and 2) to assess future research needs. The approach taken by the report involves reviewing literature on the subject, concentrating on three papers by Aschauer (1989), Munnell (1990), and Munnell and Cook (1990). The data used by these three authors were obtained, updated, and an attempt was made to duplicate their analyses. The FHWA then ran statistical tests for each analysis, comparing the findings. Conclusions were drawn from the comparisons, and recommendations made for future research.
HIGHWAYS.

283. Novick, Sheldon. **AN ENVIRONMENTAL PERSPECTIVE ON AN INTEGRATED WASTE MANAGEMENT STRATEGY**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating Insurance and Risk Management for Hazardous Wastes. Norwell, MA: Kluwer Academic; pp. 217-239. 1990.

HAZARDOUS WASTE.

284. O'Leary, Rosemary. **WILL HAZARDOUS WASTE CLEANUP COSTS CRIPPLE OUR STATE AND LOCAL GOVERNMENTS?** State and Local Government Review; 22:84-9. March 1990.

Implications of recent statutory changes and judicial decisions.
HAZARDOUS WASTE.

285. O'Toole, Laurence J. **GOAL MULTIPLICITY IN THE IMPLEMENTATION SETTING: SUBTLE IMPACTS AND THE CASE OF WASTEWATER TREATMENT PRIVATIZATION**. Policy Studies Journal; 18:1-20. September 1989.

Top-down and bottom-up perspectives on intergovernmental action on behalf of wastewater treatment.
WASTEWATER TREATMENT.

286. Obradovic, D.; Schilling, KE; Porter, E. **MODERNIZATION OF URBAN WATER SUPPLY SYSTEMS**. Urban Water Infrastructure, Proceedings of a NATO Workshop. Isle of Man, Canada: National Water Resources Institute. 1990.

Waterworks are urged by society to use resources better, cut down costs, and improve standards of service. To meet these requirements, the waterworks must undertake

modernization. They should first appreciate the deficiencies, decide on a long-term plan, and start to implement it in carefully balanced steps. The compilation and calibration of a good mathematical model of the system is always a good initial step - both for the undeveloped and for the advanced. Another is the analysis of water consumption in time and space, using available water meters.
WATER SUPPLY.

287. Olson, David J. **GOVERNANCE OF U.S. PUBLIC PORTS: A PRELIMINARY SURVEY OF KEY ISSUES**. Washington, DC: Marine Port Board Governance Roundtable. November 1992.
WATER RESOURCES.

288. Opaluch, James J. **EVALUATING IMPACTS FROM NOXIOUS FACILITIES: INCLUDING PUBLIC PREFERENCES IN CURRENT SITING MECHANISMS**. Journal of Environmental Economics and Management; 24(1), pages 41-59. January 1993.

This paper describes an approach to facility siting that ranks potential sites in terms of their social impacts. A contingent choice survey based on paired comparisons is used to construct a utility index to rank sites consistent with predicting results of a hypothetical referendum based on the attributes of the sites.
SOLID WASTE/HAZARDOUS WASTE.

289. Osmon, DR. **THE CRITICAL LINK. A MESSAGE ON THE IMPORTANCE OF THE HIGHWAY INFRASTRUCTURE TO U.S. ECONOMIC GROWTH AND PRODUCTIVITY**. Washington, DC: Highway Users Federation for Safety and Mobility. 1991.

Donn R. Osmon, Group Vice President of Traffic and Personal Safety Products of 3M Company, addressed more than 80 Congressmen and members of Congressmen's staffs at a special U.S. Congressional breakfast meeting during the Highway Users Federation 1991 Highway Transportation Congress. Mr. Osmon discusses America's infrastructure needs and the link between investment in infrastructure and the productivity of our workforce.
HIGHWAYS.

290. Pashigian, B. Peter. **CONSEQUENCES AND CAUSES OF PUBLIC OWNERSHIP OF URBAN TRANSIT FACILITIES**. Stigler, George J. Chicago Studies in Political Economy. Chicago, IL: University of Chicago Press; pp. 404-425. 1988.

MASS TRANSIT.

291. Paterson, Robert G. **SEWERING THE COAST: BANE OR BLESSING TO MARINE WATER QUALITY**. Coastal Management; 19:239-52. April 1991.

Wastewater and sewage management issues associated with increasing development of coastal regions are presented with data from 161 jurisdictions in the southeastern U.S.
WASTEWATER TREATMENT.

292. Peretz, Jean H. (University of Tennessee). **EQUITY UNDER AND STATE RESPONSES TO THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986**. Policy Sciences; 25(2), pages 191-209. May 1992.

The author examines equity and reviews hazardous waste management in a federalism context to discern the relationship between EPA and the states. The author focuses on the different roles EPA and the states perceived for the other during implementation of Section 104(k). The author concludes with an evaluation of how equity was handled under the new legislation and what remains to be done.
HAZARDOUS WASTE.

293. Petersen, Dennis W. **THE ENVIRONMENTAL REVOLUTION**. Site Selection and Industrial Development; 35:1191-5:. October 1990.

Brief overview of the effects of environmental legislation on designing, building, and operating facilities. Also discusses financial, legal, and design elements associated with current regulations.
GENERAL.

294. Peterson, George E. **HISTORICAL PERSPECTIVES ON INFRASTRUCTURE INVESTMENT: HOW DID WE GET WHERE WE ARE?** Washington, DC: The Urban Institute. 1991.

This paper is presented in two parts. Part I examines the evolution of the infrastructure debate by examining the progress made in understanding the following themes which have characterized policy discussions for the past decade: infrastructure needs estimates; infrastructure condition and performance; the linkage of infrastructure to economic growth and productivity; and federal vs. state-local financing roles. Part II examines the constraint that state and local officials themselves identify as the principal obstacle to adequate infrastructure investment: the need to secure voter approval for bond or tax financing (referendum voting).
GENERAL*

295. Peterson, George; Miller, Ted; Humphrey, Nancy; Walker, Christopher. **INFRASTRUCTURE NEEDS STUDY: A CRITIQUE**. National Council on Public Works Improvement. 1986.

Needs studies during the 1980s showed that the United States needed to invest more in its public capital facilities if they were to be saved from deterioration. This report estimates the needs of infrastructure, both new facilities and maintenance of old ones.
GENERAL*

296. Pisarski, Alan. **THE NATION'S PUBLIC WORKS: REPORT ON HIGHWAYS, STREETS, ROADS, AND BRIDGES**. National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining highways, streets, roads, and bridges as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's highway, streets, roads, and bridges.
HIGHWAYS*

297. Poole, R. W. **INCENTIVES FOR MOBILITY: USING MARKET MECHANISMS TO REBUILD AMERICA'S TRANSPORTATION INFRASTRUCTURE. WORKING PAPER**. Santa Monica, CA: Reason Foundation. 1989.

This policy study proposes that the solution to America's inadequate transportation infrastructure should be a market-oriented approach rather than simply spending more public

money. This approach stresses user funding, dedicated revenues, market pricing, and the use of private capital: principles which can be applied to airports, highways and freeways, mass transit, ports and waterways.
GENERAL.

298. Porter, Douglas R. **SPECIAL DISTRICTS: A USEFUL TECHNIQUE FOR FINANCING INFRASTRUCTURE (2ND EDITION)**. Washington, DC: The Urban Land Institute. 1992.

This second edition, which expands and updates the original book, looks at special districts as an alternate means of financing public improvements associated with new developments. In-depth case studies examine special districts providing water, sewer, transportation, and drainage facilities in seven states. It also explains how special districts are weathering the national economic downturn and how states are providing more guidance for district activities.
GENERAL.

299. Porter, Douglas R.; Matzer, John Jr. **FINANCING INFRASTRUCTURE WITH SPECIAL DISTRICTS**. Capital projects: New strategies for planning, management, and finance. Washington, DC: International City Management Association; 162-169. 1989.

This paper examines the use of special districts in financing infrastructure projects. Examples are presented for how special districts operate. Advantages and disadvantages of special districts are discussed, and a prognosis is presented for the future use of these financing mechanisms.
GENERAL.

300. Portland Cement Association. **INFRASTRUCTURE: INVESTING IN OUR FUTURE**. Skokie, IL: 1992.

This booklet examines the cost of America's deteriorating infrastructure, then looks at the individual components: highways, roads, and bridges; airports; mass transit systems; water supply systems; wastewater treatment plants; and sewer systems. Final comments concern infrastructure renewal and its cost.
GENERAL.

301. Powell, Jerry. **JUST THE FACTS: RELEVANT DATA ON MRF OPERATIONS AND COSTS**. Resource Recycling; 11:34+. May 1992.

Summarizes a 1991 Environmental Protection Agency report on materials recovery facilities (MRF).
SOLID WASTE.

302. Prince, Greg. **YES, IN THEIR BACKYARD AND EVERYBODY ELSE'S**. Beverage World. 109:22-3+. June 1990.

Report on a roundtable discussion by representatives of major packaging groups and beverage trade associations on easing the solid waste crisis, held in Washington, D.C., March 1990.
SOLID WASTE.

303. Private Sector Advisory Panel on Infrastructure Financing. **REPORT OF THE PRIVATE SECTOR ADVISORY BOARD ON INFRASTRUCTURE FINANCING TO THE COMMITTEE ON THE BUDGET; U.S. SENATE**.

This report examines options for infrastructure financing, and recommends effective ways to select and fulfill the best option. The report provides important insight with respect to trends in infrastructure funding over the past few decades and with regard to projected funding shortfalls in the coming years.
GENERAL*

304. The Privatization Council. **PROCEEDINGS OF THE PRIVATIZATION COUNCIL'S THIRD NATIONAL CONFERENCE.** Privatization Review. 4:21-35+. September 1989.

Edited versions of the six Partnership Opportunity Workshops presented at the conference, Making Ends Meet: Public-Private Partnerships into the 1990's, held in Washington, D.C., May 15-16, 1989. The workshops include: environmental infrastructure, transportation, municipal service contracting, health care, contracting out for assets and services, and labor relations and public/private partnerships.
GENERAL.

305. Public Infrastructure Subcouncil. **INVESTING IN OUR FUTURE: REPORT OF THE PUBLIC INFRASTRUCTURE SUBCOUNCIL TO THE COMPETITIVENESS POLICY COUNCIL.** March 1993.

The Subcouncil on Public Infrastructure was convened by the Competitiveness Policy Council to produce recommendations for enhancing U.S. international competitiveness by improving the effectiveness and efficiency with which we move people, goods, and information. The Subcouncil proposes a three-point strategy to ensure that U.S. infrastructure enhances our competitive edge, which recommends: 1) an aggressive program to maintain and improve transportation infrastructure, 2) adequate and sustained financing of infrastructure investment over time, and 3) decisive action to advance a new telecommunications infrastructure for the 21st century. The Subcouncil suggests legislation, priorities, financing mechanisms, and principles with which to achieve these goals.
GENERAL*

306. Pustay, M. W. (British Columbia University, Canada Center for Transportation Studies). **TOWARD A GLOBAL AIRLINE INDUSTRY: PROSPECTS AND IMPEDIMENTS.** Logistics and Transportation Review. 1992.

International aviation has undergone much change due to increasing liberalization of bilateral agreements, increased domestic competition, and privatization. Initiatives in deregulation and toward limited "open skies" enhanced the competitive position of U.S. airlines internationally, which has encouraged a variety of organizational affiliations and industry changes worldwide. Subsequent globalization will be multilateral in nature and conditioned by policies toward antitrust, public enterprise, and infrastructure.
AIR TRANSPORTATION.

307. Raftelis, George A. **THE ARTHUR YOUNG GUIDE TO WATER AND WASTEWATER FINANCE AND PRICING.** Washington, DC: Lewis Publishers. 1991.

This guide provides a review of financing and pricing strategies for the provision of wastewater services. Financing mechanisms described include bonds, short-term financing, credit enhancements, capital recovery charges, and privatization. The wastewater pricing process is discussed, including identification of revenue requirements, costing of services, designing water and wastewater rate structures, and the comparison for rates among different

utilities. An appendix provides calculations of capital recovery charges under alternative approaches.
WATER RESOURCES/WASTEWATER TREATMENT.

308. Rebuild America Coalition. **AMERICA'S INFRASTRUCTURE: PRESERVING OUR QUALITY OF LIFE**. Washington, DC: 1989.

This report is the second in a series of reports that addresses various elements of America's infrastructure problems and solutions to these problems. Within this report on America's infrastructure is a section devoted to the transportation network. It is pointed out that not only is America's transportation infrastructure deteriorating from aging facilities, but underinvestment in new facilities is overburdening current transportation networks.
GENERAL*

309. Reed, Brian E.; Sack, William A. **HAZARDOUS AND INDUSTRIAL WASTES.** 1992.

Focuses on waste treatment and site remediation technology, including sludge treatment, solids disposal, groundwater flow, recycling, and extracting energy from waste.
HAZARDOUS WASTE.

310. Reitze, Arnold W. Jr; Davis, Andrew N. **RECONSIDERING OCEAN INCINERATION AS PART OF A U.S. HAZARDOUS WASTE MANAGEMENT PROGRAM: SEPARATING THE RHETORIC FROM THE REALITY.** Boston College Environmental Affairs Law Review; 17:687-798. June 1990.

Considers disposal options and the health and environmental impact of land-based and ocean incineration.
HAZARDOUS WASTE.

311. Rephann, Terance J. **HIGHWAY INVESTMENT AND REGIONAL ECONOMIC DEVELOPMENT: DECISION METHODS AND EMPIRICAL FOUNDATIONS**. Urban Studies; 30(2), pages 437-50. March 1993.

This paper reviews criteria used in U.S. development highway corridor selection and variables identified by various regional development theories. A synthesis of highway empirical research suggests that geographical region, urbanization, development and public infrastructure may be important "triggering forces" in the U.S.
HIGHWAYS.

312. Revis, Joseph S. Tarnoff, Curtis. **THE NATION'S PUBLIC WORKS: REPORT ON INTERMODAL TRANSPORTATION**. National Council on Public Works. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining intermodal transportation as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's intermodal transportation.
GENERAL*

313. Rice, Steven (BASF Corp, Parsippany, NJ). **WASTE MANAGEMENT: THE LONG VIEW.** CHEMTECH. v21, n9, p543(4). September 1991.

Long-term planning is needed on the part of industry to better deal with waste management and the increasingly stringent regulations that are being enacted to deal with industrial wastes. Future regulations will require better identification and reporting strategies, so the costs of complying with these regulations and of responding to negative public pressure can be decreased by limiting the amount of waste generated.
HAZARDOUS WASTE*

314. Roberts, Roland K.; Douglas, Peggy V.; Park, William M. **ESTIMATING EXTERNAL COSTS OF MUNICIPAL LANDFILL SITING THROUGH CONTINGENT VALUATION ANALYSIS: A CASE STUDY**. Southern Journal of Agricultural Economics; 23(2), pages 155-65. December 1991.

Much of the solid waste stream in the United States is generated by metropolitan areas, while associated landfills are often located in adjacent rural communities. Landfill disposal of municipal solid waste often creates external costs to nearby residents. Contingent valuation was used to estimate external costs of siting a landfill in the Carter community of Knox County, Tennessee.
SOLID WASTE.

315. Roesner, L. A.; Walesh, S. G. **URBAN WATER RESOURCES ISSUES IN THE 21ST CENTURY**. Journal of Professional Issues in Engineering. New York, NY: American Society of Civil Engineers. 1988.

The Urban Water Resources Research Council identifies four critical engineering issues that must be addressed in the 21st century: water supply, storm water management, combined sewer systems, and engineering education.
WATER RESOURCES/WATER SUPPLY.

316. Rosen, Michael D.; Sexton, Richard J. **IRRIGATION DISTRICTS AND WATER MARKETS: AN APPLICATION OF COOPERATIVE DECISION MAKING THEORY**. Land Economics; 69(1), pages 39-53. February 1993.

Water supply organizations control a large portion of agricultural water rights in the western U.S. This paper applies cooperative and club theory models to analyze the response of these organizations to potential rural-to-urban water transfers.
WATER RESOURCES.

317. Rosenberg, Philip; Road, Sally. **PLANNING FOR CAPITAL IMPROVEMENTS**. Washington, DC: Management Information Services. 1984.

GENERAL.

318. Rosenthal, Isadore; Johnson, Lynn. **AN INDUSTRIAL PERSPECTIVE ON AN INTEGRATED WASTE MANAGEMENT STRATEGY**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA Dordrecht and London: Kluwer Academic. 1990.

HAZARDOUS WASTE.

319. Rothberg, Paul F. **INTELLIGENT VEHICLE HIGHWAY SYSTEMS (IVHS): CHALLENGES, CONSTRAINTS, AND FEDERAL PROGRAMS**. Washington, DC Congressional Research Service. 1992.

The challenges and constraints facing the Intelligent Vehicle Highway Systems (IVHS) are considered, the IVHS Act of 1991 is summarized, the management and structure of this program are analyzed and options that might be considered in appropriating funds for, or conducting oversight on, this national efforts are outlined.
HIGHWAYS.

320. Rothenberg, J. **THE QUALITY OF LOCAL INFRASTRUCTURE SERVICES: INVESTMENT, MAINTENANCE, AND REPLACEMENT UNDER TAX FINANCING, USER CHARGES, AND PRIVATIZATION**. 1988.

GENERAL.

321. Rubin, Marc. **SANITATION COLLECTION AND DISPOSAL**. Government Accounting Standards Board. 1991.

This report looks at production and reporting Service Efforts and Accomplishments indicators relating to the government's provision of sanitation collection and disposal services.
SOLID WASTE*

322. Rutledge, Gary L.; Leonard, Mary L. **POLLUTION ABATEMENT AND CONTROL EXPENDITURES, 1987-91.** Survey of Current Business. 73:55-62. May 1993.

Provides data for business and government expenditures on air, water, and solid waste pollution control.
GENERAL.

323. R.W. Beck and Associates. **THE NATION'S PUBLIC WORKS: REPORT ON SOLID WASTE**. Washington, DC: National Council on Public Works Improvement. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining solid waste as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's solid waste.
SOLID WASTE*

324. Salkin, Patricia E. **IMPACT FEES: THE LAW, POLICY AND PRACTICE: A BIBLIOGRAPHY**. 1991.

Impact fees are assessed by municipalities to developers for costs associated with off-site improvements necessitated as a direct result of the proposed development.
GENERAL.

325. Sanders, H. T. **PUBLIC WORKS AND PUBLIC DOLLARS: FEDERAL INFRASTRUCTURE AND LOCAL INVESTMENT POLICY**. Washington, DC: U.S. Congress, House Wednesday Group. 1991.

GENERAL.

326. Scanlon, Raymond D. **HAZARDOUS MATERIALS, HAZARDOUS WASTE: LOCAL MANAGEMENT OPTIONS**. Washington, DC: ICMA Publications. 1987.

This book explains the complex maze of federal regulations regarding hazardous materials and hazardous waste. It shows how local officials can work with industries to minimize hazardous wastes, improve transportation safety in and near the community, solve facilities siting problems, and plan for accidents prevention and emergency response.
HAZARDOUS WASTE.

327. Schilling, K. E.; Porter, E. **U.S. URBAN WATER RESOURCES INFRASTRUCTURE.** Urban Water Infrastructure: Proceedings of a NATO Workshop on the Isle of Man. Fort Belvoir, VA: U.S. Army Corps of Engineers, Institute for Water Resources. 1990.

The report reviews navigation/transportation, flood control, urban drainage, dam safety, irrigation, agriculture drainage, erosion, hydropower, recreation, and fish and wildlife created infrastructure needs. Wastewater and water supply, covered by separate Council reports, are more briefly reviewed for common themes and prospective actions.
GENERAL.

328. Schilling, Kyle; Copeland, Claudia; Dixon, Joseph; Smyth, James; Vincent, Mary; and Peterson, Janice. **THE NATION'S PUBLIC WORKS: REPORT ON WATER RESOURCES**. National Council on Public Works Improvement. Washington, DC: 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining water resources as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's water resources.
WATER RESOURCES*

329. Schnare, D. W.; Cromwell, J. E. **CAPITAL REQUIREMENTS FOR DRINKING WATER INFRASTRUCTURE**. Cincinnati, OH: American Water Works Association. 1990.

This document was written as a joint conference paper by a U.S. EPA Office of Drinking Water employee and a private contractor for a capital financing seminar at the annual conference of the American Water Works Association. It assesses the impact estimates made in conjunction with the reauthorization of the Safe Drinking Water Act (SDWA) in relation to the baseline trends of water industry capital expenditures and the size of the customer base over which the costs will ultimately be spread.
WATER SUPPLY*

330. Schroeder, Peter. **MANAGING EXISTING HAZARDOUS WASTE FACILITIES: RISK ASSESSMENT ISSUES**. Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA: Dordrecht and London: Kluwer Academic. 1990.

HAZARDOUS WASTE.

331. Schuler, Richard E. **TRANSPORTATION AND TELECOMMUNICATIONS NETWORKS: PLANNING URBAN INFRASTRUCTURE FOR THE 21ST CENTURY**. Urban Studies, V. 29, NO. 2, p. 297-310. April 1992.

This essay suggests measures to ensure that the ease and quality of access to local transportation and telecommunication networks by a diversity of users is maintained. The essay covers cost recovery, private versus public ownership, planning efficiency, and the interaction between transportation and telecommunication networks.
GENERAL.

332. Seader, David. **OPPORTUNITIES IN PRIVATIZATION FINANCE: THE MOVE TO REORIENT PUBLIC SECTOR LENDING PRACTICES.** Bankers Magazine; 172:40-4. May 1989.

Role of banks in alternative financing for municipal expansion and renovation of public works and services.
GENERAL.

333. Sears, D. (Economic Research Service, Agriculture and Rural Economy Division, Washington, DC). **INFRASTRUCTURE INVESTMENT AND ECONOMIC DEVELOPMENT: RURAL STRATEGIES FOR THE 1990's (STAFF REPORT).** December 1990.

The report examines the effects of investment in transportation, telecommunications, and water and wastewater infrastructure on improving the economies of rural America. The authors leave the reader with a healthy degree of skepticism about the possibility of the direct stimulation of economic development across the spectrum of rural communities through just any infrastructure investments.
GENERAL.

334. Seely, B. **THE SAGA OF AMERICAN INFRASTRUCTURE.** Wilson Quarterly, Washington, DC: Woodrow Wilson International Center for Scholars. 1993.

Infrastructure is said to include not only roads and sewers, but national transportation grids, communication systems, media, housing, education, and, perhaps in the 1990s, computer networks and fiber-optic information superhighways. The author concentrates on those things that provide crucial physical services: transportation, water and sewage, and power--the systems that historians Joel Tarr and Gabriel Dupuy call technological sinews.
GENERAL.

335. Seif, James; Voltaggio, Thomas. **RISK MANAGEMENT ISSUES ASSOCIATED WITH CLEANING UP INACTIVE HAZARDOUS WASTE SITES.** Kunreuther, Howard; Gowda, M. V. Rajeev. Integrating insurance and risk management for hazardous wastes. Norwell, MA: Dordrecht and London: Kluwer Academic. 1990.

HAZARDOUS WASTE.

336. Shields, Evelyn. **FUNDING ENVIRONMENTAL PROGRAMS: AN EXAMINATION OF ALTERNATIVES.** Annapolis Junction, Maryland: National Governors' Association. 1989.

This National Governors' Association report discusses alternative financing mechanisms (AFMs) for environmental programs, including fee programs, tax programs, revolving loan funds, general obligation and revenue bonds, public-private partnerships, and other revenue-generating approaches. Current state experience in using the various AFMs to finance environmental programs, revealed in a survey of all state Environment Directors, are reviewed. The study concludes that AFMs are a powerful tool to supplement general

revenue, but that they alone fail to bridge the widening gap between the costs of environmental protection and the resources to pay for it. Therefore, federal, state, and local governments will need to spend more general revenues for environmental protection and attempt to reduce program costs.
GENERAL.

337. Shughart, William F.; Kimenyi, Mwangi S. **A PUBLIC CHOICE ANALYSIS OF PUBLIC TRANSIT OPERATING SUBSIDIES**. Research in Law and Economics; 14(0): pages 251-76. 1991.

MASS TRANSIT.

338. Shuman, M. **ARE AMERICA'S BRIDGES FALLING DOWN?** Traffic Safety. Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration. 1991.

The problems that plague America's bridges are pointed out, and it is noted that of 842 bridges under local jurisdiction in New York, 56% are deficient. By the end of the decade, it will cost about $1 billion to repair New York's bridges. In the United States, in an average year, about 150 bridges collapse, and a quarter of the half million rural bridges are structurally deficient. A Federal Highway Administration study found that nearly half the bridges in the United States should be repaired or replaced. In California, because of earthquake history, bridge safety is of particular concern.
HIGHWAYS.

339. Sloane, Morris. **THE WORLD'S AIRPORTS: TODAY AND TOMORROW**. Via International Port of New York New Jersey; 40:6-9 10-13. September 1988.

Covers trends in airport development in Western Europe, Japan, and the U.S.. and it discusses cargo, noise, environmental issues, and capital improvement programs.
AIR TRANSPORTATION.

340. Small, Kenneth A. **URBAN TRAFFIC CONGESTION: A NEW APPROACH TO THE GORDIAN KNOT**. Brookings Review. 11:6-11. March 1993.

Methods of implementing congestion pricing, or charging fees for use of popular routes during rush hours, and using the revenues to improve infrastructure are presented.
HIGHWAYS.

341. Small, Kenneth A. **USING THE REVENUES FROM CONGESTION PRICING**. Institute of Transportation Studies, University of California, Irvine, CA; 24p. 1992.

Viability of tax levies and credits for miles travelled alone or by carpooling to finance highways and relieve congestion is presented, based on 1990 Los Angeles data.
HIGHWAYS.

342. Smith, Frederick W. **AIR CARGO TRANSPORTATION IN THE NEXT ECONOMY**. Guile, Bruce R.; Quinn, James Brian. Technology in Services: Policies for Growth, Trade, and Employment. Washington, DC: National Academy Press; pages 160-166. 1988. (National Academy of Engineering Series on Technology and Social Priorities).

AIR TRANSPORTATION.

343. Snell, Ronald K. **HIGHWAY TOLLS AND PRIVATE ROADS: THE WAY TO THE FUTURE?** State Legislatures; 17:52-6. July 1991.

Presents pros and cons of toll roads to finance and maintain the U.S. highway infrastructure.
HIGHWAYS.

344. Snyder, Thomas P. Stegmen, Micheal A. **PAYING FOR GROWTH: USING DEVELOPMENT FEES TO FINANCE INFRASTRUCTURE**. Washington, DC: Urban Land Institute. 1986.

GENERAL.

345. Stavins, Robert N.; Jaffe, Adam B. **UNINTENDED IMPACTS OF PUBLIC INVESTMENTS ON PRIVATE DECISIONS: THE DEPLETION OF FORESTED WETLANDS**. American Economic Review; 80(3), pages 337-52. June 1990.

By affecting relative economic returns, infrastructure investments can induce major changes in private land use. The authors find that 30 percent of forested wetland depletion in the Mississippi Valley has resulted from private decisions induced by federal flood-control projects, despite explicit federal policy to preserve wetlands. The model aggregates individual land-use decisions using a parametric distribution of unobserved land quality; dynamic simulations are used to quantify the impacts on wetlands of federal projects and other factors.
WATER RESOURCES.

346. Stein, Jay M. ,. Ed. **PUBLIC INFRASTRUCTURE PLANNING AND MANAGEMENT**. Urban Affairs Annual Reviews Vol. 33. 1988.

Financial considerations of public infrastructure are discussed including: U.S. role of economic growth in the demand for services; federal budget policies; and the ability of state and local government to finance infrastructure development.
GENERAL.

347. Steinnes, Donald N. **AN ANALYSIS OF INFRASTRUCTURE PROVISION AND LOCAL ECONOMIC DEVELOPMENT POLICY.** Journal of the Community Development Society; 21:33-53 no 1. 1990.

Uses a policy evaluation model for a sample of U.S. cities in the upper Midwest to establish the relationship between infrastructure and economic growth, 1962-82. Results for growth in manufacturing jobs are presented.
GENERAL.

348. Stiglitz, J. E.; Arnott, R. J. **SAFETY, USER FEES, AND PUBLIC INFRASTRUCTURE**. Evanston, IL: The Transportation Center, Northwestern University. 1988.

GENERAL.

349. Studholme, Edward D.; Findley, Dean P. **PRIVATIZATION OF PUBLIC FACILITIES: DOES IT MAKE ECONOMIC SENSE?** Privatization Review; 5:22-9. December 1990.

Addresses financing, construction, operation and maintenance costs, and risk and ancillary markets.
GENERAL.

350. Suarez-Villa, L.; Hasnath, SA. **THE EFFECT OF INFRASTRUCTURE ON INVENTION. INNOVATIVE CAPACITY AND THE DYNAMICS OF PUBLIC CONSTRUCTION INVESTMENT**. Technological Forecasting and Social Change. 4. 1993.

The association between public infrastructure investment and invention is explored in this study, analyzing expenditure and patenting trends and cycles over much of the 20th century. The analysis of the infrastructural investment and the innovative capacity age cycle dynamics reveals a remarkable association between educational infrastructure construction and both aggregate and corporate innovative capacity.
GENERAL.

351. Sussna, Stephen. **LAND USE REGULATION AND FINANCING TRANSPORTATION IMPROVEMENTS.** Transportation Quarterly; 44:389-403. July 1990.

Analyzes some recent cases that deal with the issue of traffic impact fees and other possible means of raising revenue on the city and county level.
GENERAL.

352. Swallow, Stephen K.; Opaluch, James J.; Weaver, Thomas F. **SITING NOXIOUS FACILITIES: AN APPROACH THAT INTEGRATES TECHNICAL, ECONOMIC, AND POLITICAL CONSIDERATIONS**. Land Economics; 68(3), pages 283-301. August 1992.

This paper develops an approach that integrates the technical, economic, and political concerns relevant to siting decisions, beginning with identification of alternative sites and extending through selection of the final site. The approach uses utility theory to structure crucial public input for use in a centralized process.
SOLID WASTE/HAZARDOUS WASTE.

353. Talley, Wayne K. **REGULATORY REFORM OF THE U.S. AND U.K. INTER CITY BUS INDUSTRIES**. The Age of Regulatory Reform. New York, NY: Oxford University Press, Clarendon Press. 1989.

MASS TRANSIT.

354. Taylor, Leon (Tulane University). **BUILDING INFRASTRUCTURE TO ACCOMMODATE GROWTH**. Eastern Economic Journal; 17(4), pages 473-81. October 1991.

Do jurisdictions spend too little on infrastructure? To answer the question, one must separate infrastructure built to accommodate growth from infrastructure built to compete for growth. Underspending is most likely for accommodative infrastructure. This paper finds that the accommodative spending path that maximizes utility is also the path leading to an equilibrium. Empirical data that suggest an equilibrium would cast doubt upon the underspending hypothesis.
GENERAL.

355. Thomas, E. **UMTA PRIVATE FINANCING FOR TRANSIT CONSTRUCTION: INFORMATION ON DEMONSTRATION GRANTS**. Washington, DC: U.S. Department of Transportation, Urban Mass Transit Administration. 1991.

This Private Financing for Transit Construction folder is a Demonstration Announcement for the innovative financing of transit projects. UMTA encourages public/private partnerships in the development of transit projects using little, or no, federal funds for capital expenditures. UMTA will fund demonstration studies that examine the institutional relationships that exist or must be created to develop and execute these projects which will include front-end studies and feasibility analyses necessary as part of the local/private decisionmaking process to undertake a project.
MASS TRANSIT.

356. Thompson, D. **MATCHING SUPPLY AND DEMAND IN THE LONGER TERM: INFRASTRUCTURE REGULATION AND AIRLINE COMPETITION**. Longer Term Issues In Transport. Brookfield, CT: Savebury/Aldershot. 1991.

AIR TRANSPORTATION.

357. Thompson, J. R. **MEETING VAST CHALLENGES IN ROADS, PORTS, AIRPORTS**. Knoxville, TN: Forum for Applied Research and Public Policy, Tennessee University, Knoxville Energy Environment Resources Center. 1990.

It has been estimated that the United States will need to spend from $50 billion to $150 billion annually to bring its transportation infrastructure into adequate condition within the next 20 years. The needs affect every region of the country and every sector of transportation infrastructure. To succeed in meeting these needs will require the combined commitment of all levels of government and the private sector.
GENERAL.

358. Thurmond, James. **ARGUMENT FOR INVESTING IN INFRASTRUCTURE**. Washington, DC: Public Management. June 1989.

GENERAL.

359. Tiemann, Mary E. **SAFE DRINKING WATER ACT: IMPLEMENTING THE 1986 AMENDMENTS**. Washington, DC: U.S. Congressional Research Service, The Library of Congress.

Discusses the status of EPA's implementation of the amendments and associated policy issues.
WATER SUPPLY.

360. Torkelson, Richard. **PAYING THE COST FOR ENVIRONMENTAL PROTECTION**. Privatization Review; 6:10-15. March 1991.

Financing issues affecting public-purpose environmental facilities are discussed.
GENERAL.

361. Transportation Research Board, National Research Council. **DATA FOR DECISIONS: REQUIREMENTS FOR NATIONAL TRANSPORTATION POLICY MAKING**. Washington, DC: 1992.

The U.S. Department of Transportation (DOT) requested that the Transportation Research Board (TRB) undertake a 15-month study of the availability and quality of national transportation data to support DOT's continuing strategic decision-making requirements. This report is the result of that study. Chapter 1 examines the role of data in national policy making. The key elements of a data support system are identified in Chapter 2. Chapter 3 focuses on how these requirements can be met by improving existing databases and supplying missing data; opportunities for public-private collaboration in data collection are considered, and applications of new technologies for reducing the cost and burden of data collection are explored. The institutional changes needed to develop a more effective and permanent data and analytic capability to support strategic decision making within the DOT are discussed in Chapter 4, and a new organization is recommended. The steps required to put such a capability in place are outlined in Chapter 5.
GENERAL.

362. Transportation Research Board, National Research Council. **HIGHWAY MAINTENANCE OPERATIONS AND RESEARCH**. 1990.

This report examines new methods of highway maintenance. Twenty-five case studies are presented showing different techniques to repair roads and bridge, under various environmental conditions.
HIGHWAYS.

363. Transportation Research Board, National Research Council. **INTERIM REPORT: IMPEDIMENTS TO LANDSIDE ACCESS TO U.S. GENERAL CARGO PORTS**. Washington, DC: U.S. Government Printing Office. 1991.

This report assesses the adequacy of landside access to U.S. general cargo ports. It reviews the current bottlenecks at U.S. ports and it identifies several options that would help balance the national interest with state and metropolitan area priorities.
WATER RESOURCES.

364. Transportation Research Board, National Research Council. **ISTEA AND INTERMODAL PLANNING: CONCEPT, PRACTICE, VISION**. Washington, DC: 1993.

The publication considers a number of issues concerned with U.S. intermodal transportation policies. These issues include: a review of the planning and funding of the U.S. transport system; the planning mechanisms developed in the Intermodal Surface Transportation Efficiency Act (ISTEA) concerned with intermodal transportation management; and the achievement of more economical and environmentally efficient transportation systems through the optimum use of various combined modes. An assessment is made of how such issues need to be integrated into a transportation planning process. Conclusions consider intermodal systems, their management and their potential for further development.
HIGHWAYS.

365. Transportation Research Board, National Research Council. **LANDSIDE ACCESS TO U.S. PORTS**. Washington, DC: National Academy Press. 1993.

U.S. seaports have become critical transfer points in the intermodal network that moves the nation's international cargo. The efficiency of this intermodal connection could be threatened, by increasing bottlenecks in the landside transportation system. This report identifies land

use, environmental, and institutional impediments to improved landside transportation and suggests ways to over come these impediments.
WATER RESOURCES.

366. Transportation Research Board, National Research Council. **MEASURING STATE TRANSPORTATION PROGRAM PERFORMANCE**. Washington, DC: 1993.

This report explains the findings and conclusions of a study undertaken to: 1) assess the current practice in comparative program/system evaluation; 2) explore the feasibility of making comparisons of the performance of state highway systems; 3) define the characteristics of methodologies used and proposed for use in making such comparisons; and 4) propose appropriate actions. An annotated bibliography of pertinent literature is provided in an appendix and is summarized in the report for highway, transportation, and nontransportation cases. A conceptual framework for program assessment is presented with more focus and description given to three major elements of an assessment methodology: performance measures, input variable, and external factors. The report concludes with a series of observations that provide direction to conducting any comparisons of state highway program/system performance.
HIGHWAYS.

367. Transportation Research Board, National Research Council. **PRIMER ON TRANSPORTATION, PRODUCTIVITY, AND ECONOMIC DEVELOPMENT**. Washington, DC: 1991.

The objective of the research reported here was to develop a primer for transportation executives and decision-makers that documents what is known about the relationship between transportation and the economy and provides guidance on the use of economic analysis to identify policies and investments with the potential to foster growth and productivity.
GENERAL.

368. Transportation Research Board, National Research Council. **PUBLIC-SECTOR AVIATION ISSUES: GRADUATE RESEARCH AWARD PAPERS**. Washington, DC: 1991.

AIR TRANSPORTATION.

369. The Universities Council on Water Resources. **WATER RESOURCES UPDATE: WATER RESOURCES INFRASTRUCTURE**. Carbondale, IL: 1991(Issue No. 86).

Several recent studies have highlighted the crisis in the U.S. infrastructure needs as an issue of major economic importance. Fiscal concerns, as well as institutional and organizational bureaucracy, have been raised. Drinking water distribution systems, wastewater treatment, irrigation, and water transportation are integral parts of the infrastructure. This volume presents an overview in five papers of federal strategies and options for national infrastructure renewal. The evaluations and management of water distribution systems are examined and implications explored for future research and practice.
WATER RESOURCES.

370. University of Colorado, Graduate School of Public Affairs. **HARD CHOICES: A REPORT ON THE INCREASING GAP BETWEEN AMERICA'S INFRASTRUCTURE NEEDS AND OUR ABILITY TO PAY FOR THEM**. Boulder, CO: University of Colorado. 1984.

The Graduate School of Public Affairs at the University of Colorado prepared an analysis of the infrastructure conditions of 23 states and developed an aggregate estimate of national infrastructure needs and available revenues through the end of the century.
GENERAL*

371. The Urban Institute. **GUIDES TO MANAGING URBAN CAPITAL SERIES, ESPECIALLY, GUIDE TO SELECTING MAINTENANCE STRATEGIES FOR CAPITAL FACILITIES,** Hatry, Harry P. And Steinthal, Bruce G., **AND GUIDE TO SETTING PRIORITIES FOR CAPITAL INVESTMENT,** Hatry, Harry P., Millar, Annie P., and Evans, James H., The Urban Institute Press. Washington, DC: 1984.

The first report on maintenance strategies provides a description of local government procedures for rating road and water projects, based on field work with ten local governments and three special districts. These procedures not only address the physical condition of the assets but also consider other programmatic and local government criteria. The second volume on setting priorities was based on field data from the ten communities, plus a random sample of 25 cities with a population between 125,000 and 500,000.

372. The Urban Institute. **THE NATION'S PUBLIC WORKS: REPORT ON MASS TRANSIT.** Washington, DC: National Council on Public Works. 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining mass transit in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's mass transit system.
MASS TRANSIT*

373. Urban Land Institute. **MYTHS AND FACTS ABOUT TRANSPORTATION AND GROWTH**. Washington, DC: 1989.

Because travel plays such an important role in daily living, virtually everyone has a perception of, and a solution for, the problem. Many of these perceptions, though based little on reality, have become entrenched, emerging as popular myths that even professionals find difficult to discredit. This booklet examines some of the most popular of these myths and offers facts in their stead in the hope that public debate can then be more sharply focused on the true problems and the most effective solutions available to communities.
GENERAL.

374. U.S. Advisory Commission on Intergovernmental Relations. **FEDERAL REGULATION OF STATE AND LOCAL GOVERNMENTS: REGULATORY FEDERALISM A DECADE LATER**. Washington, DC: 1992.

This report reviews regulatory federalism during the presidency of Ronald Reagan.
GENERAL.

375. U.S. Advisory Commission on Intergovernmental Relations. **HIGH PERFORMANCE PUBLIC WORKS: A NEW FEDERAL INFRASTRUCTURE INVESTMENT STRATEGY FOR AMERICA**. Washington, DC: U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. November 1993.

This report, prepared by ACIR as part of the Federal Infrastructure Strategy program, examines six key public works improvement topics: improving the quality of infrastructure

investments; applying benefit-cost analysis to investment options; improving the maintenance of infrastructure; making federal regulation of infrastructure more effective, efficient, and equitable; improving environmental decisionmaking for public works; and improving the financing of infrastructure.
GENERAL*

376. U.S. Advisory Commission On Intergovernmental Relations. **INTERGOVERNMENTAL DESIONMAKING FOR ENVIRONMENTAL PROTECTION AND PUBLIC WORKS.** Washington, DC: November 1992.

The aim of this paper is to find better ways to make intergovernmental decisions with respect to both environmental and infrastructure needs. Reasons for current difficulties in environmental and infrastructure decisionmaking are presented. The paper suggests ways to improve the decisionmaking process, including a new role for the National Environmental Policy Act and the Council on Environmental Quality.
GENERAL*

377. U.S. Advisory Commission on Intergovernmental Relations. **SOURCEBOOK OF WORKING DOCUMENTS TO ACCOMPANY - HIGH PERFORMANCE PUBLIC WORKS: A NEW FEDERAL INFRASTRUCTURE INVESTMENT STRATEGY FOR AMERICA.** Washington, DC: U.S. Army Corps of Engineers, Institute for Water Resources. 1994.

Companion document to the ACIR/IWR report: *High Performance Public Works: A New Federal Infrastructure Strategy for America.* Compiles those documents judged to be the most useful references in planning, designing, and executing infrastructure policies conveniently available to a wide range of public works professionals and policymakers.
GENERAL

378. U.S. Advisory Commission on Intergovernmental Relations. **TOWARD A FEDERAL INFRASTRUCTURE STRATEGY: ISSUES AND OPTIONS.** Washington, DC: 1992.

Federal investment, regulations, technology, financing, and management of infrastructure are issues presented in this report.
GENERAL*

379. U.S. Army Corps of Engineers. **A FEDERAL ACTION PLAN FOR ADDRESSING NEEDS TO SUSTAIN AND IMPROVE THE NATIONS INFRASTRUCTURE**. Washington, DC: 1991.

This report presents a proposed action plan to address infrastructure problems from the federal perspective and the overall national interest.
GENERAL.

380. U.S. Army Corps of Engineers. **NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT: THE REPORT TO U.S. CONGRESS**. Washington, DC: U.S. Army Corps of Engineers, Institute for Water Resources. September 1994.

This report is one of 17 reports produced under the National Study of Water Management During Drought with the objective of finding better ways to manage water during drought. The report includes the main technical summary of the innovative approaches that were developed and used during the National Drought Study, conducted under the authority of

Sections 707 and 729 of the Water Resources Development Act of 1986. The innovative approaches under the National Drought Study include improved computer modeling, new organizational and management approaches, and incentive approaches to water management.
WATER RESOURCES*

381. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **CHALLENGES AND OPPORTUNITIES FOR INNOVATION IN THE PUBLIC WORKS INFRASTRUCTURE - VOLUMES I AND II**. Alexandria, VA: June 1993.

The objective of this report, prepared by the U.S. Army Corps of Engineers Construction and Engineering Research Laboratory as part of the Federal Infrastructure Strategy Program, is to summarize the proceedings of the workshop "Public Works Infrastructure Innovation: Barriers, Opportunities, and Challenger," and provide recommendations on enhancing the transfer of innovative technology and management practices to improve the declining condition of the nation's public works infrastructure.
GENERAL*

382. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **A CONSOLIDATED PERFORMANCE REPORT ON THE NATION'S PUBLIC WORKS: AN UPDATE**. Alexandria, VA: Apogee Research, Inc. October 1994.

Presents a summary of the net capital stocks and representative performance measures within each of eight public works categories: highways, aviation, mass transit, water resources, water supply, wastewater treatment, and solid waste management. Represents an update of the performance information presented by the National Council on Public Works Improvement in 1986. Update was provided by Apogee Research, Inc. as part of the Corps Federal Infrastructure Strategy (FIS) program.
GENERAL

383. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **FEDERAL PUBLIC WORKS INFRASTRUCTURE R&D: A NEW PERSPECTIVE**. Alexandria, VA: Civil Engineering Research Foundation. July 1993.

The objective of this report is to provide the Federal Infrastructure Strategy with a "snapshot" in time of federal resources committed to infrastructure research and development.
GENERAL.

384. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **THE FEDERAL ROLE IN FUNDING STATE AND LOCAL INFRASTRUCTURE: TWO REPORTS ON PUBLIC WORKS FINANCING**. Alexandria, VA: Apogee Research, Inc. and The Urban Institute. August 1993

Presents the results of two inquiries into the federal role in state and local infrastructure finance as an element of the Corps Federal Infrastructure Strategy (FIS) program. Report I, entitled *Effects of Federal Tax Policy on Infrastructure Investment*, examines the volume of tax-exempt bonds issued over the period 1979-1989 in order to assess the impact that the 1986 Tax Reform Act had on the ability of state and local governments to finance public works projects. Also reviews the trend of infrastructure costs to verify whether the Act has indeed resulted in more expensive projects. Report II by The Urban Institute, *State Programs for Community Infrastructure: Innovations in Financing Methods and Program Operations*, examines innovative public works programs in nine states.

385. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **FRAMING THE DIALOGUE: STRATEGIES, ISSUES AND OPPORTUNITIES.** Alexandria, VA: May 1993.

This report describes the progress to date of a new Federal interagency initiative to develop a Federal Infrastructure Strategy (FIS). It documents the activities that took place in 1991 and 1992 during the first half of the FIS program, including the results of the intergovernmental coordination. Infrastructure issues essential to the development of a federal strategy are outlined, and opportunities for further interagency cooperation discussed.
GENERAL*

386. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: AN INTERIM REPORT VOL. I-III**. Alexandria, VA: February 1994.

This study was conducted as an element of the Federal Infrastructure Strategy (FIS) Program, a collaborative interagency study effort facilitated by the U.S. Army Corps of Engineers Institute for Water Resources and designed to develop and stimulate implementation of effective national policies for managing and maintaining the nation's public works. This interim report follows up the July 1993 publication, *Infrastructure in the 21st Century Economy: a Review of the Issues and Outline of a Study of the Impacts of Federal Infrastructure Investments*. This interim report consists of three volumes. Volume 1 contains an overview of the research effort to date, comprised of three related research tracks to capture the different dimensions of infrastructure's effects on the economy. Volume 2 contains technical papers which develop and document the research approaches which form this study. Volume 3 contains the details of a database on public capital collected and developed by Apogee Research, Inc.
GENERAL*

387. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **INFRASTRUCTURE IN THE 21ST CENTURY ECONOMY: A REVIEW OF THE ISSUES AND OUTLINE OF A STUDY OF IMPACTS OF FEDERAL INFRASTRUCTURE INVESTMENTS**. Alexandria, VA: July 1993.

The U.S. Army Corps of Engineers, through its Institute for Water Resources, has commenced an ongoing interagency study to assess the relationship of Federal infrastructure, specifically investments in water, waste management, and transportation, to the nation's productivity, economic health, and quality of life. This report describes the effort and the process by which the study's workplan was derived.
GENERAL*

388. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources, **ISSUES IN DEFERRED MAINTENANCE**. Alexandria, VA: The Urban Institute. November 1994.

This report, conducted as an element of the Federal Infrastructure Strategy was prepared by Harry P. Hatry and E. Blaine Liner of The Urban Institute. It presents the findings of an examination of public agency practices (federal, state, and local) in analyzing and reporting deferred maintenance on their facilities, such as roads, bridges, buildings, water, or sewer systems. The report examines existing literature on the subject. Several past and present

state, federal, and local agency efforts to improve deferred maintenance reporting are detailed (including field visits to New York City and San Jose, California). Suggestions are presented for governments and agencies, as well as for future research needs.
GENERAL*

389. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **LOCAL PUBLIC FINANCE IMPACT MODEL: USER'S GUIDE AND TECHNICAL DOCUMENTATION**. Alexandria, VA: June 1994.

Documents a Federal Infrastructure Strategy (FIS) effort by Dr. Dennis Robinson on the development and use of a model to estimate the impacts that the construction and operation of a public facility would have on local public revenue and expenditures. The resulting Local Public Finance Impact (LPFI) model is a working prototype of a system for public managers to predict potential changes in local revenues and expenditures caused by infrastructure investments.
GENERAL.

390. U.S. Army Corps of Engineers, Water Resources Support Center, Institute of Water Resources. **NATIONAL OPERATION AND MAINTENANCE PROGRAM PLAN OF IMPROVEMENT**. Washington, DC: 1993.

The objective of the program was to examine policies, procedure and structure of the Corps' existing projects, to ensure that justified levels of service in the least cost manner are provided.
GENERAL.

391. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **NONDESTRUCTIVE TESTING, EVALUATION, AND REHABILITATION FOR ROADWAY PAVEMENT: WARREN COUNTY, MISSISSIPPI, CINCINNATI, OHIO, AND BERKELEY, CALIFORNIA**. Alexandria, VA: U.S. Army Engineer Waterways Experiment Station. July 1994.

Documents the results of one of the technology transfer initiatives undertaken as part of the Federal Infrastructure Strategy (FIS) program: the demonstration of nondestructive pavement evaluation technology (NDT) to cooperating federal and nonfederal partners. Three demonstrations were undertaken by the U.S. Army Engineer Waterways Experiment Station, each utilizing Falling Weight Deflectometer (FWD) technology, a commercially available nondestructive procedure for determining the structural adequacy of a pavement system.
GENERAL

392. U.S. Army Corps of Engineers, Institute for Water Resources. **PUBLIC WORKS MANAGEMENT PRACTICES -- VOLUME I: A PUBLIC WORKS PERSPECTIVE OF THE ROADBLOCKS AND OPPORTUNITIES TO IMPROVE PERFORMANCE, VOLUME II: LOCAL GOVERNMENT PUBLIC WORKS AGENCIES: THE EFFECTS OF FEDERAL MANDATES ON THEIR ACTIVITIES AND IMPROVING THEIR PERFORMANCE**: Alexandria, VA: American Public Works Association (APWA); National Academy for Public Administration (NAPA). August 1994.

This report examines constraints and obstacles that limit the effectiveness of public works activities. APWA and NAPA conducted twelve site visits to state, county, city, and town governments as part of the federal infrastructure strategy program facilitated by the U.S.

Army Corps of Engineers. The first objective of these visits was to evaluate the progress of public works departments in adopting improved management practices. The second objective was to obtain from public works professionals: perceived impediments that hinder public works agencies from complying with the APWA management practices, and possible strategies which would improve the performance and operating efficiencies of public works agencies. The public works functions covered include: municipal engineering, design, construction, buildings, grounds, equipment, potable water, solid waste collection, solid waste processing and disposal, streets, snow and ice control, storm water and wastewater.
GENERAL*

393. U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. **VISION 21: A STRATEGIC ASSESSMENT OF THE NATION'S WATER RESOURCES NEEDS**. Fort Belvoir, VA: March 1990.

This draft report by the U.S. Army Corps of Engineers surveys the current trends and policy issues likely to affect water resources planning, management, and development until the end of this century. Water resources as related to economic productivity, intergovernmental relations, environmental management are examined. The report also discusses water uses, water sources, and the impact of climate change. The report concludes with an assessment of water resource trends and policy implications.
WATER RESOURCES.

394. U.S. Bureau of Reclamation. **HYDROPOWER 2002: RECLAMATION'S ENERGY INITIATIVE**. Washington, DC: xxi+93p: 1991.

Achievements of the Bureau of Reclamation in the further development of hydroelectric energy and strategies for meeting future energy needs in an environmentally acceptable manner through improvements in hydropower projects and effective management.
WATER RESOURCES.

395. U.S. Congress, Committee on Public Works and Transportation, Subcommittee on Surface Transportation. **THE STATUS OF THE NATION'S HIGHWAYS, BRIDGES, AND TRANSIT: CONDITIONS AND PERFORMANCE: REPORT OF THE SECRETARY OF TRANSPORTATION**. Pursuant to Section 307(h) of Title 23 and Section 308(e) of Title 49, United States Code; viii+197p. Washington, DC: 1993.

Highway system and usage characteristics, finance, and projected investment requirements for the years 1992-2011.
HIGHWAYS/MASS TRANSIT*

396. U.S. Congress Joint Economic Committee. **PUBLIC INVESTMENT IN HUMAN AND PHYSICAL INFRASTRUCTURE: HEARING, JULY 19, 1989.** 101st Cong., 1st sess. S Hearing 101-434; iii+200p. 1990.

Includes recommendations for public welfare and education.
GENERAL.

397. U.S. Congress, Joint Economic Committee, Subcommittee On Technology and National Security (Congressional Research Service). **DEMOGRAPHIC CHANGE AND THE ECONOMY OF THE NINETIES: REPORT.** 102d Cong., 1st sess.; xii+167p. 1991.

Implications of population changes, 1970-2010, for selected economic sectors. Effect on the labor force, manufacturing, homebuilding and housing markets, nonresidential construction, transportation infrastructure, and water supply and wastewater treatment.
GENERAL.

398. U.S. Congress, Subcommittee on Transportation Appropriations. **ECONOMIC STIMULUS PROPOSALS AND INFRASTRUCTURE INVESTMENT, SPECIAL HEARINGS.** Washington, DC: 1993.

Hearings before the Subcommittee on Transportation Appropriations to examine the economic benefits of increased federal spending on transportation infrastructure and related issues. Includes brief consideration of Administration economic stimulus proposal, focusing on provisions providing for increased funding of transportation infrastructure projects.
GENERAL.

399. U.S. Congressional Budget Office. **AN ANALYSIS OF THE REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE.** Washington, DC: 1994.

This Congressional Budget Office report analyzes the report of the Commission to Promote Investment in America's Infrastructure. This report reviews how the commission's recommendations could affect the allocation of society's resources and examined alternative ways to organize the National Infrastructure Corporation (NIC) and the Infrastructure Insurance Company.
GENERAL*

400. U.S. Congressional Budget Office. **THE FEDERAL BUDGET FOR PUBLIC WORKS INFRASTRUCTURE**. Washington, DC: July 1985.

Current federal policies for infrastructure spending are surveyed. Options for change are examined, including proposals contained in the FY86 budget. Emphasis is on seven components of public works infrastructure: highways, aviation, mass transit, wastewater treatment, water resources such as ports and waterways, water supply, and railroads.
GENERAL*

401. U.S. Congressional Budget Office. **HOW FEDERAL SPENDING FOR INFRASTRUCTURE AND OTHER PUBLIC INVESTMENTS AFFECTS THE ECONOMY**. Washington, DC: July 1991.

This report examines the effect on the economy of three broad classes of federal investment spending: physical infrastructure, including programs for transportation and environmental facilities; human capital, including programs that increase the skills and productive knowledge that people bring to their jobs, and intangible capital, such as research and development (R&D). Within each of these categories, the study examines trends in spending, discusses the rationales for that spending, and reviews evidence on the contribution of public investment to economic performance.
GENERAL*

402. U.S. Congressional Budget Office. **NEW DIRECTIONS FOR THE NATION'S PUBLIC WORKS**. Washington, DC: 1988.

Assesses the federal programs for highways, mass transit, aviation, waterways, and waste-water treatment. Includes discussion of policies to improve the effectiveness of these programs.
GENERAL*

403. U.S. Congressional Budget Office. **PAYING FOR HIGHWAYS, AIRWAYS, AND WATERWAYS: HOW CAN USERS BE CHARGED?** Washington, DC: 1992.

The combination of budgetary pressures at all levels of government and increasing demands on transportation facilities has generated increased interest in directly charging users of highways, airways, and waterways. In response to a request from the Senate Committee on the Budget, this study examines the advantages and disadvantages of alternative user fee structures, including existing taxes.
GENERAL.

404. U.S. Congressional Budget Office. **POLICIES FOR THE DEREGULATED AIRLINE INDUSTRY**. Washington, DC: 1988.

This Congressional Budget Office Report provides an overview of airline deregulation, the effects of deregulation on industry, and a future outlook for the deregulated environment. The problems of congestion associated with the aviation system reaching capacity are reviewed, and options for increasing competition and reducing congestion are discussed. The report suggests that expanding the capacity of the aviation system would be costly and time-consuming, and that more efficient management of the existing capacity might be a more effective solution.
AIR TRANSPORTATION.

405. U.S. Congressional Budget Office. **PUBLIC WORKS INFRASTRUCTURE: POLICY CONSIDERATIONS FOR THE 1980S**. Washington DC: 1983.

This study assesses the needs of seven infrastructure systems and the costs of meeting those needs.
GENERAL*

406. U.S. Congressional Budget Office. **THE STATUS OF THE AIRPORT AND AIRWAY TRUST FUND**. Washington, DC: 1988.

This Congressional Budget Office report examines the status of the Airport and Airway Trust Fund (AATF). The AATF has accumulated a substantial surplus since it was established in 1971. This study examines the history of the trust fund income and spending; the degree to which the public sector has subsidized private-sector use of the aviation system; and alternative interpretations of trust fund balances on capital-only and full user-pay approaches to trust fund accounting.
AIR TRANSPORTATION.

407. U.S. Congressional Budget Office (CBO). **UPDATING TRENDS IN PUBLIC INFRASTRUCTURE SPENDING AND ANALYZING THE PRESIDENT'S PROPOSALS FOR INFRASTRUCTURE SPENDING FROM 1994 TO 1998**. Washington, DC: August 1993.

This paper highlights trends in spending for infrastructure by all levels of government from 1956 to the 1990s. It also analyzes the President's proposals for federal infrastructure spending for 1994 through 1998 and compares them with the Congressional Budget Office's (CBO's) baseline projections. The CBO presents figures on total state and local government spending (both total spending and total spending net of federal grants and loans) and total public spending (total federal spending plus state and local spending net of federal grants and loans) through 1990. Additionally, historical analysis of federal spending on infrastructure is presented for 1991 and 1992.
GENERAL.

408. U.S. Congressional Office of Technology Assessment. **ADVANCED VEHICLE/HIGHWAY SYSTEMS AND URBAN TRAFFIC PROBLEMS**. Washington, DC: September 1989(PB94-134731).

HIGHWAYS.

409. U.S. Congressional Office of Technology Assessment. **DELIVERING THE GOODS: PUBLIC WORKS TECHNOLOGIES, MANAGEMENT, AND FINANCING**. Washington, DC: 1991.

Recommendations for financing, improving, and maintaining the nation's critical infrastructure, such as bridges, interstate highways, sewage pipes, and water systems.
GENERAL*

410. U.S. Congressional Office of Technology Assessment. **FACING AMERICA'S TRASH: WHAT NEXT FOR MUNICIPAL SOLID WASTE?** 1989.

Presents options for a national policy based on the dual strategies of MSW prevention and better management. Also includes options to address increased interstate shipments of waste and unfinished federal guidelines for landfills and incinerators.
SOLID WASTE.

411. U.S. Congressional Office of Technology Assessment. **PARTNERSHIPS UNDER PRESSURE: MANAGING COMMERCIAL LOW LEVEL RADIOACTIVE WASTE**. 1989.OTA-O-426

Overview of progress made by nine compacts and remaining unaffiliated states in developing disposal facilities mandated by the Low-Level Radioactive Waste Policy Amendments Act of 1985.
HAZARDOUS WASTE.

412. U.S. Congressional Office of Technology Assessment. **REBUILDING THE FOUNDATIONS: A SPECIAL REPORT ON STATE AND LOCAL PUBLIC WORKS FINANCING AND MANAGEMENT**. Washington, DC: March 1990.

To assess the progress of state and local governments in coping with infrastructure problems and to outline the framework for congressional decision-making, the Office of Technology Assessment (OTA) has prepared this special report documenting recent trends in public works financing and management. The report presents snapshots of current approaches and identifies successful programs and issues that have yet to be resolved.
GENERAL*

413. U.S. Department of Agriculture, Farmers Home Administration. **FINANCING SMALL COMMUNITY INFRASTRUCTURE--THE FARMERS HOME ADMINISTRATION COMMUNITY DISCOUNT PURCHASE PROGRAM**. 1989.

This report begins by providing background on the Farmers Home Administration community program discount purchase program and describes the general provisions and eligibility for participation. A discussion of the advantages and disadvantages of participating in this program is provided.
GENERAL.

414. U.S. Department of Agriculture, Office of Transportation. **RURAL ROADS AND BRIDGES--FEDERAL AND STATE FINANCING**. 1989.

This report studies the condition of rural bridges and roads and how to finance their construction/repair.
HIGHWAYS*

415. U.S. Department of Commerce, Office of Economic Affairs. **EFFECTS OF STRUCTURAL CHANGE IN THE U.S. ECONOMY ON THE USE OF PUBLIC WORKS SERVICES**. Washington, DC: For National Council on Public Works Improvement. 1987. Project No. PW 7-625.

Part I examines how structural change caused by international trade and technological developments, will affect the nation's requirements for public works services and how the requirements will differ among different regions. Part II provides the National Council on Public Works Improvement with a methodology and a new database to assist it with planning public works improvements that anticipated economic development.
GENERAL.

416. U.S. Department of Transportation. **FINANCING THE FUTURE: REPORT OF THE COMMISSION TO PROMOTE INVESTMENT IN AMERICA'S INFRASTRUCTURE, PUBLIC WORKS FINANCING BY PENSION PLANS, AND OTHER FUNDING ISSUES, FINDINGS AND RECOMMENDATIONS**. Washington, DC: 1993.

Report examines public works financing methods, including a proposal to issue infrastructure securities attractive to pension fund and other institutional investors. Report is the final publication of the Commission To Promote Investment in America's Infrastructure, established under the Intermodal Surface Transportation Efficiency Act of 1991.
GENERAL*

417. U.S. Department of Transportation. **HIGHWAY BRIDGE REPLACEMENT AND REHABILITATION PROGRAM 1991 TENTH REPORT OF THE SECRETARY OF TRANSPORTATION TO THE UNITED STATES CONGRESS**. Washington DC: 1991.

This tenth report on the Highway Bridge Replacement and Rehabilitation Program(HBRRP) describes in detail the progress made in administering the HBRRP through June 30,1990 as well as the status of bridge inventories for both Federal-aid and off-system highways. It also summarizes the status of bridge management system.
HIGHWAYS.

418. U.S. Department of Transportation. **MOVING AHEAD: 1991 SURFACE TRANSPORTATION LEGISLATION**. Washington, DC: U.S. Government Printing Office. 1991.

This OTA report was requested by Congress to help identify changes and set new priorities for federal surface transportation assistance programs. Moving Ahead provides four illustrative, generic models with program components that can be mixed and matched. Other items discussed in this report include safety, research, and development agendas, and other motor carrier issues, with special attention to heavy trucks with multiple trailers.
GENERAL*

419. U.S. Department of Transportation. **MOVING AMERICA: NEW DIRECTIONS, NEW OPPORTUNITIES. VOLUME 1: BUILDING THE NATIONAL TRANSPORTATION POLICY**. Washington, DC: 1989.

"This report assesses the conditions and trends in the markets served by transportation, identifies the external factors that affect transportation, and sets out key issues for discussion and negotiation," stated Samuel K. Skinner, Secretary of Transportation. The report also highlights the nation's growth trends and current investment priorities in transportation.
GENERAL*

420. U.S. Department of Transportation. **NATIONAL TRANSPORTATION STRATEGIC PLANNING STUDY**. Washington, DC: 1990.

This is a companion volume to *Moving America: New Directions, New Opportunities. Volume 1: Building the National Transportation Policy*. Provided is an overview of the Nation's transportation system which identifies future investments required to maintain and develop its infrastructure. It is organized around a framework in which transportation is viewed as an integral part of our socioeconomic system.
GENERAL.

421. U.S. Department of Transportation, Bureau of Transportation Statistics. **DIRECTORY OF TRANSPORTATION DATA SOURCES**. Washington, DC: 1993(DOT-VNTSC-BTS-93-2).

HIGHWAYS.

422. U.S. Department of Transportation, Federal Aviation Administration. **1993 AVIATION SYSTEM CAPACITY PLAN**. Washington, DC: 1993(DOT/FAA/ASC-93-1).

This report quantifies the magnitude of delay for the top 100 airports in the U.S. It is a comprehensive review of the Federal Aviation Administration's (FAA) program to improve capacity of the National Air Transportation System.
AIR TRANSPORTATION*

423. U.S. Department of Transportation, Federal Aviation Administration. **AVIATION SYSTEM CAPITAL INVESTMENT PLAN**. Washington, DC: U.S. Government Printing Office. 1991.

The second annual Aviation Systems Capital Investment Plan describes the Facilities and Equipment programs that the FAA will pursue in addressing key concerns of the National

Airspace System such as safety, efficiency, traffic demands, equipment and facilities, and airspace use.
AIR TRANSPORTATION.

424. U.S. Department of Transportation, Federal Aviation Administration. **NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS(NPIAS): 1990-1999**. Washington, DC: U.S. Government Printing Office. 1991.

This report estimates the type and cost of development that will be required at a large majority of U.S. airports from 1990-1999. The developments recommendations are drawn primarily from plans prepared by state and local agencies responsible for airport planning and development; only development eligible for federal-aid under the Airport Improvement Program are included.
AIR TRANSPORTATION.

425. U.S. Department of Transportation, Federal Aviation Administration. **REPORT TO CONGRESS: LONG TERM AVAILABILITY OF ADEQUATE AIRPORT SYSTEM CAPACITY**. Washington, DC: 1992(DOT/FAA/PP-92-4).

The report describes the probable extent of airport congestion in the future, given current trends. Specific proposals for airport development seldom extend more than ten years into the future, so the report relied heavily on the judgement of experts from various segments of the air transportation industry.
AIR TRANSPORTATION*

426. U.S. Department of Transportation, Federal Highway Administration. **THE 1992 STATUS OF THE NATION'S HIGHWAYS AND BRIDGES: CONDITIONS, PERFORMANCE, AND CAPITAL INVESTMENT REQUIREMENTS**. Washington, DC: 1992.

This report is presented in four chapters. Chapter 1 describes recent trends in highway travel and highway system mileage. Chapter 2 outlines sources of highway revenue and recent expenditure patterns for Federal, State, and local governments. Chapter 3 describes current conditions and performance for highways and bridges. It also discusses selected trends. Chapter 4 projects future highway travel demand and estimates capital investment requirements.
HIGHWAYS.

427. U.S. Department of Transportation, Federal Highway Administration. **ASSESSING THE RELATIONSHIP BETWEEN TRANSPORTATION INFRASTRUCTURE AND PRODUCTIVITY: SUMMARY OF CURRENT RESEARCH: PART OF A HIGHWAYS AND ECONOMIC PRODUCTIVITY AGENDA**. Washington, DC: August 1992.

The paper attempts to present a broad review of the literature, a summary of the results of recent research studies, the strengths and weaknesses of the research, and new estimates concerning the debate over the relationship between productivity and public capital and highways. Overall, national production function estimates for the magnitude of the relationship between highway investment and economic productivity are unrealistically large, but they signify the existence of this relationship.
HIGHWAYS.

428. U.S. Department of Transportation, Federal Highway Administration. **GUIDANCE FOR STATE IMPLEMENTATION OF ISTEA TOLL PROVISIONS IN CREATING PUBLIC-PRIVATE PARTNERSHIPS**. Washington, DC: 1993(FHWA-PL-93-015).

This report is intended to serve as a guide for states seeking to make legislative changes to create a more hospitable environment for public-private toll partnerships.
HIGHWAYS*

429. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: EXAMINING CONGESTION PRICING IMPLEMENTATION ISSUES.** Washington, DC: 1992. Number 6.

This report summarizes the results of a symposium on congestion pricing implementation issues sponsored by the Federal Highway Administration and the Federal Transit Administration.
HIGHWAYS/MASS TRANSIT.

430. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: TRANSPORTATION AND AIR QUALITY**. Washington, DC: August 1992. Number 5(FHWA-PL-92-029).

This report summarizes a Federal Highway Administration (FHWA) seminar on key issues in air quality and transportation in 1991 - supplemented by findings that emerged during the year after the seminar. The report discusses developments in methods for reducing mobile source emissions, including technological innovations, land use measures, congestion pricing and transportation user fees, and other "Transportation Control Measures."
GENERAL.

431. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: AN EXAMINATION OF TRANSPORTATION INDUSTRY PRODUCTIVITY MEASURES**. Washington, DC: 1993. Number 8.

This document summarizes the proceedings of the Highway-Related Transportation Industry Productivity Measures Symposium on November 19 and 20, 1992, in Arlington, Virginia. The symposium brought together approximately 80 participants to address problems with the derivation of currently available statistics, including the underlying methodology, and to identify additional research necessary to provide more representative measures of the transportation sector's economic performance.
HIGHWAYS.

432. U.S. Department of Transportation, Federal Highway Administration. **SEARCHING FOR SOLUTIONS: BOND FINANCING AND TRANSPORTATION INFRASTRUCTURE: EXPLORING CONCEPTS AND ROLES**. Washington, DC: 1994. Number 9.

HIGHWAYS/MASS TRANSIT.

433. U.S. Department of Transportation, Federal Transit Administration. **INTRODUCTION TO PUBLIC FINANCE AND PUBLIC TRANSIT**. Washington, DC: Office of Technical Assistance and Safety. 1993.

This report provides a comprehensive description of the elements of public finance, particularly as they relate to public transit issues.
MASS TRANSIT.

434. U.S. Department of Transportation, Federal Transit Administration. **REPORT ON FUNDING LEVELS AND ALLOCATIONS OF FUNDS: REPORT OF THE SECRETARY OF TRANSPORTATION TO THE UNITED STATES CONGRESS**. Washington, DC: 1993.

HIGHWAYS/MASS TRANSIT.

435. U.S. Department of Transportation, Federal Transit Administration. **TURNKEY PROCUREMENT: OPPORTUNITIES AND ISSUES**. Washington, DC: 1992(FTA-MA-08-7001-92-1).

MASS TRANSIT.

436. U.S. Department of Transportation, Office of the Secretary of Transportation. **FEDERAL TRANSPORTATION FINANCIAL STATISTICS FISCAL YEARS 1983-1993**. Washington, DC: (DOT-P-36-94-1).

This report presents time series on federal government transportation-related outlays and collections for fiscal years 1983 through 1993. The figures are "aggregative" in the sense that they are nationwide; i.e., there are no state or lower level geographical breakdowns. However, the data are detailed down to the program level.
GENERAL.

437. U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center. **COMMUTER-INTERCITY RAIL IMPROVEMENT STUDY (BOSTON-NEW YORK)**. Washington, DC/Cambridge, MA: U.S. Department of Transportation, Federal Transit Administration. 1992.

This study documents potential system improvements to benefit commuter and intercity rail passenger service in the Boston-New York corridor.
MASS TRANSIT.

438. U.S. Department of Transportation, Urban Mass Transportation Administration. **PUBLIC TRANSPORTATION IN THE UNITED STATES: PERFORMANCE AND CONDITION REPORT TO CONGRESS**. Washington, DC: February 1991.

The report examines the performance and condition of mass transportation in the United States in relationship to the changing market for urban and suburban transportation. The role urban mass transportation is able to play is determined in large part by the cost and convenience of auto use in congested urban areas. An uncertain energy future and increasing atmospheric pollution will continue to spur interest in transit and related forms of high occupancy mobility to support economic growth.
MASS TRANSIT.

439. U.S. Environmental Protection Agency. **AN ANALYSIS OF STATE SUPERFUND PROGRAMS: 50 STATE STUDY**. Washington, DC: vi+216p: 1989.

This report emphasizes the cleanup of hazardous waste sites. An overview of activities and capabilities, statutes, program organization, funding, enforcement, policies and criteria, and public participation is provided.
HAZARDOUS WASTE.

440. U.S. Environmental Protection Agency. **FOCUSING ON THE GARBAGE CRISIS**. EPA Journal. 15:10-52. March 1989.

Recycling, landfills and incinerators, source reduction, and other aspects of solid waste control are discussed. Various viewpoints and local solutions to the garbage problem are presented.
SOLID WASTE.

441. U.S. Environmental Protection Agency. **PAYING FOR PROGRESS: PERSPECTIVES ON FINANCING ENVIRONMENTAL PROTECTION**. Washington, DC: 1990.

Paying for environmental programs presents one of the major challenges for the 1990s. This report covers: the changing roles of the federal, state, and local government; creative approaches to environmental funding; and overcoming barriers and introducing incentives.
GENERAL*

442. U.S. Environmental Protection Agency. **REPORT TO CONGRESS: SOLID WASTE DISPOSAL IN THE UNITED STATES: VOLUMES 1 AND 2.** Washington, DC: U.S. Environmental Protection Agency. October 1988.

Volume 1 presents conclusions and recommendations of a Subtitle D study to evaluate the adequacy of the program. Objectives addressed include disposal of nonhazardous solid waste, which includes municipal solid waste, oil and gas waste, and industrial waste, at landfills, waste piles, land application units, and surface impoundments. Volume 2 contains results of data collection efforts for Volume 1 and presents study methodology and data collection results for Subtitle D wastes, Subtitle D facilities, and Subtitle D state programs.
SOLID WASTE.

443. U.S. Environmental Protection Agency, Center for Environmental Research Information. **HANDBOOK: SEWER SYSTEM INFRASTRUCTURE ANALYSIS AND REHABILITATION**. Cincinnati, OH: October 1991.

The Handbook provides guidance on the evaluation and rehabilitation of existing sewers. It presents information on typical problems, procedures and methods for rehabilitation, case study information, budgetary costs, advantages and disadvantages of rehabilitation techniques, and application of these techniques and materials/equipment used in rehabilitation.
WASTEWATER TREATMENT.

444. U.S. Environmental Protection Agency, Office of Administration and Resource Management. **PUBLIC PRIVATE PARTNERSHIPS FOR ENVIRONMENTAL FACILITIES: A SELF-HELP GUIDE FOR LOCAL GOVERNMENTS**. May 1990.

This self-help guide for local governments was written by the U.S. Environmental Protection Agency to introduce local officials to the concept of public-private partnerships for environmental facilities, their benefits, and the steps that a community must take to enter into partnerships with the private sector. The report includes the following sections: public-private

partnerships: what and why; building a public-private partnership: an action checklist; and financing, procurement, and the service agreement.
GENERAL*

445. U.S. Environmental Protection Agency, Office of Administration and Resources Management. **A PRELIMINARY ANALYSIS OF THE PUBLIC COSTS OF ENVIRONMENTAL PROTECTION: 1981-2000**. Washington, DC: 1990.

This report provides an overview of environmental expenditures from 1981 to 2000, both to maintain current levels of environmental quality and to meet standards associated with new regulations.
GENERAL.

446. U.S. Environmental Protection Agency, Office of Administration and Resources Management. **ALTERNATIVE FINANCING MECHANISMS FOR ENVIRONMENTAL PROGRAMS: STATE CAPACITY TASK FORCE: THE ALTERNATIVE FINANCING MECHANISMS TEAM REPORT**. Washington, DC: 1992.

The report outlines the financing challenges of funding environmental programs and provides a range of alternative financing mechanisms at both the state and local level.
GENERAL.

447. U.S. Environmental Protection Agency, Office of Administration and Resources Management. **PUBLIC PRIVATE PARTNERSHIP CASE STUDIES: PROFILES OF SUCCESS IN PROVIDING ENVIRONMENTAL SERVICES.** Washington, DC: vi+118p. 1989.

Components of successful partnerships in the areas of solid waste management, wastewater treatment, and drinking water are provided based upon the experience of 23 U.S. communities.
GENERAL.

448. U.S. Environmental Protection Agency, Office of Administration and Resources Management. **PUBLIC-PRIVATE PARTNERSHIPS (P3) STRATEGY**. Washington, DC: 1989.

The purpose of this document is to give an overview of EPA's Public-Private Partnerships initiative. It identifies the objectives, activities, products, and time frames to implement this initiative.
GENERAL.

449. U.S. Environmental Protection Agency, Office of Solid Waste. **ADDENDUM TO THE REGULATORY IMPACT ANALYSIS FOR THE FINAL CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS**. Washington, DC: August 1991.

Represents EPA's best efforts to quantify costs, economic impacts, and benefits of regulatory options relating to Subtitle D criteria for municipal solid waste landfills.
SOLID WASTE.

450. U.S. Environmental Protection Agency, Office of Solid Waste. **DECISION-MAKERS GUIDE TO SOLID WASTE MANAGEMENT**. Washington, DC: November 1989.

Presents problems and possible solutions for waste management issues to be addressed by policy makers. Introduces concept of integrated waste management by providing an overview of major municipal waste management while also highlighting program options and listing criteria for evaluating alternatives.
SOLID WASTE.

451. U.S. Environmental Protection Agency, Office of Solid Waste. **SOLID WASTE DILEMMA: AN AGENDA FOR ACTION (BACKGROUND DOCUMENT, APPENDICES, AND FINAL REPORT)**. Washington, DC: August 15, 1988.

The background document describes municipal solid waste and presents a strategy to improve management of wastes. The document also presents the analysis behind recommended actions in a summary fashion. Compiles options of potential research, development, and demonstration activities to provide data for solutions. The appendices supplement the background document by summarizing various components of the municipal solid waste stream.
SOLID WASTE.

452. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **COMMERCIAL TREATMENT/RECOVERY DATA SET**. Washington, DC: May 1990.

Outlines the commercial treatment/recovery capacity database. Contains data sets on incineration and reuse of fuel, as well as other treatment systems input into the database. Data are derived from the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities.
HAZARDOUS WASTE.

453. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **NATIONAL SURVEY OF HAZARDOUS WASTE GENERATORS, AND TREATMENT, STORAGE, DISPOSAL, AND RECYCLING FACILITIES IN 1986: HAZARDOUS WASTE GENERATION AND MANAGEMENT**. Washington, DC: October 15, 1991.

Presents findings of two extensive surveys conducted by mail during a 3-year period to obtain detailed information concerning hazardous waste generation and management practices.
HAZARDOUS WASTE*

454. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SUMMARY REPORT OF CAPACITY AT COMMERCIAL FACILITIES, VIOLS 1-2**. Washington, DC: January 31, 1989.

Provides capacity data on commercial hazardous waste management facilities in all states as derived from EPA's Treatment, Disposal, and Recycling Facilities Survey (conducted in 1987.) Covers commercial system capacity, captive system capacity, and onsite system capacity.
HAZARDOUS WASTE.

455. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **CHARACTERIZATION OF MUNICIPAL SOLID WASTE IN THE UNITED STATES: 1990 UPDATE**. 103p+v.p. 1990.

Provides solid waste estimates by weight, volume, and composition and includes projections of generation and management for the years 1995-2010.
SOLID WASTE.

456. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **THE NATION'S HAZARDOUS WASTE MANAGEMENT PROGRAM AT A CROSSROADS: THE RCRA IMPLEMENTATION STUDY**. Washington, DC: 1990.

Discusses the Resource Conservation and Recovery Act, its progress since its enactment in 1976, and key issues for the 1990s.
HAZARDOUS WASTE.

457. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SITES FOR OUR SOLID WASTE: A GUIDEBOOK FOR EFFECTIVE PUBLIC INVOLVEMENT**. Washington, DC: vi+110p: 1990.

Recommendations for appropriate handling of the public risk vs. public benefit dilemma.
SOLID WASTE.

458. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **SUMMARY REPORT OF CAPACITY AT LIMITED COMMERCIAL AND COMPANY CAPTIVE FACILITIES: VIOLS 1-2**. Washington, DC: February 15, 1989.

Provides capacity data on limited commercial and company captive hazardous waste management facilities in all states. Data are designed to be used with the Biennial Report on waste generated to support development of States' Capacity Assurance Plan.
HAZARDOUS WASTE.

459. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. **TECHNOLOGY TRANSFER NEEDS ASSESSMENT, 1990**. Washington, DC: 83p: 1990.

Technology needed for better waste disposal under Superfund, hazardous waste, and underground storage tank programs.
SOLID WASTE/HAZARDOUS WASTE.

460. U.S. Environmental Protection Agency, Office of Solid Waste, Municipal Solid Waste Task Force. **THE SOLID WASTE DILEMMA: AN AGENDA FOR ACTION: FINAL REPORT OF THE MUNICIPAL SOLID WASTE TASK FORCE**. Washington, DC: Environmental Protection Agency. 1989.

The Agenda for Action offers a number of concrete suggestions to curb U.S. generated solid waste, not only for EPA but also government at all levels, industry, and private citizens.
SOLID WASTE*

461. U.S. Environmental Protection Agency, Office of Water. **1990 NEEDS SURVEY: REPORT TO CONGRESS: ASSESSMENT OF NEEDED PUBLICLY OWNED WASTEWATER TREATMENT FACILITIES IN THE UNITED STATES -- INCLUDING FEDERALLY RECOGNIZED INDIAN TRIBES AND ALASKA NATIVE VILLAGES**. Washington, DC: November 1991.

WASTEWATER TREATMENT.

462. U.S. Environmental Protection Agency, Office of Water. **INNOVATIVE OPTIONS FOR FINANCING NONGOVERNMENTAL PUBLIC WATER SUPPLIES' NEEDS.** Washington, DC: September 1993.

The document describes a range of alternative funding mechanisms available to assist small, non-public drinking water systems in financing infrastructure improvements needed to stay in compliance with the state and federal regulations.
WATER SUPPLY.

463. U.S. Environmental Protection Agency, Office of Water. **LOCAL FINANCING FOR WELLHEAD PROTECTION**. Washington, DC: June 1989.

Provides information to state and local managers of water quality and water supply about a variety of financing approaches available to support wellhead protection initiatives.
WATER SUPPLY.

464. U.S. Environmental Protection Agency, Office of Water. **WELLHEAD PROTECTION PROGRAMS: TOOLS FOR LOCAL GOVERNMENTS**. Washington, DC: April 1989.

This EPA Technical Assistance Document (TAD) describes how localities can, as a part of a State Wellhead Protection Program, develop and implement effective techniques for the protection of ground water. The document emphasizes innovative wellhead protection methods that have been used by local communities, discusses combinations of programs that have worked well, and presents several factors that affect the success of local wellhead protection programs, such as budgetary constraints and legal issues. Contacts for more information on these local programs are listed.
WATER SUPPLY.

465. U.S. Environmental Protection Agency, Office of Water, Office of Wastewater, Enforcement, and Compliance. **MUNICIPAL WASTEWATER REUSE: SELECTED READINGS ON WATER REUSE**. Washington, DC: iv+74p: 1991.

Focuses on projects demonstrating successful effluent reclamation and recycling.
WATER SUPPLY/WASTEWATER TREATMENT.

466. U.S. General Accounting Office. **BRIDGE INFRASTRUCTURE: MATCHING THE RESOURCES TO THE NEED**. Washington, DC: 1991(GAO/RCED-91-167).

This report compares the Department of Transportation's current methodology for determining bridge needs to an alternative (level of service) methodology.
HIGHWAYS.

467. U.S. General Accounting Office. **DRINKING WATER: WIDENING GAP BETWEEN NEEDS AND AVAILABLE EPA RESOURCES THREATENS VITAL EPA PROGRAM.** Washington, DC: July 1992.

WATER SUPPLY.

468. U.S. General Accounting Office. **ENVIRONMENTAL INFRASTRUCTURE: EFFECTS OF LIMITS ON CERTAIN TAX-EXEMPT BONDS**. Washington, DC: 1993(GAO/RCED-94-2).

One important incentive for private investment in environmental infrastructure is the issuance of tax-exempt bonds by state and local governments for private projects that help meet public needs. In 1986 the U.S. Congress placed a $50 per capita or $150 million cap on the volume of these bonds that could be issued. This GAO report addresses the question of whether these limits on tax-exempt bonds have reduced investment in environmental infrastructure. The report finds that the cap has not reduced the volume of bond issues for environmental infrastructure; this volume has remained constant. However, the cost of complying with federal mandates has risen, and the cap might be discouraging investment from meeting these additional needs. Data is included on environmental capital investment of states that are limited by the bond cap verses states that are not limited by the bond cap.
GENERAL.

469. U.S. General Accounting Office. **HIGH-SPEED GROUND TRANSPORT: ACQUIRING RIGHTS-OF-WAY FOR MAGLEV SYSTEMS REQUIRES A FLEXIBLE APPROACH.** Washington, DC: 1992(GAO/RCED-92-82).
This report discusses the advantages and disadvantages of right-of-way alternatives for magnetic levitation(maglev) systems.
MASS TRANSIT.

470. U.S. General Accounting Office. **HIGHWAY DEMONSTRATION PROJECTS: IMPROVED SELECTION AND FUNDING CONTROLS ARE NEEDED**. Washington, DC: 1991(GAO/RCED-91-146).

This GAO report examined 66 of the 152 Surface Transportation and Uniform Relocation and Assistance Act projects in 8 states to determine (1): their relationship to state and regional transportation plans;(2) progress and problems encountered in implementing such projects;(3) their estimated costs and impacts on other highway project funding; and (4) options that Congress may wish to consider if demonstration projects are included in the 1991 federal-aid highway program reauthorization.
HIGHWAYS.

471. U.S. General Accounting Office. **HIGHWAY FINANCING: PARTICIPATING STATES BENEFIT UNDER TOLL FACILITIES PILOT PROGRAM**. Washington, DC: 1990(GA/RCED-91-46).

This document reviews the progress of states using tolls as a means to help finance new and reconstructed federal-aid highway facilities.
HIGHWAYS.

472. U.S. General Accounting Office. **HIGHWAY TRUST FUND: STRATEGIES FOR SAFEGUARDING HIGHWAY FINANCING**. Washington, DC: 1992(GAO/RCED-92-245).

This report examines the capacity of the highway account to support ISTEA's authorization and the reasons for anticipating a shortfall in revenue; the consequences of a shortfall; and the strategies for dealing with a shortfall.
HIGHWAYS.

473. U.S. General Accounting Office. **HIGHWAY TRUST FUND: REVENUE SOURCES, USES, AND SPENDING CONTROLS**. Washington, DC: 1991(GAO/RCED-92-48FS).

This report reviews the sources and amounts of Highway Trust Fund revenues during fiscal years 1987 through 1991. It also examines the uses of the revenues, the estimated balance remaining in the trust fund when federal-aid highway and mass transit programs expire at the end of fiscal year 1991, and the influence of the 1990 Budget Act on surface transportation spending during the next reauthorization period.
HIGHWAYS.

474. U.S. General Accounting Office. **INTERMODAL FREIGHT TRANSPORTATION: COMBINED RAIL-TRUCK SERVICE OFFERS PUBLIC BENEFITS, BUT CHALLENGES REMAIN**. Washington, DC: 1992(GA/RCED-93-16).

As a possible alternative to the trucking industry, the General Accounting Office examined the status and potential benefits of intermodal rail transportation, in which loaded containers or trailers are transferred intact from truck to rail and back to truck.
HIGHWAYS*

475. U.S. General Accounting Office. **INVESTING IN INFRASTRUCTURE**. G.A.O. Journal. pp. 4-21. March 1991.

These articles discuss the role of infrastructure in the U.S. economy and building and maintaining transportation and telecommunications systems.
GENERAL.

476. U.S. General Accounting Office. **INVESTMENT**. Washington, DC: 1992(GAO/OCG-93-2TR).

This report is part of the Transition Series by the General Accounting Office. It emphasizes the importance of investment for economic growth and how the government can increase investment in the nation.
GENERAL.

477. U.S. General Accounting Office. **MASS TRANSIT: NEEDS PROJECTIONS COULD BETTER REFLECT FUTURE COSTS**. Washington, DC: 1993(GAO/RCED-93-61).
This GAO report reviews the extent to which current transportation needs are adequately addressed and estimates the future transit needs of the nation.
MASS TRANSIT*

478. U.S. General Accounting Office. **SURFACE TRANSPORTATION: AVAILABILITY OF INTERCITY BUS SERVICE CONTINUES TO DECLINE**. Washington, DC: 1992(GAO/RCED 92-126).

This report assesses the reasons and the socio-economic impacts of the decline of intercity bus service.
MASS TRANSIT.

479. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: URBAN TRANSPORTATION PLANNING CAN BETTER ADDRESS MODAL TRADE-OFF**. 1992.

The GAO examined issues related to funding flexibility between highway and mass transit programs.
GENERAL.

480. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: DEPARTMENT OF TRANSPORTATION HIGHWAY AND MASS TRANSIT PROGRAM REAUTHORIZATION PROPOSALS. STATEMENT BY KENNETH M. MEAD BEFORE THE SUBCOMMITTEE ON SURFACE TRANSPORTATION, COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, HOUSE OF REPRESENTATIVES**. Washington, DC: 1991.

This is the testimony of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office, on the proposed Surface Transportation Assistance Act of 1991. The 5-year, $105 billion package would reauthorize highway and highway safety programs at $89.1 billion and mass transit programs at $16.3 billion. It focuses on those aspects of the Administration's reauthorization proposal that concern future federal spending, consolidation of highway programs, increased funding flexibility between mass transit and highways, and the outlook for highway safety.
GENERAL.

481. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: BETTER TOOLS NEEDED FOR MAKING DECISIONS ON USING ISTEA FUNDS FLEXIBLY**. Washington, DC: 1993.

The General Accounting Office (GAO) evaluated (1) the extent to which states and localities have used the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) highway and mass transit capital funds flexibly to finance highway, mass transit, and nontraditional projects; (2) the factors that have influenced or will influence the flexible use of ISTEA funds; and (3) the adequacy of analytical tools for making transportation investment decisions.
HIGHWAYS*/MASS TRANSIT*

482. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: PRESERVING THE NATION'S INVESTMENT IN THE INTERSTATE HIGHWAY SYSTEM**. Washington, DC: August 1991.

This GAO report for the House Committee on Public Works and Transportation examines the condition of the Interstate system, the outlook for future preservation needs, and factors that influence Interstate pavement deterioration and federal and state efforts to ensure adequate maintenance of the Interstate Highway System. The General Accounting Office recommends a number of measures that Congress may want to consider in reauthorizing the federal-aid highway program to ensure that Interstate preservation needs are met. Important among these are changes to the system by which the FHWA certifies that maintenance efforts of states are adequate.
HIGHWAYS*

483. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: FEDERAL HIGHWAY ADMINISTRATION FY 1992 BUDGET REQUEST AND HIGHWAY PROGRAM REAUTHORIZATION PROPOSAL**. Washington, DC: March 5, 1991.

The Department of Transportation (DOT) estimates that about $29 billion must be invested annually by all levels of government over the next 15 years to maintain the national highways at 1985 conditions and meet bridge needs. While the plan recognized these needs, it lacked specific funding strategies and suggested a major shifting of financial burden to the states. FHWA fiscal year (FY) 1992 budget and reauthorization proposal offers an ambitious, yet conceptually sound strategic framework for helping states address important highway and bridge investment requirements through increased funding and more flexibility in using those funds. Testimony focuses on the proposed FY 1992 through FY 1996 federal-aid highway program budget commitment and plan for restructuring the program.
HIGHWAYS.

484. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: FLEXIBILITY IN FEDERAL-AID FUNDING ESSENTIAL TO HIGHWAY PROGRAM RESTRUCTURING. STATEMENT OF KENNETH M. MEAD BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE**. Washington, DC: 1990.

This is the testimony of Kenneth M. Mead, Director, Transportation Issues, Resources, Community, and Economic Development Division, General Accounting Office, on transportation issues related to the federal-aid highway program reauthorization. It shows how states have used existing federal-aid highway program flexibilities and other funding mechanisms to better meet their needs, and suggests options for restructuring the federal-aid highway program.
HIGHWAYS.

485. U.S. General Accounting Office. **TRANSPORTATION ISSUES**. Washington, DC: 1992.

This transition series report discusses major policy, management, and program issues facing the Congress and the new administration in the area of transportation.
GENERAL*

486. U.S. General Accounting Office. **TRANSPORTATION INFRASTRUCTURE: REPORT TO THE SECRETARY OF TRANSPORTATION**. Washington, DC: 2v: 1989.

Based on a GAO seminar, New Directions in Surface Transportation Infrastructure, held June 29, 1989. Examines federal highway and mass transportation programs, focusing on traffic congestion, road and bridge deterioration, block grants, toll financing, intermodal and multimodal transport, and environmental aspects.
HIGHWAYS.

487. U.S. General Accounting Office. **WATER POLLUTION: STATE REVOLVING FUNDS INSUFFICIENT TO MEET WASTEWATER TREATMENT NEEDS**. Washington, DC: January 1992.

On the basis of GAO's survey of state officials responsible for SRFs, visits to five states, and consultations with financial experts and others, GAO concluded that although the SRF program is structurally sound, a number of provisions of the 1987 Amendments to the Clean Water Act and administrative problems may hamper the efficiency and effectiveness of its implementation.
WASTEWATER TREATMENT*

488. U.S. General Accounting Office. **WATER POLLUTION: STATES' PROGRESS IN DEVELOPING REVOLVING LOAN FUND PROGRAMS**. Washington, DC: March 1991.

States are developing SRF programs at different paces. While many SRFs are not in final form, all 50 states and Puerto Rico have developed statutory and administrative frameworks. WASTEWATER TREATMENT.

489. U.S. General Accounting Office. **WATER POLLUTION: ISSUES CONCERNING STATE REVOLVING LOAN FUND PROGRAMS**. Washington, DC: April 1991.

This GAO report presents testimony of Richard L. Hembra, Director of Environmental Protection Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office before the Subcommittee on Water Resources, Committee on Public Works and Transportation of the U.S. House of Representatives. According to Mr. Hembra's testimony, all 50 states have created State Revolving Loan Fund Programs (SRFs) and have received at least one capital grant. These programs are generally similar in structure, but will become increasingly different as states customize their programs over time. States officials maintain that several key statutory and regulatory changes, including allowing of land not directly used in the treatment process to be eligible for SRF assistance, would increase the effectiveness of the SRF Program. The testimony includes key characteristics of state programs, lists questionable SRF statutory and regulatory requirements, and provides preliminary observations of states' ability to meet needs through SRF. Survey information gathered to date indicates that SRFs will only meet about one-third of states' wastewater treatment needs over the next ten years.
WASTEWATER TREATMENT.

490. U.S. General Accounting Office. **WATER POLLUTION: ALTERNATIVE STRATEGIES NEEDED TO REDUCE WASTEWATER TREATMENT COSTS**. Washington, DC: August 1992.

GAO study suggests that several barriers may be impeding the use of promising alternative technologies, including insufficient information about the alternatives, institutional biases towards conventional treatment technologies, and private-sector financial disincentives for using these alternatives.
WASTEWATER TREATMENT.

491. U.S. General Accounting Office. **WATER POLLUTION: NONINDUSTRIAL WASTEWATER POLLUTION CAN BE BETTER MANAGED**. Washington, DC: December 1991.

This GAO report discusses the range, sources, and seriousness of pollutants found in nonindustrial wastewater; strategies and programs developed by local and state governments to better manage and control these pollutants; and federal options that might encourage or require better management and control of nonindustrial wastewater pollution. Recommendations are made to the U.S. Environmental Protection Agency to better manage, control, and possibly reduce nonindustrial wastewater pollution. Recommendations include: (1) requiring major wastewater treatment plants to identify the most serious nonindustrial pollutants entering their facilities and the sources of these pollutants, and report on efforts to control them; (2) exercising the EPA's authority under the Toxic Substance Control Act to

restrict or ban substances, or require manufacturers to place warning labels on their products to alert consumers of their products' risks.
WASTEWATER TREATMENT.

492. U.S. General Accounting Office. **WATER RESOURCES: FACTORS THAT LEAD TO SUCCESSFUL COST SHARING IN CORPS PROJECTS**. Washington, DC: August 1993.

This GAO report examines the three primary factors that lead to successful cost sharing in Corps projects. These factors are 1) good communications between the Corps and sponsor, 2) the sponsor's significant involvement in decisions and activities, and 3) the Corps' responsiveness to the sponsor's concerns about cost sharing. The report presents background information on proposed civil works construction projects and five appendices displaying various graphics, charts, and tables regarding Corps activities.
WATER RESOURCES.

493. U.S. House of Representatives. **AVIATION INFRASTRUCTURE INVESTMENT ACT OF 1993**. Washington, DC: September 1993.

Recommends passage, with an amendment in the nature of a substitute, of H.R. 2739, the Aviation Infrastructure Investment Act of 1993, to amend the Airport and Airway Improvement Act of 1982 and other acts to extend and revise federal aviation programs.
AIR TRANSPORTATION.

494. U.S. House of Representatives. **MARKUP OF WAYS AND MEANS COMMITTEE AMENDMENT TO H.R. 2739 (AVIATION INFRASTRUCTURE INVESTMENT ACT OF 1993)**. Washington, DC: October 1993.

Description, prepared by Joint Taxation Committee staff, of provisions for Airport and Airway Trust Fund FY94-FY96 authorizations and program revisions contained in: H.R. 2739, the Aviation Infrastructure Investment Act of 1993, to amend the Airport and Airway Improvement Act of 1982 to authorize FY94-FY96 funding for FAA airport development and air traffic control programs. H.R. 2820, the Federal Aviation Administration Research, Engineering, and Development Authorization Act of 1993, to authorize FY94-FY96 funding for FAA R&D programs. H.R. 2820 provisions are expected to be offered as an amendment to H.R. 2739 when considered by the House. Reviews present law, provides background on the purpose of Airport and Airway Trust Fund expenditures, and explains proposed changes.
AIR TRANSPORTATION.

495. U.S. House of Representatives. **THE NEED FOR A NATIONAL POLICY TO REBUILD THE INFRASTRUCTURE OF THE U.S.** Washington, DC: September 26, 1990.

Recommends passage, with an amendment in the nature of a substitute, of H. Con. Res. 362, to express the sense of Congress that a national policy should be established for rebuilding the U.S. infrastructure, including assistance to States and localities to meet basic infrastructure needs. Also proposes to use funds from the Highway Trust Fund and the Airport and Airway Trust Fund to meet transportation infrastructure needs.
GENERAL.

496. U.S. House of Representatives, Committee on Agriculture, Subcommittee on Department Operations, Research, and Foreign Agriculture. **RECYCLABLE MATERIALS SCIENCE**

AND TECHNOLOGY DEVELOPMENT ACT OF 1989: HEARING, NOVEMBER 16, 1989, ON H.R. 500. Washington, DC: 101st Cong., 1st sess., iii+156p. 1990.

Recycling degradable and non-degradable materials with some emphasis on efforts to develop solid waste composting technology.
SOLID WASTE.

497. U.S. House of Representatives, Committee on Banking, Finance, and Urban Affairs, Subcommittee on Policy Research. **INFRASTRUCTURE NEEDS ASSESSMENTS AND FINANCING ALTERNATIVES: HEARING, MAY 8, 1990.** 101st Cong., 2d sess., iii+373p. Washington, DC: 1990.

State and local problems in the areas of environmental public works, including water supply, sewers, and garbage, and in transportation, including highways, transit, and intercity rail.
GENERAL.

498. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Energy and Power. **NATIONAL ENERGY STRATEGY: HEARINGS: PARTS. 1-7, FEBRUARY 20-SEPTEMBER 20, 1991.** 102nd Cong., 1st sess., 7pts. Washington, DC: 1991.

Testimony covers a variety of issues: oil and gas, motor vehicle fuel consumption, electric utilities, fuel efficiency, alternative fuels, electricity regulation, transmission access, strategic petroleum reserve, gas pipelines, gasoline pump labeling, hydropower, global warming, and oil policy.
WATER RESOURCES.

499. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Energy And Power. **STATE CONTROL OF WATER RESOURCES: HEARING, JUNE 4, 1991, ON H.R. 649, A BILL TO AMEND THE FEDERAL POWER ACT**. 102nd Cong., 1st sess., iii+150p. Washington, DC: 1992.

Proposed legislation that gives the state greater control over stream flow at national hydroelectric facilities.
WATER RESOURCES.

500. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Health And the Environment. **SAFE DRINKING WATER ACT: HEARING, APRIL 19, 1993, ON H.R. 1701, A BILL TO AMEND TITLE XVI OF THE PUBLIC HEALTH SERVICE ACT (THE SAFE DRINKING WATER ACT) TO ESTABLISH STATE REVOLVING FUNDS TO PROVIDE FOR DRINKING WATER TREATMENT FACILITIES, AND FOR OTHER PURPOSES**. 103d Cong., 1st sess., iii+232p. Washington, DC: 1993.

Hearing on proposal to establish state revolving funds for drinking water facilities. Some focus on the water contamination problems experienced by Milwaukee.
WATER SUPPLY.

501. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Oversight and Investigations. **GROUNDWATER MONITORING AT RCRA LAND DISPOSAL FACILITIES: HEARING, APRIL 27, 1989.** Washington, DC: 101st Cong., 1st sess., iii+357p. 1989.

Commercial and private land disposal facilities regulated under the Resource Conservation and Recovery Act. Focuses on pollution of drinking water at hazardous waste sites and cleanup efforts.
HAZARDOUS WASTE.

502. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Transportation and Hazardous Materials. **HAZARDOUS WASTE REDUCTION ACT: HEARING, APRIL 21, 1988, ON H.R. 2800, A BILL TO IMPROVE ENVIRONMENTAL PROTECTION AGENCY DATA COLLECTION AND DISSEMINATION REGARDING REDUCTION OF TOXIC CHEMICAL EMISSIONS.** Washington, DC: 100th Cong., 2d sess., iii+299p. 1989.

Includes discussion of the establishment of a clearinghouse of information, building a database, and provision of government technical assistance to states.
HAZARDOUS WASTE.

503. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Transportation and Hazardous Materials. **MUNICIPAL SOLID WASTE DISPOSAL CRISIS: HEARING, JUNE 22, 1989, ON H.R. 2099 AND H.R. 2723, BILLS TO PROHIBIT THE DISPOSAL OF SOLID WASTE IN ANY STATE OTHER THAN THE STATE IN WHICH THE WASTE WAS GENERATED.** Washington, DC: 101st Cong., 1st sess., iii+270p. 1989.

Proposes amending the Resource Conservation and Recovery Act to improve procedures for the implementation of state compacts providing for the establishment and operation of regional disposal facilities.
SOLID WASTE.

504. U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Transportation, Tourism, and Hazardous Materials. **MUNICIPAL INCINERATOR ASH: HEARING, APRIL 13, 1988, ON H.R. 2517 [AND OTHER BILLS], BILLS TO REDUCE THE HAZARDS ASSOCIATED WITH MUNICIPAL INCINERATOR ASH AND TO AMEND SUBTITLE D OF THE SOLID WASTE DISPOSAL ACT TO PROVIDE FOR SAFE MANAGEMENT AND REGULATION OF MUNICIPAL SOLID WASTE INCINERATORS.** Washington, DC: 100th Cong., 2d sess., iii+274p. 1989.

SOLID WASTE/HAZARDOUS WASTE.

505. U.S. House of Representatives, Committee on Energy And Commerce, Subcommittee on Transportation And Hazardous Materials. **RECYCLING OF MUNICIPAL SOLID WASTE: HEARINGS, JULY 12-13, 1989, ON H.R. 1593 [AND OTHER BILLS].** Washington, DC: 101st Cong., 1st sess., iv+635p. 1989.

Recycling or disposal of hazardous materials is discussed, focusing on alternatives to landfilling, oil and car battery recycling, and the role of the EPA.
SOLID WASTE/HAZARDOUS WASTE.

506. U.S. House of Representatives, Committee on Government Operations Environment, Energy, And Natural Resources Subcommittee. **REVIEW OF EPA'S CAPACITY ASSURANCE**

PROGRAM: HEARING, MAY 2, 1991. Washington, DC: 102nd Cong., 1st sess., iv+332p. 1992.

Problems with hazardous waste site data reporting requirements are discussed. Refers to the provision which was incorporated into the 1986 reauthorization of Superfund, requiring every state to demonstrate to EPA that it has, or has access to, adequate disposal capacity for all of the hazardous waste projected to be generated in the state over the next 20 years or face a cutoff of its Superfund cleanup money.
HAZARDOUS WASTE.

507. U.S. House of Representatives, Committee on Government Operations, Legislation and National Security Subcommittee. **INVESTING IN AMERICA: PROPOSED CHANGES IN THE FEDERAL BUDGET PROCESS: HEARING, JULY 23, 1992.** Washington, DC: 102nd Cong., 2d sess., iii+84p. 1993.

Presents the case for more federal investment in infrastructure: roads, bridges, airports, and water systems.
GENERAL.

508. U.S. House of Representatives, Committee on Merchant Marine and Fisheries. **NATIONAL CLEAN WATER INVESTMENT CORPORATION AND OPTIONS FOR CLEAN WATER FUNDING: HEARING, AUGUST 11, 1992, BEFORE THE SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT AND THE SUBCOMMITTEE ON OCEANOGRAPHY, GREAT LAKES AND THE OUTER CONTINENTAL SHELF ON THE FUTURE COURSE OF THE FEDERAL CLEAN WATER ACT AND A PROPOSAL TO ESTABLISH A NATIONAL CLEAN WATER INVESTMENT CORPORATION**. 102nd Cong., 2d sess., v+138p. Washington, DC: 1992.

Discusses financing state and municipal water pollution control projects. Proposes charging fees for wastewater discharges and for pesticide and fertilizer use to set up the corporation.
WASTEWATER TREATMENT/WATER RESOURCES.

509. U.S. House of Representatives, Committee on Public Works and Transportation. **TO EXAMINE THE FUTURE OF OUR NATION'S INFRASTRUCTURE NEEDS. HEARINGS BEFORE THE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, HOUSE OF REPRESENTATIVES, 1O1ST CONGRESS, 2ND SESSION**. Washington, DC: 1991.

The subject of these hearings is the future of the Nation's infrastructure needs. From 1960 to 1985, total public spending on infrastructure dropped from 3.6% of the GNP to 2.6%. These hearings examine this decline in investment and its impact on the nation's infrastructure systems and the economy. Included are testimony, prepared statements submitted by members of Congress, prepared statements of witnesses, submissions for the record, and additions to the record.
GENERAL.

510. U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Water Resources. **STATUS OF THE SUPERFUND HAZARDOUS WASTE CLEANUP PROGRAM AND THE IMPLEMENTATION OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA): HEARING, JULY 7, 1988**. Washington, DC: 100th Cong, 2d sess., iii+113p. 1988.

Revisions to the National Contingency Plan, EPA's enforcement and cost recovery activities, the impact of EPA activities under the act, revisions to the hazardous ranking system, and EPA's deferred listing policy.
HAZARDOUS WASTE.

511. U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Economic Development. **TO DISCUSS THE FINAL REPORT OF THE NATIONAL COUNCIL ON PUBLIC WORKS IMPROVEMENT: HEARING, MAY 18, 1988.** 100th Cong., 2d sess., iii+448. Washington, DC: 1988.

Fragile Foundations: A Report on America's Public Works. Includes the text of the Feb. 1988 report, as well as the Council's Sept. 1986 and May 1987 reports.
GENERAL.

512. U.S. House of Representatives, Committee on Public Works and Transportation, Subcommittee on Water Resources. **WATER SUPPLY POLICY OF THE FEDERAL GOVERNMENT: HEARING, APRIL 26, 1989.** 101st Cong., 1st sess., iii+151p. Washington, DC: 1989.

Discusses cost and infrastructure concerns, particularly in the West.
WATER SUPPLY.

513. U.S. House of Representatives, Committee on Science, Space, and Technology. **TECHNOLOGY POLICY: SURFACE TRANSPORTATION INFRASTRUCTURE R&D. HEARINGS BEFORE THE SUBCOMMITTEE ON TECHNOLOGY, ENVIRONMENT AND AVIATION, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, 103RD CONGRESS, 1ST SESSION, MAY 25 AND AUGUST 3, 1993**. Washington, DC: 1993.

These are hearings on technology policy dealing with surface transportation improvements. The progress which has been made to date in the development of technologies related to intelligent vehicle highway systems, human factor engineering, high speed rail systems, and maglev is examined. Also discussed are scrap tire utilization technologies. Included are the testimony and prepared statements of witnesses and additional material submitted for the record.
GENERAL.

514. U.S. House of Representatives, Committee on Science, Space and Technology, Subcommittee on Natural Resources, Agriculture, Research, and Environment. **SOLID WASTE REDUCTION, RECYCLING, POLLUTION PREVENTION: HEARING, JANUARY 29, 1990.** Washington, DC: 101st Cong., 2d sess., iii+216p, no. 107. 1990.

Makes reference to several legislative initiatives, including H.R. 568, the National Beverage Container Reuse and Recycling Act, and H.R. 3736, the Waste Export Control Act.
SOLID WASTE.

515. U.S. House of Representatives, Subcommittee on Water Resources, Transportation, and Infrastructure. **INFRASTRUCTURE, PRODUCTIVITY, AND ECONOMIC GROWTH.** Washington, DC: 1991.

Hearing before the Subcommittee on Water Resources, Transportation, and Infrastructure to review national transportation policy issues involved in federal aid highway programs in light

of upcoming reauthorization of the Surface Transportation and Uniform Relocation Assistance Act of 1987.
GENERAL.

516. U.S. House of Representatives, Subcommittee on Water Resources, Transportation and Infrastructure. **TRANSPORTATION INFRASTRUCTURE**. Washington, DC: 1991.

Hearing to examine issues involved in future Federal policies regarding transportation infrastructure, in light of the pending reauthorization of highway and mass transit programs.
GENERAL.

517. U.S. Interstate Commerce Commission, Bureau of Economics. **A COST AND BENEFIT ANALYSIS OF SURFACE TRANSPORT REGULATION**. Washington, DC: Interstate Commerce Commission.

HIGHWAYS.

518. U.S. National Institute for Occupational Safety And Health. **HAZARDOUS WASTE BIBLIOGRAPHY**. Atlanta, GA: 1989.

Includes selected hazardous waste publications of the U.S. Institute for Occupational Safety and Health.
HAZARDOUS WASTE.

519. U.S. Senate. **CONGESTION PRICING AND INFRASTRUCTURE FINANCING**. Washington, DC: March 21, 1991.

Hearing before the Subcommittee on Water Resources, Transportation, and Infrastructure to examine highway congestion pricing for urban areas, involving the imposition of tolls during peak traffic hours to reduce highway use and generate funds for highway maintenance. Also examines financing issues and proposals for State and local infrastructure projects.
HIGHWAYS.

520. U.S. Senate, Committee on Environment and Public Works. **A LEGISLATIVE HISTORY OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED, TOGETHER WITH A SECTION BY SECTION INDEX: JUNE 1991.** Washington, DC: 102nd Cong., 1st sess. 1991.

Covers topics related to the Office of Solid Waste, including authorities of the Administrator and Interagency Coordinating Committee, hazardous waste management; state or regional solid waste plans; duties of the Secretary of Commerce in resource and recovery; federal responsibilities; miscellaneous provisions; research development, demonstration, and information; regulation of underground storage tanks.
SOLID WASTE.

521. U.S. Senate, Committee on Environment and Public Works. **INFRASTRUCTURE, PRODUCTIVITY, AND ECONOMIC GROWTH. HEARING BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE, 102ND CONGRESS, 1ST SESSION, FEBRUARY 5, 1991**. Washington, DC: 1991.

This hearing focuses on the relationship between infrastructure investment and economic growth, and is the first of a series of hearings to be held on the reauthorization of the Surface Transportation Act of 1987. Included are the opening statements of U.S. Senators from the states of North Dakota, New Jersey, Connecticut, New York, Nevada, New Hampshire, and Virginia, testimony and prepared statements of witnesses, and additional material submitted for the record.
GENERAL.

522. U.S. Senate, Committee on Environment and Public Works. **OVERSIGHT OF THE FEDERAL-AID HIGHWAY PROGRAM. HEARING BEFORE THE SUBCOMMITTEE ON WATER RESOURCES, TRANSPORTATION, AND INFRASTRUCTURE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, UNITED STATES SENATE, 101ST CONGRESS, 2ND SESSION, ST. PAUL MINNESOTA, JULY 10, 1990. PART 4**. Washington, DC: 1990.

This hearing addresses a number of issues, including the impact of federal transportation policy under the State and local governments, the impact of the federal transportation policy on the transportation system users and consumers, the importance of a national transportation system to the United States in general, and Minnesota specifically, and innovations in the area of better management and research and development that can help meet transportation's needs. Included are prepared statements, testimony, and additional material submitted for the record.
HIGHWAYS.

523. U.S. Senate, Committee on Environment and Public Works. **PROTECTION OF MARINE AND COASTAL WATERS: JOINT HEARINGS, JULY 12 AUGU.S.T 11, 1989, ON S.587,[AND OTHER] BILLS CONCERNING RESEARCH AND PROTECTION OF MARINE AND COASTAL WATERS, BEFORE THE SUBCOMMITTEE ON SUPERFUND, OCEAN, AND WATER PROTECTION AND THE SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION**. 101st Cong., 1st sess, iv+579p. Washington, DC: 1990.

Discusses proposals to establish regional research programs and reduce pollution from industrial plants and sewage treatment facilities.
WASTEWATER TREATMENT.

524. U.S. Senate, Committee on Environment and Public Works. **SMALL COMMUNITIES ENVIRONMENTAL ASSISTANCE: HEARING**. 101st Cong., 2d sess., iii+220p. Washington, DC. 1990.

Proposed legislation to correct certain provisions of the Clean Water Act which put small communities at an economic disadvantage by assisting small communities in financing environmental facilities.
GENERAL.

525. U.S. Senate, Committee on Environment and Public Works, Subcommittee on Water Resources, Transportation, and Infrastructure. **WATER RESOURCES INFRASTRUCTURE: NEEDS AND IMPACTS: HEARING, MARCH 4, 1992**. 102d Cong., 2d sess., iii+71p. Washington, DC: 1992.

Potential federal initiatives in water surface transportation. Covers improvements in rivers, canals, and other waterways, ports and terminals, and integrated and inter-modal systems.

WATER RESOURCES.

526. U.S. Senate Committee on Environment and Public Works, Subcommittee On Environmental Protection. **AMENDING THE SOLID WASTE DISPOSAL ACT: HEARING, JUNE 21, 1989, ON S. 1112, MUNICIPAL SOLID WASTE SOURCE REDUCTION AND RECYCLING ACT AND S. 1113, WASTE MINIMIZATION AND CONTROL ACT OF 1989**. Washington, DC: 101st Cong., 1st sess., iii+256p. 1989.

Proposed mandatory state planning, standards and operating permits for waste management facilities, promotion of more durable, less toxic products, and increased recycling programs.
SOLID WASTE.

527. U.S. Senate, Committee on Environment and Public Works, Subcommittee on Environmental Protection. **INTERSTATE TRANSPORT AND DISPOSAL OF SOLID WASTE: HEARING, JULY 18, 1990**. iii+251p: Washington, DC: 1990.

Role of state and federal governments in restricting solid waste importing in light of decline of availability of landfills.
SOLID WASTE.

528. U.S. Senate, Committee on Governmental Affairs, Subcommittee on General Services, Federalism, and The District Of Columbia. **INFRASTRUCTURE PROBLEMS AND INTERGOVERNMENTAL SOLUTIONS: HEARING, MAY 4, 1989.** 101st Cong., 1st sess. S. hearing 101-116; iv+300p. 1989.

Possible federal, state, and local initiatives to develop solutions for infrastructure problems.
GENERAL.

529. U.S. Senate, Select Committee on Indian Affairs. **WORKSHOP ON SOLID WASTE DISPOSAL ON INDIAN LANDS, JULY 29, 1991**. Washington, DC: 102d Cong., 1st sess., iii+96p. 1992.

Federal regulations governing the design, siting, and operations of solid waste facilities and their applicability to Indian lands.
SOLID WASTE.

530. Utterback, Nancy. **MANAGING THE NATION'S AIR TRANSPORTATION NEEDS: THE EVOLVING PARTNERSHIP OF AIRLINES, AIRPORTS, AND THE FEDERAL GOVERNMENT**. Municipal Finance Journal. 14:76-98 1993. March 1993.
Financing air transport infrastructure, the FAA's outlook, and legal issues.
AIR TRANSPORTATION.

531. Vallianos, L.; Stakhiv, E. Z. **DEVELOPING A FEDERAL INFRASTRUCTURE STRATEGY**. Water Resources Update: Water Resources Infrastructure. Issue No. 86, Autumn, 1991. p 15-19. 4 ref.

Within the federal infrastructure establishment there is an increasing awareness of the desirability of strengthening agency linkages and broadening the scope of interagency coordination. Among the basic initial objectives are the enhancement of interagency exchanges of information and sharing of strategies, procedures, and resources (such as research-laboratory facilities).

WATER RESOURCES.

532. Van Daniker, Relmond P. Kwiatkowski, Vernon. **INFRASTRUCTURE ASSETS: AN ASSESSMENT OF USER NEEDS AND RECOMMENDATIONS FOR FINANCIAL REPORTING.** Stamford CT Government Accounting Standards Board. 1986.

This GASB-sponsored research report presents the findings from a 1985 mail survey of a sample of (1) academics, (2) investors, (3) public managers, (4) legislators, and (5) citizens about the need for financial reporting on infrastructure assets.
GENERAL.

533. Viessman, Jr. Warren (University of Florida, Gainesville). **WATER MANAGEMENT ISSUES FOR THE NINETIES**. Water Resources B. v26, n6, p883(9). December 1990.

Water management includes the application of structural and nonstructural measures on problems related to water supply, allocation, quality, extreme events, and environmental protection.
WATER SUPPLY.

534. Viton, Philip A. **CONSOLIDATIONS OF SCALE AND SCOPE IN URBAN TRANSIT**. Regional Science and Urban Economics; 22(1), pages 25-49. March 1992.

The author studies the cost-effectiveness of forming large multi-modal transit organizations by estimating a quadratic multi-product frontier cost function on a U.S. sample, 1984-86. Several policy applications, including a pilot study of San Francisco Bay Area proposals are presented.
MASS TRANSIT.

535. Wade Miller Associates, Inc. **THE NATION'S PUBLIC WORKS: REPORT ON WATER SUPPLY**. National Council on Public Works Improvement. Washington, DC: 1987.

This report was prepared to assist the National Council on Public Works Improvement in examining water supply as an issue in the Nation's public works improvement program and to make a detailed assessment of the state of the nation's water supply.
WATER SUPPLY*

536. Wagner, Travis P. **THE HAZARDOUS WASTE Q&A: AN IN-DEPTH GUIDE TO THE RESOURCE CONSERVATION AND RECOVERY ACT AND THE HAZARDOUS MATERIALS TRANSPORTATION ACT**. xx+404p. 1990.

Partial contents of this report include: waste identification and classification; generators; groundwater monitoring; land disposal restrictions; corrective action; enforcement; state authorization.
HAZARDOUS WASTE.

537. Walker, Jana L.; Gover, Kevin. **COMMERCIAL SOLID AND HAZARDOUS WASTE DISPOSAL PROJECTS ON INDIAN LANDS**. Yale Journal on Regulation; 10(1), pages 229-62. December 1993.

This article analyzes the controversial issue of using Indian reservations as sites for commercial solid and hazardous waste facilities and provides a model for planning,

developing, and regulating commercial waste projects on Indian lands. The article concludes that, under certain circumstances, and with an adequate regulatory program, a waste disposal project may be a viable and appropriate form of industrial development for some tribes and can provide opportunities for economic development on some reservations.
SOLID WASTE/HAZARDOUS WASTE.

538. Walski, T. M. **COST OF WATER DISTRIBUTION SYSTEM INFRASTRUCTURE REHABILITATION, REPAIR, AND REPLACEMENT: FINAL TECHNICAL REPORT.** Vicksburg, MS: Army Engineer Waterways Experiment Station, Environmental Laboratory. March 1985.

This report presents data and estimating procedures for predicting the cost of several types of work involved with maintaining water systems, including cleaning and cement mortar lining of pipes, cathodic protection of buried pipes, repair of pipe breaks and leaks, replacing (relaying) water mains, and chemical addition to produce water that is neither corrosive nor scaleforming. The report is intended to serve as a tool for water supply engineers required to develop planning level cost estimates of alternative rehabilitation measures.
WATER SUPPLY.

539. Wanielista, Martin P. **STORMWATER MANAGEMENT**. New York, NY: J. Wiley & Sons. 1993.

WATER RESOURCES.

540. Water Quality 2000. **A NATIONAL WATER AGENDA FOR THE 21st CENTURY**. Alexandria, VA: Water Environment Federation. November 1992.

This report provides consensus recommendations from a coalition of over 80 public, private, and nonprofit organizations for improvements for water quality policies and programs. Recommendations include promoting wise use of water resources, strengthening existing federal programs, and providing incentives and funding for water quality improvements.
WATER SUPPLY.

541. Watson, Tom. **SOLID WASTE COMPOSTING AIMS FOR THE MAINSTREAM: ALTHOUGH SOLID WASTE COMPOSTING ISN'T NEW IN EUROPE, IT'S RECEIVING INCREASING ATTENTION IN THE U.S.** Resource Recycling; 9:30+. July 1990.

Includes a list of selected municipal solid waste composting facilities and system vendors.
SOLID WASTE.

542. Weidenbaum, Murray. **PROTECTING THE ENVIRONMENT**. Society ; 27:49-56. November 1989.

Topics presented include economic considerations; economic solutions to hazardous waste problems; economic incentives needed; and a birth control approach to pollution.
HAZARDOUS WASTE.

543. Wheeler, Porter. **THE ALLOCATION OF GOVERNMENTAL RESPONSIBILITIES IN CONSTRUCTING, MAINTAINING, AND FINANCING PUBLIC WORKS**. National Council on Public Works Improvement. October 1986.

This report examines the role of the federal government and initiatives toward decentralization in the context of infrastructure investment and repair. Situations in which state and local authority verses federal control could or could not be preferable are discussed.
GENERAL*

544. Whitlock, Edward M. **FINANCING AIRPORT FACILITIES**. Transportation Quarterly; 46:99-114. January 1992.

Issues in public finance as well as forces behind privatization of airport facilities are presented.
AIR TRANSPORTATION.

545. Wieman, C. **ROAD WORK AHEAD: HOW TO SOLVE THE INFRASTRUCTURE CRISIS**. Technology Review. Cambridge, MA: Massachusetts Institute of Technology, Association of Alumni and Alumnae of MIT. 1993.

The report states that we owe today's infrastructure crisis to yesterday's shortsightedness. The vision that produced our cities' subways, highways, bridges, and thousands of miles of water mains earlier in the century failed to provide for the care and replenishment of the infrastructure once it was built. The author provides the good news: the infrastructure crisis is solvable. Promoting system efficiency will have to be the watchword for solving the infrastructure crisis on all levels - funding, organization, planning and implementation, and as its name implies, the new $155 billion federal Intermodal Surface Transportation Efficiency Act has adopted this approach as a chief policy goal.
GENERAL*

546. Wieman, Clark. **ROAD WORK AHEAD: HOW TO SOLVE THE INFRASTRUCTURE CRISIS**. Technology Review. August 1993.

Recommends adequate maintenance, dedicated funds and bureaucratic reform.
HIGHWAYS.

547. Williams, K. M. **STATES' ROLE IN REBUILDING AMERICA**. Transportation Executive Update. 1990.

This article discusses the states' plans to participate in a rebuilding of our nation's infrastructure. Through the National Governor's Association, the states have developed a strategy to meet this challenge. It requires cooperation among federal, state, and local governments with a clear definition of roles and with greater state responsibility.
GENERAL.

548. Williams, Kristine M. **STRATEGIES FOR MANAGING CAPITAL IMPROVEMENTS**. Planning and Zoning News; 10:5-9. February 1992.

Report uses the level of service approach derived from the 1991 report, Infrastructure Management Options to Deal with the Impacts of Growth. The experiences of Florida and Michigan are presented as case studies.
GENERAL.

549. Williams, M.; Mullen, J. K. **THE CONTRIBUTION OF HIGHWAY INFRASTRUCTURE TO STATES' ECONOMIES**. International Journal of Transport Economics; 19(2), pages 149-63. June 1992.

HIGHWAYS.

550. Williams, Susan. **TRASH TO CASH: NEW BUSINESS OPPORTUNITIES IN THE POST CONSUMER WASTE STREAM.** vii+317p. 1991.

Presented on industry-by-industry assessment of the volume and value of recoverable materials in municipal solid waste and identification of companies presently engaged in recycling operations. Initiatives in the aluminum, glass, steel, paper, and plastics industries are discussed, including discussion of composting and waste-to-energy alternatives.
SOLID WASTE.

551. Williams, Susan. **WASTE TO ENERGY: STATUS REPORT: 1992**. Independent Energy; 22:53+. July 1992.

Viability as a component of an integrated waste disposal program, prospects for growth, despite contract cancellations and the downturn in awards for new facilities.
SOLID WASTE.

552. Wilson, Robert H. **STATES AND THE ECONOMY: POLICYMAKING AND DECENTRALIZATION**. xi+290p. 1993.

Argues that economic and political decentralization forces state governments to adjust and reform functions and programs, especially economic development functions. Partial contents: Structural economic change and the states; Development and technology policy; The state as regulator of infrastructure: telecommunications policy; The state as social infrastructure provider: education and training.
GENERAL.

553. Winston, C. **EFFICIENT TRANSPORTATION INFRASTRUCTURE POLICY**. Journal of Economic Perspectives. 1991.

This paper offers a different perspective on paying for, and investing in, the transportation infrastructure. Making efficient use of current transportation capacity will reduce the need for massive public investment in airports and roads and will prevent the recurrence of infrastructure problems.
GENERAL.

554. Winston, Clifford. **CONCEPTUAL DEVELOPMENTS IN THE ECONOMICS OF TRANSPORTATION: AN INTERPRETIVE SURVEY**. Journal of Economic Literature; pages 57-94. March 1985.

The objective of this paper is to survey the literature in transportation economics, exploring two basic themes: first, the conceptual developments in the analysis of supply and demand, which recognize noteworthy aggregation biases in the empirical work on aggregate data and indicate that a correct analysis of the issues should take place at a highly disaggregated level; second, the use of these conceptual developments to evaluate efficiency aspects of

transportation pricing, investment, and the impact of government regulation on resource allocation and distribution in the transportation sector.
HIGHWAYS.

555. Winston, Clifford; Corsi, Thomas M. **THE ECONOMIC EFFECTS OF SURFACE FREIGHT DEREGULATION**. Washington, DC: The Brookings Institution. 1990.

This study quantitatively assesses the effects of surface freight deregulation. It investigates the costs of regulating surface freight transportation and estimates the efficiency and distributional effects of surface freight deregulation on shippers, carriers, labor, and small communities. Deregulation and shipper optimality; competition and welfare under deregulation; and the benefits to railroads and shippers from further adjustments to deregulation are discussed. The study concludes with an examination of railroad and motor carrier policy issues.
HIGHWAYS.

556. Working Group on Infrastructure. **AN INFRASTRUCTURE PROPOSAL FOR JOBS, THE ENVIRONMENT, AND PERFORMANCE**. Washington, DC: 1993.

GENERAL.

557. Zimmerman, Dennis. **THE PRIVATE USE OF TAX EXEMPT BONDS: CONTROLLING PUBLIC SUBSIDY OF PRIVATE ACTIVITY**. xxiv+364p. 1991.

Examines U.S. tax legislation, and economic and fiscal policy aspects; emphasis on federal, state, and local government relations. Other issues include tax immunity and equity, economic incentives, administration and enforcement, infrastructure, municipal socialism, and the volume cap.
GENERAL.

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13. ABSTRACT *(Maximum 200 words)*

This report updates a previous issue of "Infrastructure Reports: Summaries" published in January 1992. This updated edition includes additional and revised abstracts on work reflecting an interest in the Nation's infrastructure. The emphasis of the update is on the period after the publication of "Fragile Foundations" (1988) by the National Council on Public Works Improvement (NCPWI).

The report consists of three components: (1) an analysis of current and evolving national infrastructure policies; (2) abstracts of approximately 100 studies; and, (3) an annotated bibliography of infrastructure related reports.

The specific programs covered are: aviation; highways; mass transit; water resources; wastewater treatment; public water supply; solid waste management; and, hazardous waste management.

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