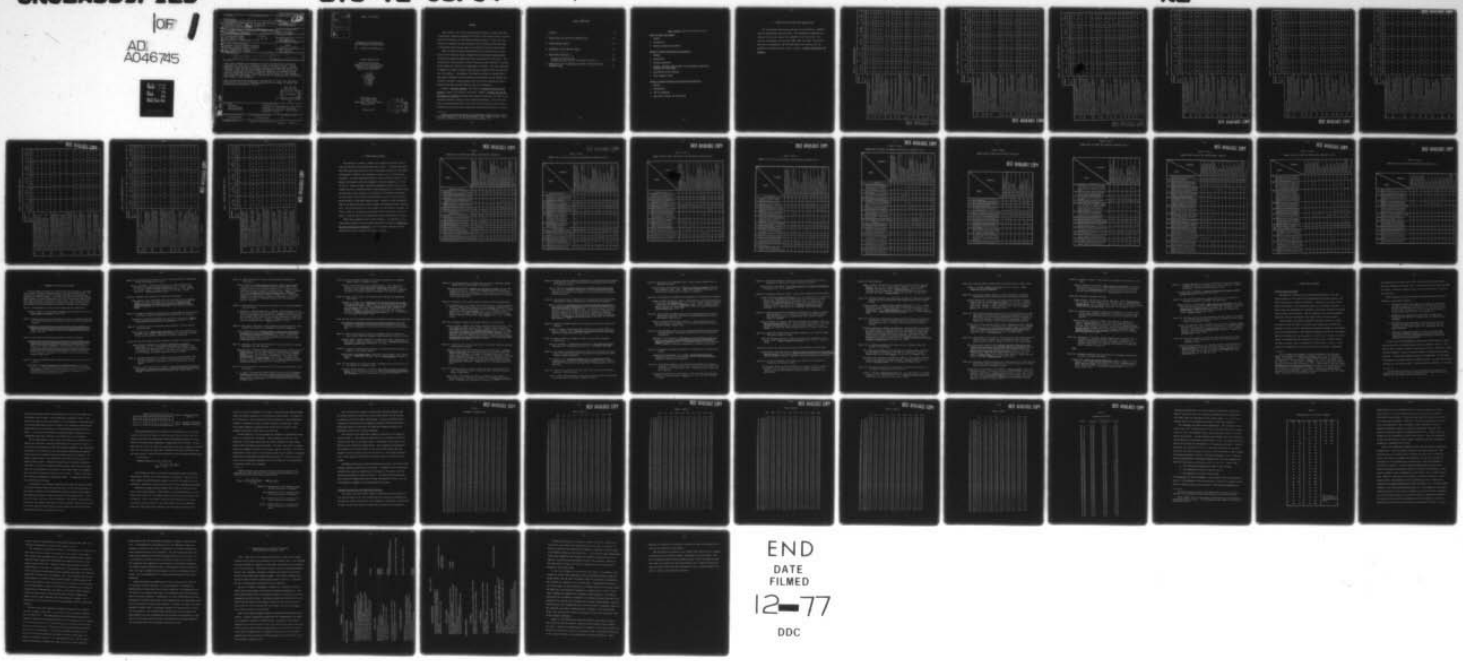
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16. Abstract

This study updated and expanded the five socioeconomic scenarios prepared for the FAA in the prior study similarly titled. These scenarios were revised to reflect changes in conditions since the original study and to incorporate new material that may better aid the FAA in policy analysis. Scenario sections on economics were greatly augmented to give substantive descriptions of the economic and financial processes, and a new sector on international conditions was added to each scenario.

This volume contains supporting information on event and variable selections and on event probabilities which was used in making the projections described in Volume 3.

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Report 276-72-05/04

# ALTERNATIVE FUTURE SCENARIOS FOR THE NATIONAL AVIATION SYSTEM

## Vol. 4: Supporting Documentation

A report prepared for

System Concepts Branch
Federal Aviation Administration
Department of Transportation
Contract DOT FA6WA-3855

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# PREFACE

This volume is one of four covering the work done in revising the five socioeconomic scenarios developed for the FAA in the study entitled, "Alternative Future Scenarios for the National Aviation System."* That study was directed at depicting various alternative future conditions that may exist in the United States and may impact on the National Aviation System (NAS).

While the basic positions differentiating the scenarios are the same here as in the previous study, insights into socioeconomic changes gained during the preceding 18 months have been incorporated into this study. New variables have been selected to better characterize the alternative "external worlds" which may influence the development of the NAS. New events important to shaping the nature of these worlds have been identified and incorporated into the scenarios. Furthermore, the scenario sections on economics have been greatly augmented to give substantive descriptions of the economic and financial processes in each scenario and a new section dealing with international conditions has been added to each of the scenarios.

Volume 1, Executive Summary, and Volume 2, Scenario Descriptions and Graphics, present the results of the study. Volume 3, Methods and Data for Projecting the Variables, explains how projections were made for each of the variables selected to help quantify scenario development. This volume contains supporting information on event and variable selections and on event probabilities which was used in making the projections described in Volume 3.

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*Alternative Future Scenarios for the National Aviation System, Report 174-72-01, prepared for the Systems Concepts Branch, Federal Aviation Administration (Glastonbury, CT: The Futures Group, August 1975).

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4. PROJECTIONS OF THE VARIABLES

5. MAJOR SCENARIO EVENTS

Volume 3: Methods and Data for Projecting the Variables

PREFACE

1. INTRODUCTION

2. THE TIA PROCEDURE

3. DATA USED IN MAKING THE PROJECTIONS

# 1. MASTER EVENT LIST AND EVENT PROBABILITIES

All of the events used in the study are listed in Table 1, together with the probabilities for each event. The probabilities represent the judgment of the study team on the likelihood of the occurrence of an event in each scenario for the years 1980, 1990, and 2000. The key and NAS event are identified, and for these events the rationale for the probability selections may be found in Volume 2, Scenario Descriptions and Graphics.

## Table 1 EVENT PROBABILITIES

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| °1. Establishment of 10 new resorts comparable to Disney World. | 5 | 20 | 40 | 15 | 60 | 70 | 10 | 50 | 60 | 0 | 10 | 10 | 10 | 20 | 40 |
| 2. Subsidized day-care centers are made available to all mothers in the labor force. | 20 | 30 | 40 | 10 | 20 | 25 | 10 | 20 | 25 | 10 | 20 | 30 | 20 | 40 | 60 |
| 4. Home and work are highly mixed so that average one-way travel is reduced from about 8 miles to 4 miles. | 0 | 30 | 40 | 0 | 15 | 20 | 0 | 40 | 50 | 0 | 20 | 30 | 0 | 50 | 60 |
| °7. Federal guidelines are developed to serve as a voluntary framework for planning population distribution among the various states and regions. | 40 | 60 | 70 | 10 | 20 | 30 | 50 | 70 | 80 | 5 | 10 | 20 | 50 | 70 | 75 |
| 9. Government subsidizes relocation and training of needy, rural workers to encourage migration to urban centers. | 30 | 80 | 90 | 15 | 30 | 40 | 15 | 40 | 45 | 25 | 70 | 80 | 30 | 75 | 80 |
| °10. New cities are developed proximate to natural resources. | 0 | 20 | 35 | 0 | 40 | 55 | 0 | 60 | 70 | 0 | 20 | 30 | 0 | 75 | 90 |
| *11. Use of telecommunicators reduces the amount of travel by 20 percent. | 5 | 50 | 70 | 0 | 30 | 50 | 0 | 30 | 40 | 0 | 20 | 30 | 0 | 60 | 80 |
| *13. The marriage rate declines to 8 per thousand population (a little over 10 per thousand population in 1975). | 20 | 50 | 60 | 10 | 40 | 55 | 20 | 50 | 70 | 20 | 30 | 40 | 20 | 45 | 55 |
| °23. Synthetic gas from coal is commercially available. | 10 | 20 | 30 | 10 | 60 | 80 | 10 | 50 | 60 | 10 | 15 | 20 | 10 | 50 | 60 |
| 27. Five percent of the work force accomplishes its job functions through the use of electronic communication. | 0 | 20 | 30 | 0 | 50 | 70 | 0 | 40 | 50 | 0 | 20 | 20 | 0 | 30 | 40 |
| 29. Car lifetimes are extended to double 1976 expected values. | 0 | 50 | 60 | 0 | 30 | 50 | 0 | 30 | 40 | 0 | 30 | 40 | 0 | 60 | 90 |
| °30. Refineries and offshore terminals are established on the East Coast to provide a capacity approaching area demand for oil products. | 0 | 25 | 30 | 0 | 40 | 60 | 0 | 35 | 55 | 0 | 20 | 25 | 0 | 30 | 40 |
| 31. The naval petroleum reserves are opened to commercial exploitation. | 10 | 25 | 40 | 20 | 80 | 90 | 20 | 60 | 70 | 20 | 80 | 90 | 10 | 45 | 60 |
| 32. Domestic uranium supplies fall 25 percent short of requirements. | 5 | 40 | 50 | 5 | 40 | 50 | 5 | 30 | 40 | 5 | 55 | 65 | 5 | 30 | 35 |
| 33. Production reaches one-half million barrels a day of shale oil. | 0 | 20 | 30 | 0 | 40 | 50 | 0 | 40 | 50 | 0 | 10 | 15 | 0 | 30 | 40 |

° NAS Event * Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| °34. The Atlantic Outer Continental Shelf produces 1 million barrels of oil per day. | 0 | 20 | 25 | 0 | 40 | 50 | 0 | 30 | 40 | 0 | 15 | 15 | 0 | 30 | 35 |
| 35. Solar energy, refuse burning, and geothermal power constitute 3-4 percent of the total U.S. energy requirements annually. | 0 | 35 | 40 | 0 | 50 | 60 | 0 | 40 | 50 | 0 | 20 | 25 | 0 | 40 | 60 |
| 36. U.S. wind energy program produces the energy equivalent of 200,000 barrels of oil a day. | 0 | 35 | 40 | 0 | 50 | 60 | 0 | 40 | 50 | 0 | 10 | 25 | 0 | 40 | 60 |
| *40. Coal and nuclear stations contribute 75 percent of electrical energy. | 0 | 10 | 30 | 0 | 40 | 60 | 0 | 40 | 50 | 0 | 10 | 15 | 0 | 60 | 80 |
| 42. Non-petroleum sources of primary power for ground transportation (storage batteries, fuel cells, electromagnetic propulsion and the like) account for one quarter of the transportation energy demand. | 0 | 10 | 15 | 0 | 30 | 55 | 0 | 30 | 65 | 0 | 5 | 10 | 0 | 30 | 40 |
| 44. A national electrical energy grid is implemented. | 0 | 10 | 15 | 0 | 20 | 30 | 0 | 20 | 40 | 0 | 5 | 10 | 0 | 40 | 60 |
| *45. A national program for raw material resource rationing is established. | 15 | 50 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 25 | 40 | 15 | 50 | 75 |
| *46. Environmentally acceptable pest control fails to provide adequate crop protection. | 10 | 30 | 50 | 5 | 10 | 10 | 5 | 10 | 15 | 10 | 60 | 80 | 10 | 30 | 40 |
| °47. More than 10,000 miles of the interstate highway system are electrified and automated to accommodate dual-mode automobiles. | 0 | 10 | 20 | 0 | 30 | 50 | 0 | 40 | 70 | 0 | 5 | 10 | 0 | 20 | 40 |
| 49. Alaskan oil is added to domestic production. | 80 | 90 | 90 | 90 | 99 | 99 | 90 | 99 | 99 | 80 | 90 | 99 | 90 | 99 | 99 |
| °51. Developing countries form cartels for key raw materials: bauxite, manganese, tin, and chromium. | 25 | 70 | 90 | 10 | 20 | 30 | 10 | 15 | 15 | 25 | 40 | 55 | 10 | 40 | 40 |
| °53. Capital resources are not able to meet long-term investment needs of industry. | 10 | 15 | 20 | 20 | 25 | 30 | 20 | 25 | 30 | 40 | 50 | 85 | 20 | 30 | 40 |
| °54. The DOD budget increases to at least 50 percent of the Federal budget (about 27 percent in 1975). | 5 | 5 | 10 | 10 | 25 | 35 | 20 | 30 | 40 | 10 | 30 | 40 | 10 | 15 | 20 |
| *55. Wage, price, profit, and interest rate controls are permanently established. | 30 | 80 | 95 | 5 | 10 | 10 | 5 | 15 | 20 | 15 | 20 | 25 | 20 | 45 | 60 |
| *56. One-half of consumer durables are fabricated using recycled materials. | 0 | 40 | 60 | 0 | 20 | 30 | 0 | 50 | 60 | 0 | 30 | 40 | 0 | 70 | 90 |

° NAS Event * Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| | SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| °57. | 10 billion dollars per year of government funds are devoted to urban transit system development (approximately $2 billion in 1974). | | | 75 | 0 | 30 | 40 | 0 | 35 | 50 | 0 | 25 | 30 | 0 | 50 | 60 |
| *59. | A publicly owned petroleum company is established, which supplies 20 percent of the domestic market. | 5 | 20 | 30 | 0 | 5 | 10 | 0 | 15 | 25 | 15 | 50 | 60 | 5 | 45 | 55 |
| 62. | A fourth level of government is created in the form of many regional authorities to administer specific functions (e.g., transportation, resources, the environment, etc.) now residing in Federal, state, and municipal governments. | 15 | 20 | 20 | 10 | 10 | 10 | 20 | 20 | 25 | 5 | 10 | 10 | 20 | 25 | 30 |
| *63. | R&D spending in the United States increases from the mid-1970's level of 2.5 percent of GNP to 5 percent of GNP. | 10 | 20 | 30 | 20 | 60 | 70 | 20 | 70 | 80 | 0 | 10 | 10 | 15 | 40 | 50 |
| 64. | All U.S. railroads are nationalized. | 0 | 50 | 60 | 0 | 15 | 20 | 0 | 25 | 30 | 0 | 80 | 90 | 0 | 60 | 70 |
| *65. | The transportation, communication, and energy industries become either public or quasi-public enterprises. | 0 | 5 | 10 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 15 | 30 | 0 | 10 | 20 |
| 66. | Federal legislation requires natural gas allocation on a national basis. | 20 | 50 | 60 | 10 | 20 | 30 | 10 | 30 | 40 | 30 | 50 | 60 | 30 | 60 | 80 |
| *67. | The prices of prime energy sources are totally deregulated. | 5 | 10 | 15 | 20 | 50 | 70 | 15 | 40 | 50 | 5 | 10 | 20 | 5 | 10 | 20 |
| 68. | States in temperate areas of the country offer significant tax incentives to accelerate introduction of new industry. | 30 | 60 | 70 | 10 | 30 | 40 | 10 | 40 | 50 | 10 | 20 | 25 | 30 | 60 | 80 |
| 72. | Anti-exodus laws are passed penalizing industry for moving outside the United States. | 20 | 40 | 50 | 5 | 10 | 15 | 10 | 15 | 20 | 20 | 60 | 70 | 20 | 30 | 40 |
| 73. | Legislation is passed providing a guaranteed minimum annual income for U.S. citizens. | 10 | 40 | 50 | 5 | 10 | 15 | 5 | 40 | 60 | 10 | 30 | 40 | 10 | 40 | 50 |
| *75. | A national program of socialized medicine is established. | 0 | 25 | 45 | 0 | 5 | 10 | 0 | 15 | 20 | 0 | 25 | 40 | 0 | 40 | 60 |
| *76. | A land-use bill which requires states to develop Federally approved zoning plans is passed. | 20 | 50 | 65 | 10 | 15 | 20 | 30 | 50 | 75 | 10 | 15 | 20 | 30 | 70 | 90 |
| 77. | Congress enacts a new tax on goods and services proportional to their environmental impact, allocating these funds for environmental improvements. | 30 | 40 | 60 | 5 | 10 | 15 | 20 | 30 | 40 | 10 | 15 | 20 | 35 | 50 | 70 |

° NAS Event *Key Event



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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| *78. Federal funds for community development, to revitalize cities, increase threefold over the 1975 level. (Community development funds totalled 3.2 billion dollars in 1975.) | 20 | 50 | 70 | 10 | 20 | 30 | 10 | 40 | 55 | 15 | 25 | 35 | 30 | 50 | 80 |
| 80. Areas having air pollution below maximum legal levels are allowed to increase pollution to these levels. | 0 | 0 | 0 | 0 | 20 | 20 | 0 | 0 | 0 | 0 | 30 | 50 | 0 | 20 | 20 |
| 81. Successful legislation is enacted guaranteeing full employment. | 10 | 20 | 30 | 5 | 5 | 5 | 5 | 30 | 60 | 5 | 10 | 10 | 10 | 40 | 50 |
| °82. A progressive tax is imposed on all energy usage with the proceeds funneled into energy production and conservation R&D programs. | 30 | 60 | 70 | 5 | 10 | 15 | 15 | 40 | 60 | 10 | 15 | 20 | 30 | 70 | 80 |
| 83. Car-pooling for travel to work becomes mandatory. | 0 | 40 | 60 | 0 | 0 | 0 | 0 | 10 | 20 | 0 | 50 | 80 | 0 | 65 | 65 |
| *84. Federal government assumes full responsibility for all public aid payments. | 30 | 60 | 70 | 0 | 5 | 5 | 5 | 15 | 25 | 30 | 40 | 50 | 30 | 80 | 90 |
| 88. A nuclear moratorium is called in new construction with a complete re-evaluation of nuclear power generation. | 20 | 40 | 50 | 5 | 10 | 15 | 10 | 20 | 25 | 20 | 50 | 60 | 10 | 20 | 30 |
| °89. Federal funds are withheld in order to stop urban expressway construction. | 20 | 50 | 70 | 0 | 0 | 0 | 10 | 30 | 40 | 10 | 20 | 30 | 15 | 50 | 70 |
| 93. The Federal Government attempts to restrict the size of the labor force by adopting policies to encourage early retirement or higher levels of public education. | 10 | 50 | 60 | 0 | 0 | 5 | 5 | 10 | 10 | 10 | 50 | 60 | 10 | 40 | 50 |
| °94. Twenty-five percent of the work force does not work the standard five-day, forty-hour week. | 20 | 60 | 80 | 20 | 50 | 60 | 20 | 70 | 80 | 20 | 60 | 70 | 20 | 30 | 40 |
| °95. Half of all U.S. employees have 30 days of work vacation and 15 scheduled holidays. | 0 | 40 | 60 | 0 | 40 | 50 | 0 | 70 | 90 | 0 | 10 | 15 | 0 | 30 | 40 |
| *96. Fifty percent of assembly line production is controlled by computers. | 0 | 15 | 20 | 0 | 40 | 50 | 0 | 50 | 70 | 0 | 10 | 10 | 0 | 20 | 30 |
| *97. Middle-class attitudes toward work are challenged by the rise of strong avocational interests, resulting in decreased demands for career advancement opportunities. | 10 | 60 | 80 | 5 | 10 | 20 | 5 | 30 | 40 | 5 | 10 | 15 | 10 | 40 | 50 |

° NAS Event *Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| *171. OPEC dissolves. | 5 | 15 | 20 | 20 | 50 | 80 | 20 | 65 | 90 | 5 | 5 | 5 | 5 | 30 | 60 |
| *172. European community and Japan erect prohibitive trade and investment restrictions which effectively deny market access to the United States. | 10 | 20 | 30 | 5 | 5 | 10 | 10 | 10 | 15 | 30 | 80 | 85 | 20 | 20 | 20 |
| 174. United States and other developed countries negotiate multilateral agreements with LDC's, assuring access to raw material supplies for consumer nations, and stable export earnings for producing nations. | 15 | 15 | 20 | 5 | 5 | 5 | 55 | 65 | 75 | 0 | 0 | 0 | 20 | 50 | 70 |
| 180. Tax levies on capital gains are reduced 50 percent from current levels. | 10 | 10 | 10 | 70 | 80 | 90 | 40 | 45 | 50 | 10 | 20 | 30 | 20 | 30 | 40 |
| °181. An indexing system for all wages, prices, interest rates, and profits is established. | 0 | 0 | 0 | 0 | 5 | 10 | 0 | 0 | 0 | 10 | 30 | 80 | 5 | 10 | 25 |
| °182. Accelerated depreciation allowances are approved and become law. (20 percent increase over 1975 levels.) | 0 | 5 | 10 | 50 | 60 | 80 | 40 | 50 | 60 | 30 | 40 | 50 | 10 | 20 | 30 |
| 183. Capacity utilization in manufacturing falls to 70 percent and remains there for eight consecutive quarters. | 60 | 60 | 60 | 5 | 10 | 15 | 5 | 10 | 15 | 60 | 70 | 80 | 20 | 30 | 40 |
| °184. Corporate profits distributed as dividends are no longer taxed. | 0 | 0 | 0 | 5 | 85 | 90 | 40 | 60 | 70 | 5 | 10 | 15 | 20 | 40 | 50 |
| °185. In order to improve municipal finance conditions, Federally subsidized municipal securities are established and issued. | 50 | 60 | 70 | 20 | 25 | 40 | 50 | 60 | 70 | 10 | 20 | 30 | 40 | 50 | 60 |
| 186. The stock of capital per worker averages 2.5 percent growth for a ten-year period. | 0 | 15 | 20 | 0 | 70 | 80 | 0 | 60 | 70 | 0 | 10 | 15 | 0 | 30 | 40 |
| 187. Reserve requirements on time and savings accounts are abolished. | 5 | 5 | 5 | 60 | 70 | 80 | 10 | 20 | 30 | 20 | 25 | 30 | 20 | 30 | 40 |
| 188. Two major U.S. cities (e.g., New York, San Francisco) default on 25 percent of loan commitments and are declared bankrupt. | 40 | 40 | 40 | 10 | 20 | 30 | 10 | 15 | 20 | 60 | 70 | 80 | 10 | 20 | 30 |
| 189. The amount of mortgage debt outstanding held by Federal and related agencies doubles. (1975 = $88.1 billion) | 5 | 15 | 20 | 15 | 20 | 25 | 20 | 60 | 70 | 5 | 15 | 20 | 10 | 30 | 50 |

° NAS Event * Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| 190. European Community (EC) achieves a monetary union with currency parities established by the Council and further fluctuations are controlled by a Central European Bank. | 5 | 5 | 10 | 5 | 10 | 15 | 35 | 50 | 80 | 5 | 5 | 5 | 15 | 30 | 65 |
| °191. EC negotiates a series of preferential trade agreements with OPEC countries embodying preferred EC access to OPEC crude oil at below world prices and OPEC discrimination in favor of EC exports, in exchange for EC technology, technical assistance, and lower tariffs on OPEC manufactured products. | 30 | 35 | 40 | 10 | 10 | 15 | 20 | 30 | 30 | 10 | 10 | 10 | 30 | 30 | 30 |
| 192. EC cohesion diminishes as monetary cooperation--the joint float--fails, the Commission loses all initiative, and the customs union dissolves, as EC members unilaterally raise tariffs against each other's exports. | 30 | 50 | 65 | 15 | 20 | 30 | 5 | 5 | 5 | 65 | 75 | 85 | 20 | 30 | 40 |
| 193. Communist parties in Italy, Spain, Portugal, and France become dominating forces in left of center governing coalitions, and the Labor Party in the UK comes under control of its left wing. | 25 | 35 | 45 | 10 | 15 | 25 | 5 | 5 | 5 | 40 | 65 | 80 | 15 | 25 | 35 |
| 194. The EC expands to include, as formal members, Portugal, Spain, Greece, Austria, Switzerland, Yugoslavia, and Norway. | 5 | 5 | 10 | 25 | 30 | 35 | 35 | 55 | 75 | 5 | 5 | 5 | 10 | 20 | 30 |
| 195. The OECD financial support fund becomes operational, lending at low interest rates to any OECD country suffering balance of payments deficits from petroleum imports. | 10 | 10 | 15 | 50 | 50 | 50 | 65 | 65 | 65 | 5 | 5 | 5 | 20 | 30 | 30 |
| 196. OECD negotiates a mandatory code of conduct for multinational corporations assuring national treatment for all MNC's, protection against expropriation and forced modification of agreements, and prohibiting political activity by MNC's. | 30 | [illegible] | 50 | 10 | 10 | 15 | 50 | 65 | 90 | 5 | 10 | 10 | 30 | 50 | 75 |
| °197. Development of North Sea oil and natural gas, and further growth in nuclear power in France, the United Kingdom, Italy, and West Germany enable Europe to supply 65 percent of its energy needs. | 0 | 25 | 35 | 0 | 30 | 45 | 0 | 45 | 65 | 0 | 10 | 15 | 0 | 45 | 75 |
| 198. The United Kingdom and France establish currency controls to stem the flow of investment funds to other developed and underdeveloped countries. | 40 | 60 | 60 | 5 | 5 | 10 | 10 | 15 | 20 | 40 | 65 | 80 | 30 | 30 | 30 |

° NIS Event * Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| 199. The Conference on International Economic Cooperation (CIEC) negotiates a broad agreement on debt relief for LDC's involving forgiveness of external debt to DC governments in exchange for assurances on access to LDC raw materials. | 35 | 45 | 60 | 15 | 20 | 25 | 25 | 35 | 60 | 5 | 10 | 15 | 35 | 50 | 70 |
| 200. GATT negotiations result in a system of DC preferences for LDC exports, and a new GATT organization governing DC-LDC trade, which links level of tariff preference to level of LDC development. | 10 | 15 | 20 | 20 | 25 | 30 | 35 | 55 | 85 | 5 | 5 | 5 | 15 | 35 | 60 |
| 201. Latin American governments adopt legislation to acquire majority ownership of all multinational corporations (MNC's) to export at least one-third of their production, to limit MNC's repartition of capital, and to require all locally produced goods to contain 75 percent local content. | 25 | 40 | 55 | 35 | 55 | 80 | 15 | 25 | 35 | 35 | 40 | 65 | 25 | 25 | 25 |
| 202. Latin American Economic System (SELA) achieves increased regional economic cooperation throughout Latin America, including a customs union, common Latin American positions on MNC's, tariff preferences and commodity trade, and successfully promotes specific interregional economic projects in areas such as energy, raw material development, and transportation. | 25 | 25 | 25 | 15 | 15 | 15 | 25 | 50 | 75 | 10 | 10 | 10 | 35 | 60 | 85 |
| 203. Venezuelan public investments total $37 billion, principally for expansion of steel and aluminum making, shipbuilding, hydroelectric power, petroleum, and petrochemical production capacity. | 5 | 15 | 25 | 15 | 30 | 55 | 15 | 40 | 70 | 5 | 5 | 10 | 10 | 25 | 50 |
| 204. Brazil invests $70 billion on major development projects for energy, minerals, new agricultural lands, steel making, hydroelectric power, and transportation. | 5 | 15 | 25 | 15 | 30 | 55 | 15 | 40 | 70 | 5 | 5 | 10 | 10 | 25 | 50 |
| 205. Latin American governments completely liberalize their trade and investment controls over imports of goods and capital. | 10 | 15 | 20 | 10 | 25 | 35 | 15 | 35 | 70 | 5 | 5 | 5 | 15 | 25 | 40 |
| *206. Escalating guerrilla warfare and radicalization of Latin American governments lead to expropriation of financial assessments and renunciation of debts to developed countries. | 20 | 35 | 55 | 10 | 25 | 50 | 5 | 5 | 5 | 25 | 55 | 80 | 10 | 15 | 20 |

* NAS Event * Key Event



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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| °207. Mexico and Brazil, with significant offshore oil production, join OPEC. | 25 | 50 | 75 | 25 | 35 | 40 | 20 | 25 | 30 | 25 | 55 | 80 | 25 | 45 | 45 |
| °208. Venezuela withdraws from OPEC. | 5 | 10 | 15 | 10 | 20 | 35 | 15 | 40 | 90 | 5 | 5 | 5 | 10 | 25 | 45 |
| 209. The Japanese Socialist Party and the Japanese Communist Party gain politically at the expense of the Liberal Democrats and become dominant elements in a governing coalition. | 25 | 40 | 65 | 10 | 20 | 30 | 5 | 10 | 15 | 30 | 60 | 90 | 25 | 35 | 35 |
| °210. Completion of a Treaty of Peace and Friendship with the PRC leads to very large Japanese investments in Tai oil reserves and annual purchases of more than 60 million tons of crude oil from the PRC. | 0 | 75 | 95 | 1 | 45 | 55 | 1 | 55 | 60 | 1 | 65 | 85 | 1 | 45 | 55 |
| °211. Settlement of the Kuril Islands dispute with the Soviet Union is followed by very large Japanese investments in Siberian raw material development --oil, gas, and lumber primarily--including Japanese construction of a pipeline from Tyumen oil fields with Soviet repayment in crude oil. | 35 | 65 | 85 | 20 | 35 | 45 | 35 | 45 | 50 | 30 | 55 | 75 | 25 | 35 | 45 |
| °213. Japanese completely liberalize trade and investment restrictions on imports of goods and capital. | 5 | 10 | 15 | 10 | 60 | 85 | 10 | 55 | 75 | 5 | 5 | 5 | 10 | .25 | 40 |
| 214. Japanese Government adopts controls on the export of capital. | 15 | 35 | 60 | 5 | 15 | 25 | 5 | 10 | 10 | 20 | 45 | 75 | 15 | 30 | 35 |
| 215. Japan and the EC become involved in a trade war involving competitive devaluations of currency, trade, and investment restrictions. | 15 | 30 | 60 | 5 | 10 | 15 | 5 | 5 | 5 | 20 | 50 | 85 | 10 | 25 | 35 |
| 216. Japan enters preferential trade agreements, embodying preferred access to markets and raw materials, and technology transfer, with certain LDC's, including Brazil, Mexico, and Venezuela. | 15 | 40 | 70 | 5 | 5 | 5 | 5 | 15 | 25 | 20 | 50 | 80 | 15 | 30 | 40 |
| °217. Japanese programs to stimulate technological innovation achieve technological parity or superiority in data processing, electric automobiles, and pollution abatement equipment. | 5 | 35 | 45 | 0 | 15 | 20 | 0 | 15 | 20 | 5 | 40 | 55 | 5 | 35 | 40 |

° NAS Event * Key Event

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Table 1 EVENT PROBABILITIES (Cont.)

| SCENARIO | A Lim. Gro. | | | B Exp. Gro. | | | C Ind. Aff. | | | D Hardship | | | R Rea. Alloc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| 218. The International Energy Agency (IEA) becomes a permanent organization with authority over an IEA oil stockpile, compulsory sharing of oil during emergencies, OECD wide energy conservation and R&D, and an OECD oil price floor to encourage new investments. | 10 | 10 | 10 | 25 | 45 | 50 | 25 | 50 | 55 | 5 | 5 | 5 | 15 | 40 | 65 |
| 219. OPEC countries increase their long-term, direct investment in developed countries to the level of one-half their annual surplus. | 15 | 20 | 20 | 20 | 45 | 70 | 15 | 35 | 60 | 10 | 10 | 10 | 15 | 25 | 50 |
| °220. OPEC countries continue to spend large portions of oil revenues on imports of products and technology. | 20 | 25 | 25 | 25 | 55 | 65 | 25 | 55 | 65 | 15 | 15 | 15 | 15 | 30 | 60 |
| 221. A formal settlement between Israel and the Arab countries (Egypt, Syria, Jordan) is achieved, embodying guarantees of Israeli security, border adjustments, and resolution of the Palestinian issue. | 25 | 35 | 50 | 30 | 50 | 65 | 30 | 55 | 75 | 15 | 20 | 25 | 15 | 35 | 55 |
| 222. Conflict again erupts between Israel and the Arab states, with further Israeli occupation and diplomatic/strategic stalemate. | 30 | 50 | 70 | 15 | 25 | 35 | 15 | 20 | 25 | 40 | 65 | 80 | 30 | 35 | 35 |
| 223. War among the Arab states breaks out, pitting the front line states against Iraq, Libya, and the Palestinians. | 20 | 30 | 45 | 25 | 45 | 60 | 25 | 50 | 70 | 10 | 15 | 20 | 10 | 30 | 50 |
| °224. The IEA and OPEC agree to an indexation plan for linking crude oil prices to general level of inflation in manufactured products. | 25 | 50 | 75 | 5 | 5 | 5 | 10 | 30 | 50 | 5 | 5 | 5 | 20 | 40 | 50 |
| °225. North Sea, Mexican, and PRC oil enter world markets in large volumes, causing OPEC exports to fall to 20 million barrels per day or less. | 10 | 20 | 40 | 5 | 10 | 15 | 10 | 20 | 25 | 10 | 40 | 60 | 10 | 40 | 75 |

° NAS Event * Key Event

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## 2. EVENT-VARIABLE MATRIX

The selection of events to impact each variable projected by TIA is shown by the three event-variable matrices of Table 1. The matrices show the events which have been used in the trend impact analyses of the general socioeconomic variables, the financial variables, and the international variables. To assure comprehensiveness in event selection, events in the general socioeconomic area were arranged in several categories, as shown in Table 1. Events in these categories (demography and life-style, technology/resources, business/economics, politics/legislation, the labor force, and education) relate primarily to the general socioeconomic development of each scenario, while events in the financial matrix and international matrix pertain to these more specific areas. However, as may be expected some of the same events were found to impact the variables in more than one area. This was especially true with respect to the financial variables, on which a number of the general socioeconomic events were found to have an impact, as may be seen from the financial event-variable matrix of Table 1.

Events were assigned to one or more variables. In carrying out the trend impact analyses of the variables (described in Volume 3, Methods and Data for Projecting the Variables), all of the events assigned to each variable were used to compute its future projection.

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Table 1

EVENTS USED TO IMPACT THE GENERAL SOCIOECONOMIC VARIABLES

| EVENT \ VARIABLE | Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products | Average Price of Electricity--All Sectors | Business Capital Expenditures for Pollution Abatement--Air and Water | PCE for Transportation (Goods and Services) | PCE for Recreation (Goods and Services) | Median Number of Years of School Completed by the Civilian Non-Institutional Population, 25 Years Old and Over | Total of All Government Spending As a Percent of GNP | Total Social Welfare Expenditures Under Public Programs As a Percent of GNP | Percent of Population Living In Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined Northeast and North Central Census Regions | Labor Participation Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Demography and Life-style** | | | | | | | | | | | | |
| 1. Establishment of 10 new resorts comparable to Disney World. | | | | | X | | | | | | | |
| 2. Subsidized day-care centers are made available to all mothers in the labor force. | | | | | | | | X | | | | X |
| 4. Home and work are highly mixed so that average one-way travel is reduced from about 8 miles to 4 miles. | | | | X | | | | | | | | |
| 7. Federal guidelines are developed to serve as a voluntary framework for planning population distribution among the various states and regions. | | | | | | | | | X | X | X | |
| 9. Government subsidizes relocation and training of needy, rural workers to encourage migration to urban centers. | | | | | | X | | X | | X | X | |
| 10. New cities are developed proximate to natural resources. | | | | | | | | | X | X | X | |
| 11. Use of telecommunicators reduces the amount of travel by 20 percent. | X | | | X | | | | | | | | |
| **Technology/Resources** | | | | | | | | | | | | |
| 23. Synthetic gas from coal is commercially available. | X | | X | | | | | | | | | |
| 27. Five percent of the work force accomplishes its job functions through the use of electronic communication. | | | | X | | | | | | | | |
| 29. Car lifetimes are extended to double 1976 expected values. | | | X | X | | | | | | | | |
| 31. The naval petroleum reserves are opened to commercial exploitation. | X | | | | | | | | | | | |
| 32. Domestic uranium supplies fall 25 percent short of requirements. | | X | X | | | | | | | | | |
| 33 Production reaches one-half million barrels a day of shale oil. | X | X | X | | | | | | | | | |
| 34. The Atlantic Outer Continental Shelf produces 1 million barrels of oil per day. | X | X | | | | | | | | | | |
| 35. Solar energy, refuse burning, and geothermal power constitute 3-4 percent of the total U.S. energy requirements annually. | X | X | X | | | | | | | | | |
| 36. U.S. wind energy program produces the energy equivalent of 200,000 barrels of oil a day. | X | | | | | | | | | | | |
| 40. Coal and nuclear stations contribute 75 percent of electrical energy. | X | | | | | | | | | | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE GENERAL SOCIOECONOMIC VARIABLES (Cont.)

| EVENT \ VARIABLE | Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products | Average Price of Electricity--All Sectors | Business Capital Expenditures for Pollution Abatement--Air and Water | PCE for Transportation (Goods and Services) | PCE for Recreation (Goods and Services) | Median Number of Years of School Completed by the Civilian Non-Institutional Population, 25 Years Old and Over | Total of All Government Spending As a Percent of GNP | Total Social Welfare Expenditures Under Public Programs As a Percent of GNP | Percent of Population Living in Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined Northeast and North Central Census Regions | Labor Participation Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Technology/Resources (cont.)** | | | | | | | | | | | | |
| 42. Non-petroleum sources of primary power for ground transportation (storage batteries, fuel cells, electromagnetic propulsion and the like) account for one-quarter of the transportation energy demand. | X | | X | | | | | | | | | |
| 44. A national electrical energy grid is implemented. | | X | | | | | | | | | | |
| 45. A national program for raw material resource rationing is established. | X | | | | | | | | | | | |
| 46. Environmentally acceptable pest control fails to provide adequate crop protection. | | | | | | | | | | X | X | |
| 47. More than 10,000 miles of the interstate highway system are electrified and automated to accommodate dual-mode automobiles. | X | | | X | | | X | | | | | |
| 49. Alaskan oil is added to domestic production. | X | | | | | | | | | | | |
| 123. Conservation efforts using newly developed technologies (to achieve increases in thermal engine efficiencies, reduction in heat losses, the productive use of waste heat, etc.) reduce petroleum consumption by 20 percent. | X | | | | | | | | | | | |
| 124. Increased exploration and drilling activities doubles the rate of discovery of onshore and offshore petroleum reserves. | X | | | | | | | | X | | | |
| ***Business/Economics*** | | | | | | | | | | | | |
| 53. Capital resources are not able to meet long-term investment needs of industry. | X | X | X | | | | | | X | | | X |
| 54. The DOD budget increases to at least 30 percent of the Federal budget (about 27 percent in 1975). | | | | | | X | X | X | | | | X |
| 55. Wage, price, profit, and interest rate controls are permanently established. | | | | | | | | X | | | | |
| 56. One-half of consumer durables are fabricated using recycled materials. | | | X | | | | | | | | | |
| 57. $10 billion per year of government funds are devoted to urban transit system development (approximately $2 billion in 1974). | X | | | X | | | | | | X | X | |
| 59. A publicly owned petroleum company is established, which supplies 20 percent of the domestic market. | | X | | | | | X | | | | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE GENERAL SOCIOECONOMIC VARIABLES (Cont.)

| EVENT \ VARIABLE | Ratio of Domestic [illegible] on of Crude Oil, Lease Condensate, and [illegible]ral Gas Liquids to Domestic Demand for Refined Products | Average Price of Electricity--All Sectors | Business Capital Expenditures for Pollution Abatement--Air and Water | PCE for Transportation (Goods and Services) | PCE for Recreation (Goods and Services) | Median Number of Years of School Completed by the Civilian Non-Institutional Population, 25 Years Old and Over | Total of All Government Spending As a Percent of GNP | Total Social Welfare Expenditures Under Public Programs As a Percent of GNP | Percent of Population Living in Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined Northeast and North Central Census Regions | Labor Participation Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Business/Economics (cont.)** | | | | | | | | | | | | |
| 63. R&D spending in the United States increases from the mid-1970's level of 2.5 percent of GNP to 5 percent of GNP. | | | | | | | X | | | | | |
| 64. All U.S. railroads are nationalized. | | | | | | | X | | | | | |
| 65. The transportation, communication, and energy industries become either public or quasi-public enterprises. | | | | | | | X | | | | | |
| 66. Federal legislation requires natural gas allocation on a national basis. | | | X | | | | | | | | | |
| 67. The prices of prime energy sources are totally deregulated. | | X | | X | X | | | | | | | |
| 68. States in temperate areas of the country offer significant tax incentives to accelerate introduction of new industry. | | | | | | | | | X | | | |
| 152. Federal reserve adopts constant growth policy as regards the monetary aggregates (i.e., $M_1$ grows at 6 percent) and thus dispenses with monetary policy as a discretionary tool, and the Federal budget is balanced. | | | | | | | X | X | | | | |
| 153. Costs for electric system equipment accelerate at 10 percent above the general inflation rate. | | X | | | | | | | | | | |
| 154. Industry difficulties and foreign pressures force the price of fossil energy to rise to the oil equivalent of $20 per barrel in real terms. | | X | | X | | | | | | | | |
| 155. Pollution abatement requirements are allowed to be dependent on industrial and economic growth. | | | X | | | | | | | | | |
| 183. Capacity utilization in manufacturing falls to 70 percent and remains there for eight consecutive quarters. | | | | | | | X | X | | | | X |
| 186. The stock of capital per worker averages 2.5 percent growth for a 10-year period. | | | | | | | | | | | | X |
| 189. The amount of mortgage debt outstanding held by Federal and related agencies doubles. (1975 = $88.1 billion) | | | | | | | X | | | | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE GENERAL SOCIOECONOMIC VARIABLES (Cont.)

| EVENT \ VARIABLE | Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products | Average Price of Electricity--All Sectors | Business Capital Expenditures for Pollution Abatement--Air and Water | FCE for Transportation (Goods and Services) | PCE for Recreation (Goods and Services) | Median Number of Years of School Completed by the Civilian Non-Institutional Population, 25 Years Old and Over | Total of All Government Spending As a Percent of GNP | Total Social Welfare Expenditures Under Public Programs As a Percent of GNP | Percent of Population Living in Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined Northeast and North Central Census Regions | Labor Participation Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Politics/Legislation** | | | | | | | | | | | | |
| 72. Anti-exodus laws are passed penalizing industry for moving outside the United States. | | | | | | | | | | X | X | |
| 73. Legislation is passed providing a guaranteed minimum annual income for U.S. citizens. | | | | | X | | X | X | | | | |
| 75. A national program of socialized medicine is established. | | | | | | | X | X | | | | |
| 76. A land-use bill which requires states to develop Federally approved zoning plans is passed. | | | | | | | | | | X | X | |
| 77. Congress enacts a new tax on goods and services proportional to their environmental impact, allocating these funds for environmental improvements. | | | X | | | | X | | | | | |
| 78. Federal funds for community development, to revitalize cities, increase threefold over the 1975 level. (Community development funds totaled $3.2 billion in 1975.) | | | | | | | X | X | X | X | X | |
| 80. Areas having air pollution below maximum legal levels are allowed to increase pollution to these levels. | | | X | | | | | | X | X | X | |
| 81. Successful legislation is enacted guaranteeing full employment. | | | | | | | | | | | | X |
| 82. A progressive tax is imposed on all energy usage with the proceeds funneled into energy production and conservation R&D programs. | X | X | X | | | | X | | | | | |
| 83. Car-pooling for travel to work becomes mandatory. | X | | X | X | | | | | | | | |
| 84. Federal Government assumes full responsibility for all public aid payments. | | | | | | | | X | | | | |
| 88. A nuclear moritorium is called in new construction with a complete re-evaluation of nuclear power generation. | X | X | X | | | | | | | | | |
| 89. Federal funds are withheld in order to stop urban expressway construction. | X | | | X | | | X | | | X | X | |
| 171. OPEC dissolves. | X | X | | X | | | | | | | | |
| 172. European community and Japan erect prohibitive trade and investment restrictions which effectively deny market access to the United States. | | | | | | | X | | | | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE GENERAL SOCIOECONOMIC VARIABLES (Cont.)

| EVENT \ VARIABLE | Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products | Average Price of Electricity--All Sectors | Business Capital Expenditures for Pollution Abatement--Air and Water | PCE for Transportation (Goods and Services) | PCE for Recreation (Goods and Services) | Median Number of Years of School Completed by the Civilian Non-Institutional Population, 25 Years Old and Over | Total of All Government Spending As a Percent of GNP | Total Social Welfare Expenditures Under Public Programs As a Percent of GNP | Percent of Population Living in Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined South and West Census Regions | Percent Urban to Total Resident Population of Combined Northeast and North Central Census Regions | Labor Participation Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Labor Force** | | | | | | | | | | | | |
| 93. The Federal Government attempts to restrict the size of the labor force by by adopting policies to encourage earle retirement or higher levels of public education. | | | | | X | X | X | X | | | | X |
| 94. Twenty-five percent of the work force does not work the standard five-day, forty-hour week. | | | | | X | | | | | | | X |
| 95. Half of all U.S. employees have 30 days of work vacation and 15 Scheduled holidays. | | | | X | X | | | | | | | |
| 96. Fifty percent of assembly line production is controlled by computers. | | | | | | | | | | | | X |
| 97. Middle-class attitudes toward work are challenged by the rise of strong avocational interests, resulting in decreased demands for career advancement opportunities. | | | | | X | X | | | | | | X |
| 98. Nearly all workers undergo job retraining because of technological obsolescence or voluntary career change. | | | | | | X | X | | | | | X |
| 100. Coal production fails to reach projected levels because of labor problems, inadequate transportation, and environmental constraints. | X | X | | | | | | | X | | | |
| 104. Rigorous enforcement of immigration laws occurs with respect to aliens seeking U.S. employment. | | | | | | | | | X | | | |
| 105. Private pension plans replace the social security system in a majority of states. | | | | | | | X | X | | | | |
| **Education** | | | | | | | | | | | | |
| 111. Automated individual instruction is introduced at all educational levels. | | | | | | | | X | | | | |
| 114. Schools teach leisure subjects to young people. | | | | | X | | | | | | | |
| 115. Simulators are developed to provide technical training to mentally and physically handicapped people to prepare them to return to society. | | | | | | X | | | | | | |
| 116. Four-year-old children begin elementary school (first grade). | | | | | | X | | | | | | |
| 117. Programs are implemented which greatly increase the level of multilingual public education at the primary and secondary levels. | | | | | | X | | | | | | |
| 118. Most employers provide scholarship assistance as a part of the employee benefit package. | | | | | | X | | | | | | |
| 119. Bachelors degree is compressed from four to three years by majority of colleges and universities. | | | | | | X | | | | | | |
| 120. Speed reading techniques are made part of the general education curriculum. | | | | | | X | | | | | | |
| 121. One out of every ten colleges and universities in the United States is forced to merge or close down due to financial pressures. | | | | | | X | | | | | | |

Table 1 (Cont.)

EVENTS USED TO IMPACT THE FINANCIAL VARIABLES

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| EVENT \ VARIABLE | Percent of Investment Funds Generated Internally by Non-Financial Corporate Business | Percent of Final Sales Accounted by Goods | Expenditures on New Plant and Equipment | AAA Corporate Bond Rate | Amount of Long-Term Investment Funds Raised in Credit Markets | Output Per Hours of all Persons--Non-Farm Private | Index of Industrial Production |
|---|---|---|---|---|---|---|---|
| 10. New cities are developed proximate to natural resources. | | | X | | | | |
| 11. Use of telecommunictions reduces the amount of all travel by 20 percent. | | | | | | X | |
| 29. Car lifetimes are extended to double 1976 expected values. | | X | | X | | | |
| 51. Developing countries form cartels for raw materials: bauxite, manganese, tin, and chromium. | | X | X | X | | | X |
| 53. Capital resources are not able to meet long-term investment needs of industry. | X | X | X | X | X | X | X |
| 55. Wage, price, profit, and interest rate controls are permanently established. | X | | X | X | X | X | X |
| 56. One-half of consumer durables are fabricated using recycled materials. | | X | | | | | |
| 63. R&D spending in the United States increases from the mid-1970's level of 2.5 percent of GNP to 5 percent of GNP. | | X | | | | X | |
| 73. Legislation is passed providing a guaranteed minimum annual income for U.S. citizens. | | | | | | | X |
| 77. Congress enacts a new tax on goods and services proportional to their environmental impact, allocating these funds for environmental improvements. | | X | | | | | |
| 93. The Federal Government attempts to restrict the size of the labor force by adopting policies to encourage early retirement or higher levels of public education. | | | | | | X | |
| 96. Fifty percent of assembly line production is controlled by computers. | | | | | | X | |

Table 1 (Cont.)

EVENTS USED TO IMPACT THE FINANCIAL VARIABLES (Cont.)

| EVENT \ VARIABLE | Percent of Investment Funds Generated Internally by Non-Financial Corporate Business | Percent of Final Sales Accounted by Goods | Expenditures on New Plant and Equipment | AAA Corporate Bond Rate | Amount of Long-Term Investment Funds Raised in Credit Markets | Output Per Hours of all Persons--Non-Farm Private | Index of Industrial Production |
|---|---|---|---|---|---|---|---|
| 97. Middle-class attitudes toward work are challenged by the rise of strong avocational interests, resulting in decreased demands for career advancement opportunities. | | X | | | | X | |
| 98. Nearly all workers undergo job retraining because of technological obsolescence or voluntary career change. | | | | | | X | |
| 105. Private pension plans replace the social security system in a majority of states. | X | | X | X | X | | |
| 151. Corporate income tax rate is reduced by 50 percent from 1975 levels. | X | | X | X | X | X | X |
| 152. Federal Reserve adopts constant growth policy as regards the monetary aggregates (i.e., $M_1$ grows at 6 percent) and thus dispenses with monetary policy as a discretionary tool, and the Federal budget is balanced. | X | | X | X | X | | X |
| 172. European Community and Japan erect prohibitive trade and investment restrictions which effectively deny market access to the United States. | X | | X | X | | | X |
| 180. Tax levies on capital gains are reduced 50 percent from current levels. | X | | | | | | |
| 181. An indexing system for all wages, prices, interest rates, and profits is established. | | | | X | | | |
| 182. Accelerated depreciation allowances are approved and become law. (20 percent increase over 1975 levels.) | X | X | X | X | X | X | X |
| 183. Capacity utilization in manufacturing falls to 70 percent and remains there for eight consecutive quarters. | X | | X | X | X | X | X |
| 184. Corporate profits distributed as dividends are no longer taxed. | X | | X | | X | | |
| 185. In order to improve municipal finance conditions, Federally subsidized municipal securities are established and issued. | | | | | X | | |
| 186. The stock of capital per worker averages 2.5 percent growth for a ten-year period. | | | | X | | | X |
| 189. The amount of mortgage debt outstanding held by Federal and related agencies doubles. (1975 = $98.1 billion) | X | | | | X | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE INTERNATIONAL VARIABLES

| EVENT \ VARIABLE | U.S. Exports to European Community | U.S. Imports from European Community | U.S. Investment to European Community | U.S. Investments from European Community | U.S. Exports to Japan | U.S. Imports from Japan | U.S. Investments to Japan | U.S. Investments from Japan | U.S. Exports to Latin America | U.S. Imports from Latin America | U.S. Investments to Latin America | Latin American External Debt to United States | OPEC Prices |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51. Developing countries form cartels for key raw materials: bauxite, manganese, tin, and chromium (Scenario A). | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 171. OPEC dissolves (Scenario A). | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 172. European Community and Japan erect prohibitive trade and investment restrictions which effectively deny market access to the United States (Scenario D). | X | X | X | X | X | X | X | X | | | X | | |
| 174. United States and other developed countries negotiate multilateral agreements with LDC's, assuring access to raw material supplies for consumer nations and stable export earnings for producing nations. (Scenario R.) | X | X | | | X | X | | | X | X | | X | X |
| 190. European Community (EC) achieves a monetary union with currency parities established by the Council and further fluxuations are controlled by a Central European Bank. | X | | X | | | | | | | | | | |
| 191. EC negotiates a series of preferential trade agreements with OPEC countries embodying preferred EC access to OPEC crude oil at below world prices and OPEC discrimination in favor of EC exports, in exchange for EC technology, technical assistance, and lower tariffs on OPEC manufactured products. | X | X | X | X | | | | | | | | | |
| 192. EC cohesion diminishes as monetary cooperation--the joint float--fails, the Commission loses all initiative, and the customs union dissolves, as EC members unilaterally raise tariffs against each other's exports. | X | X | X | X | | | | | | | | | |
| 193. Communist parties in Italy, Spain, Portugal, and France become dominant forces in left-of-center governing coalitions, and the labor Party in the United Kingdom comes under control of its left wing. | X | X | X | X | | | | | | | | | |
| 194. The EC expands to include, as formal members, Portugal, Spain, Greece, Austria, Switzerland, Yugoslavia, and Norway. | X | X | X | | | | | | | | | | |
| 195. The OECD financial support fund becomes operational, lending at low interest rates to any OECD country suffering balance of payments deficits from petroleum imports. | X | X | X | | | | | | | | | | X |
| 196. OECD negotiates a mandatory code of conduct for multinational corporations assuring national treatment for all MNC's, protection against expropriation, and forced modification of agreements, and prohibiting political activity by MNC's. | | | X | | | | X | | | | | | |
| 197. Development of North Sea oil and natural gas, and further growth in nuclear power in France, The United Kingdom, Italy, and West Germany enable Europe to supply 65 percent of its energy needs. | X | X | X | | | | | | | | | | X |
| 198. The United Kingdom and France establish currency controls to stem the flow of investment funds to other developed and underdeveloped countries. | | | | X | | | | | | | | | |
| 199. The Conference on International Economic Cooperation (CIEC) negotiates a broad agreement on debt relief for LDC's involving forgivness of external debt to DC governments in exchange for assurances on access to LDC raw materials. | | | | | | | | | X | | | X | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE INTERNATIONAL VARIABLES (Cont.)

| EVENT \ VARIABLE | U.S. Exports to European Community | U.S. Imports from European Community | U.S. Investment to European Community | U.S. Investments from European Community | U.S. Exports to Japan | U.S. Imports from Japan | U.S. Investments to Japan | U.S. Investments from Japan | U.S. Exports to Latin America | U.S. Imports from Latin America | U.S. Investments to Latin America | Latin American External Debt to United States | OPEC Prices |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200. GATT negotiations result in a system of DC preferences for LDC exports and a new GATT organization governing DC-LDC trade, which links level of tariff preference to level of LDC development. | | | | | | | | | | X | | X | |
| 201. Latin American governments adopt legislation to acquire majority ownership of all multinational corporations (MNC's) to export at least one-third of their production, to limit MNC's repartition of capital, and to require all locally produced goods to contain 75 percent local content. | | | X | | | | | | X | X | X | | |
| 202. Latin American Economic System (SELA) achieves increased regional economic cooperation throughout Latin America, including a customs union, common Latin American positions on MNC's, tariff preferences, and commodity trade, and successfully promotes specific interregional economic projects in areas such as energy, raw material development, and transportation. | | | | | | | | | X | X | X | | |
| 203. Venezuelan public investments total $37 billion, principally for expansion of steel and aluminum making, shipbuilding, hydroelectric power, petroleum, and petrochemical production capacity. | | | | | | | | | X | X | X | X | |
| 204. Brazil invests $70 billion on major development projects for energy, minerals, new agricultural lands, steelmaking, hydroelectric power, and transportation. | | | | | | | | | X | X | X | X | |
| 205. Latin American governments completely liberalize their trade and investment controls over imports of goods and capital. | | | X | X | | | X | X | X | | X | X | |
| 206. Escalating guerrilla warfare and radicalization of Latin American governments lead to expropriation of financial assessments and renunciation of debts to developed countries. | | | | | | | | | | | X | X | |
| 207. Mexico and Brazil, with significant offshore oil production, join OPEC. | | | | | | | | | X | | X | X | |
| 208. Venezuela withdraws from OPEC. | | | | | | | | | | X | | | X |
| 209. The Japanese Socialist Party and the Japanese Communist Party gain politically at the expense of the Liberal Democrats and become dominant elements in a governing coalition. | | | | | X | | X | X | | | | | |
| 210. Completion of a Treaty of Peace and Friendship with the PRC leads to very large Japanese investments in Tai oil reserves and annual purchases of more than 60 million tons of crude oil from the PRC. | | | | | | | | X | | | | | |
| 211. Settlement of the Kuril Islands dispute with the Soviet Union is followed by very large Japanese investments in Siberian raw material development--oil, gas, and lumber primarily--including Japanese construction of a pipeline from Tyumen oil fields with Soviet repayment in crude oil. | | | | | | | | X | | | | | |
| 213. Japanese completely liberalize trade and investment restrictions on imports of goods and capital. | | | | | X | | X | | | | | | |

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Table 1 (Cont.)

EVENTS USED TO IMPACT THE INTERNATIONAL VARIABLES (Cont.)

| EVENT \ VARIABLE | U.S. Exports to European Community | U.S. Imports from European Community | U.S. Investment to European Community | U.S. Investments from European Community | U.S. Exports to Japan | U.S. Imports from Japan | U.S. Investments to Japan | U.S. Investments from Japan | U.S. Exports to Latin America | U.S. Imports from Latin America | U.S. Investments to Latin America | Latin American External Debt to United States | OPEC Prices |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 214. Japanese government adopts controls on the export of capital. | | | | | | | | X | | | | | |
| 215. Japan and the EC become involved in a trade war involving competitive devaluations of currency, trade, and investment restrictions. | X | X | | | X | X | | X | | | | | |
| 216. Japan enters preferential trade agreements, embodying preferred access to markets and raw materials, and technology transfer, with certain LDC/s, including Brazil, Mexico, and Venezuela. | | | | | X | X | X | X | X | X | | | |
| 217. Japanese programs to stimulate technological innovation achieve technological parity or superiority in data processing, electric automobiles, and pollution abatement equipment. | X | | | | X | X | X | X | X | | | | |
| 218. The International Energy Agency (IEA) becomes a permanent organization with authority over an IEA oil stockpile, compulsory sharing of oil during emergencies, OECD-wide energy conservation and R&D, and an OECD oil price floor to encourage new investments. | | | | | | | | | | | | | X |
| 219. OPEC countries increase their long-term, direct investment in developed countries to the level of one-half their annual surplus. | | | | | | | | | | | | | X |
| 220. OPEC countries continue to spend large portions of oil revenues on imports of products and technology. | | | | | | | | | | | | | X |
| 221. A formal settlement between Israel and the Arab countries (Egypt, Syria, and Jordon) is achieved, embodying guarantees of Israeli security, border adjustments, and resolution of the Palestinian issue. | | | | | | | | | | | | | X |
| 222. Conflict again erupts between Israel and the Arab states, with further Israeli occupation and diplomatic/strategic stalemate. | | | | | | | | | | | | | X |
| 223. War among the Arab states breaks out, pitting the front line states against Iraq, Libya, and the Palestinians. | | | | | | | | | | | | | X |
| 224. The IEA and OPEC agree to an indexation plan for linking crude oil prices to general level of inflation in manufactured products. | | | | | | | | | | | | | X |
| 225. North Sea, Mexican, and PRC oil enter world markets in large volumes, causing OPEC exports to fall to 20 million barrels per day or less. | | | | | | | | | | | | | X |

# 3. REFERENCES FOR KEY AND NAS EVENTS

The following references are given for key and NAS events. The references contain relevant background material for each of these events. The literature is suggestive of the potential trends and occurrences which underlie the event statements. In general, because the literature did not always provide a succinct statement of an event, the specific event statements were formulated by The Futures Group staff. Thus, while the events were suggested by the literature, they were phrased by the staff to give the specificity and quantification necessary to evaluate their impacts.

*Event 1: Establishment of 10 new resorts comparable to Disney World.*

Gobben G. Greer, "Super Colossal Amusement Parks: America's 15 Best," Better Homes and Gardens (August 1974).

*Event 7: Federal guidelines are developed to serve as a voluntary framework for planning population distribution among the various states and regions.*

Population and the American Future: The Report of the Commission on Population Growth and the American Future to the President (March 1972). This event appears as one of the Commission's recommendations on p. 120.

*Event 10: New cities are developed proximate to natural resources.*

Population and the American Future: The Report of the Commission on Population Growth and the American Future to the President (March 1972). This report examines the relationship of population distribution to land use planning. In The Futures Group report, A Technology Assessment of Geothermal Energy Resource Development prepared for the National Science Foundation (April 15, 1975), p. 4.6 contains a discussion of the growth of new cities at geothermal energy sites.

*Event 11: Use of telecommunications reduces the amount of all travel by 20 percent.*

James Martin, Future Developments in Telecommunications (Englewood Cliffs, NJ: Prentice-Hall, 1971); Charlton R. Price, Conferencing Via Computer, Innovation and Information Analysis Project, Program of Policy Studies in Science and Technology (Washington, DC: George Washington University, 1974).

*Event 13: The marriage rate declines to 8 per 1000 population (a little over 10 per 1000 population in 1975).*

Alan C. Kerckhoff, "Patterns of Marriage and Family Formation and Disillusion," Journal of Consumer Research, Vol. 2 (March 1976); A. J. Morton and P. C. Glick, "Marital Instability: Past, Present, and Future," Journal of Social Issues, Vol. 32, No. 1 (1976).

*Event 23: Synthetic gas from coal is commercially available.*

"Coal Research (II): Gasification Faces an Uncertain Future," Science (August 27, 1976); "Synthetic Fuel from Coal," Federal Energy Administration Project Independence Blueprint Final Task Force Report (Washington, DC: U.S. Department of the Interior, November 1974).

*Event 30: Offshore terminals and refineries are established on the East Coast to provide a capacity approaching area demand for oil products.*

Department of Planning and Energy Policy, State of Connecticut, Report of the Governor's Task Force on Oil Refineries (January 6, 1975).

*Event 34: The Atlantic outer continental shelf produces 1 million barrels of oil per day.*

Don E. Kash et al., Energy under the Oceans (Norman, OK: University of Oklahoma Press, 1973). This volume contains a technology assessment of the outer continental shelf for oil and gas operations.

*Event 40: Coal and nuclear stations contribute 75 percent of electrical energy.*

Federal Energy Administration, Project Independence: A Summary (Washington, DC: U.S. Government Printing Office, November 1974). This report discusses the outlook for various fuels under a number of assumptions. One scenario (p. 45) shows coal and nuclear sources to be 74 percent of electric generation inputs in 1985.

*Event 42: Non-petroleum sources of primary power for ground transportation (storage batteries, fuel cells, electromagnetic propulsion and the like) account for one-quarter of the transportation energy demand.*

Douglas G. Harvey and W. Robert Menchen, The Automobile, Energy and the Environment: A Technology Assessment of Advanced Automobile Propulsion Systems (Columbia, MD: Hittman Associates, Inc., March 1974).

*Event 45: A national program for raw material resource rationing is established.*

Hans H. Lansberg, Natural Resources for U.S. Growth: A Look Ahead (Baltimore, MD: Johns-Hopkins University Press, 1964). This monograph reviews the long-term adequacy of U.S. resources and discusses the major issues in resource policy. Eugene M. Cameron (ed.), The Mineral Position of the United States, 1975-2000 (Madison, WI: University of Wisconsin Press, 1973). This report examines the relationship of demand to production in the United States in the light of expressed concern over this country's mineral situation.

*Event 46: Environmentally acceptable pest control fails to provide adequate crop protection.*

C. Djerassi, C. Shih-Coleman, and J. Dickman, "Insect Control of the Future: Operational and Policy Aspects," Science (November 15, 1974); this article suggests that unless certain policies are implemented it is unlikely that there will be any new approaches to insect control in the next decade. "Cosmetic Standards: Are Pesticides Overused for Appearances Sake?" Science (August 27, 1976).

*Event 47: More than 10,000 miles of the interstate highway system are electrified and automated to accommodate dual-mode automobiles.*

Jon E. Burkhardt et al., Project Metran: An Integrated Evolutionary Transportation System for Urban Areas, MIT Report 8 (Cambridge, MA: Massachusetts Institute of Technology, Spring 1966); Daniel Brand, "Bringing Logic to Urban Transportation Innovation," MIT Technology Review (January 1976).

*Event 51: Developing countries form cartels for key raw materials: bauxite, manganese, tin, and chromium.*

Nathaniel Leff, "The New Economic Order--Bad Economics, Worse Politics," Foreign Policy, No. 24; James Theberge, "Raw Materials," Foreign Policy, No. 17; Fred Bergsten, "The Response to the Third World," Foreign Policy, No. 17; Thierry de Montbriad, "For a New World Economic Order," Foreign Affairs, Vol. 54, No. 1 (October 1975); Council on International Economic Policy, Special Report: Critical Imported Materials (Washington, DC: December 1974).

*Event 53: Capital resources are not able to meet long-term investment needs of industry.*

R. V. Ayres, "Macroeconomic Issues Through the Year 2000," Technology Assessment of Future Intercity Passenger Transportation Systems, Vol. 2 (March 1976); T. Gaines, Economic Report: Financial Implications of Material Shortages (New York: Manufacturers Hanover Trust, November 1973).

*Event 54: The DOD budget increases to at least 50 percent of the Federal budget (about 27 percent in 1975).*

"Toward a New Consensus in U.S. Defense Policy," in H. Owen and C. L. Schultze (eds.), Settling National Priorities (Washington, DC: Brookings Institution, June 1976). This chapter contains a general discussion of expected defense requirements for the next decade.

*Event 55: Wage, price, profit, and interest rate controls are permanently established.*

Crawford D. Goodwin (ed.), Exhortation and Controls/Search for a Wage Price Policy 1945-1971 (Washington, DC: Brookings Institution, 1975); J. Kraft and B. Roberts (eds.), Wage Price Controls: Essays on the U.S. Experiment (New York: Praeger Publishers, Inc., 1975); R. J. Gordon, "Response of Wages and Prices to the First Two Years of Controls," Brookings Papers on Economic Activity, Vol. 3 (Washington, DC: Brookings Institution, 1973).

*Event 56: One half of consumer durables are fabricated using recycled materials.*

The Bulletin of the National Center for Resource Recovery, published quarterly, is devoted to the potentials which may be realized from solid waste management and solid waste recycling programs (Washington, DC).

*Event 57: Ten billion dollars per year of government funds are devoted to urban transit system development (approximately $2 billion in 1974).*

American Public Transit Association, "Transit Fact Book" (Washington, DC: March 1976); Executive Office of the President, The Budget of the U.S. Government, Fiscal 1976 (Washington, DC: 1976).

*Event 59: A publicly owned petroleum company is established that supplies 20 percent of the domestic market.*

Norman Medvin, The Energy Cartel (New York: Vintage Books, 1974); Robert Sherrill, "Breaking Up Big Oil," New York Times Magazine (October 3, 1976).

*Event 63: R&D spending in the United States increases from the 1974 level of 2.5 percent to 5 percent of GNP.*

"Research and Development in Industry," U.S. National Science Foundation Annual (1973); Keith Norris and John Vaize, The Economics of Research and Technology (London: George Allan and Unwin, Ltd., 1973).

*Event 65: The transportation, communication, and energy industries become either public or quasi-public enterprises.*

John Kenneth Galbraith, Economics and the Public Purpose (Boston, MA: Houghton Mifflin Co., 1973). In a chapter titled "The Socialist Imperative" there is a discussion of the formation of public enterprises resulting from deficiencies in the market system in relation to the planning system.

*Event 67: The prices of all prime energy sources are totally deregulated.*

H. H. Heldling and J. E. Turky, "Oil Price Controls: A Counterproductive Effort," Federal Reserve Bank of St. Louis Review (November 1975); J. Hausman, "Project Independence Report: An Appraisal of U.S. Energy Needs Up to 1985," Bell Journal, Vol. 1, No. 2 (Autumn 1975); T. MacAvoy and R. Pindyck, "Alleviation Regulatory Policy of Dealing with the Natural Gas Shortage," Bell Journal, Vol. 4, No. 2 (August 1973).

*Event 75: A national program of socialized medicine is established.*

Alice M. Rivlin, "Agreed: Here Comes a National Health Insurance," New York Times Magazine (July 21, 1974); "National Health Insurance: Reassurance from the Left," Medical Economics (June 9, 1975); H.R. 21: A Bill To Create a National System of Health Security, the most important bill introduced into the House by Rep. Corman; Joseph P. Newhouse, Charles E. Phelps, and William B. Schwartz, Policy Option and the Impact of National Health Insurance (Santa Monica, CA: Rand Corporation, June 1974).

*Event 76: A land-use bill that required states to develop Federally approved zoning plans is passed.*

Stephen S. Ross, "Land Use: Federal and State Initiatives," Land Use Planning Abstracts (New York: Environment Information Center, Inc., 1974); E. W. Ingraham, "Lead Time for Assessing Land Use: A Case Study," Science (October 1, 1976). This article describes the possibilities for land planning in a small area of the western United States; Noreen Lyday, "The Law of the Land: Debating National Land Use Legislation 1970-1975" (Washington, D.C., The Urban Institute, 1976)

*Event 77: Congress enacts a new tax on goods and services proportional to their environmental impact, allocating these funds for environmental improvements.*

James Griffin, "Environmental Quality and Rising Energy Needs: A Collision Course?" in Gerald M. Bannon (ed.), Studies in Energy Tax Policy (Cambridge, MA: Ballinger Publishing Co., 1975).

*Event 78: Federal funds for community development to revitalize cities increase threefold over the 1975 level (community development funds totaled $3.2 billion in 1975).*

Juan D. deTorres, Government Services in the Major Metropolitan Areas (New York: The Conference Board, Inc., 1972); contains outlays for community development in the budget of the United States Government; published annually.

*Event 82: A progressive tax is imposed on all energy usage with the proceeds funneled into energy production and conservation R&D programs.*

Kent P. Anderson, Some Implications of Policies To Stem the Growth of Electricity Demand in California, Report R-990-NSF/CSA (Santa Monica, CA: Rand Corporation, December 1972). This report raises the possibility of a tax large enough to impact on electricity demand growth with the revenues to be applied to energy conservation programs. Gerald M. Brannon (ed.), "Tax Policies To Modify Energy Consumption Patterns," in Studies in Energy Tax Policy (Cambridge, MA: Ballinger Publishing Co., 1975).

*Event 84: Federal Government assumes full responsibility for all public aid payments.*

Richard P. Nathan, "Intergovernmental Relations in the Year 2000," in Harvey S. Perloff (ed.), The Future of the United States Government (New York: George Braziller, Inc., 1971).

*Event 89: Federal funds are withheld in order to stop urban expressway construction.*

Victor K. McElheny, "Transportation Sociology," MIT Technology Review (Cambridge, MA: Massachusetts Institute of Technology, May 1973).

*Event 93: The Federal Government attempts to restrict the size of the labor force by adopting policies to encourage early retirement of higher levels of public education.*

M. W. Riley et al., Aging and Society; Vol. 3: A Sociology of Age Stratification (New York: Russell Sage Foundation, 1972). Chapter 5 contains a discussion of the problems of removing people from the work force.

*Event 94: Twenty-five percent of the work force does not work the standard five-day, forty-hour week.*

John D. Owens, "The Assessment of Alternative Work Schedules," presented at the AAAS Meeting, New York, January 28, 1975.

*Event 95: Half of all U.S. employees have 30 days of work vacation and 15 scheduled holidays.*

Mitchell Meyer and Harland Fox, Profile of Employee Benefits (New York: The Conference Board, 1974). This report contains a discussion of vacation and holiday benefits among U.S. employees.

*Event 96: Fifty percent of assembly-line production is controlled by computers.*

Herman W. Meyer and Marinus Jensen, "Development of an Online Manufacturing System," ISA Transactions, Vol. 10, No. 2 (1971); "Group Technology ...What Role for Robots?" Datamation (August 1973); "Computer-Aided Manufacturing: The Cutting Edge in the Push for Higher Productivity," Product Engineering (June 1973).

*Event 97: Middle-class attitudes toward work are challenged by the rise in avocational interests, resulting in decreased demands for career advancement opportunities.*

Albert H. Cantril and Charles W. Roll, Jr., "Hopes and Fears of the American People," The Quality of Life Concept Symposium (Warrenton, VA: Airlie House, August 1972).

*Event 100: Coal production fails to reach currently projected levels because of labor problems, inadequate transportation, and environmental constraints.*

Department of the Interior, Final Report of the Interagency Coal Task Force to the Federal Energy Administration Project Independence Blueprint (Washington, DC: U.S. Government Printing Office, November 1974). Chapter 6 contains a discussion of potential constraints.

*Event 111: Automated individual instruction is introduced at all educational levels.*

James Martin and Adrienne E. D. Norman, The Computerized Society (Englewood Cliffs, NJ: Prentice-Hall, 1970). This book contains a chapter on teaching with computers.

*Event 123: Conservation efforts, using developed technologies (to achieve increases in thermal efficiencies, reductions in heat losses, the productive use of waste heat, etc.) reduce petroleum consumption by 20 percent.*

Lee Schipper and Allan J. Lichtenberg, "Efficient Energy Use and Well-Being: The Swedish Example," Science, Vol. 194, No. 4269 (December 3, 1976).

*Event 124: Increased exploration and drilling activities double the rate of discovery of onshore and offshore petroleum reserves.*

National Petroleum Council, U.S. Energy Outlook: Oil and Gas Availability (Washington, DC: 1973), Chapter 1.

*Event 151: Corporate income tax rate is reduced by 50 percent from 1975 levels.*

Joseph A. Pechman, Federal Tax Policy, rev. ed. (New York: W. W. Norton and Co., 1971); Tilford Gaines, "What Should We Do Now?" Manufacturers Hanover Trust Economic Report (New York: 1975); J. Shoven and J. Vulow, "Inflation Accounting and Non-Financial Corporate Profits, Financial Assets and Liabilities," Brookings Papers on Economic Activity, Vol. 1 (Washington, DC: Brookings Institution, 1976)

*Event 152: Federal reserve adopts constant growth policy as regards the monetary aggregates (i.e., $M_1$ grows at 6 percent) and thus dispenses with monetary policy as a discretionary tool, and the Federal budget is balanced.*

Milton Friedman, "A Monetary and Fiscal Framework for Economic Stability," American Economic Review, Vol. 38 (June 1948); Karl Burnner, "The Role of Money and Monetary Policy," Federal Reserve Bank of St. Louis Review (St. Louis, MO: Federal Reserve Bank of St. Louis, July 1968).

*Event 153: Costs for electric system equipment accelerate at 10 percent above the general inflation rate.*

Donald H. Saunders and Paul G. Busby, "Accounting for Inflation: To Be or Not To Be?" Public Utilities Fortnightly, Vol. 97, No. 3 (June 29, 1976).

*Event 154: The cost of fossil energy rises to $20 per barrel in real terms.*

International Conditions Section, Affective Future Scenarios for the National Aviation System. The event is based on the TIA analysis for estimated landed cost in the United States of imported crude petroleum from Saudi Arabia.

*Event 155: Pollution abatement requirements are allowed to be dependent on industrial and economic growth.*

"The Economic Impact of Pollution Control: A Summary of Recent Studies," prepared for the Council on Environmental Quality, Department of Commerce, and the Environmental Protection Agency (Washington, DC: March 1972).

*Event 171: OPEC dissolves.*

James E. Akins, "The Oil Crisis: This Time the Wolf Is Here," Foreign Affairs, Vol. 51, No. 3 (April 1973); Amory B. Lovins, "Energy Strategy: The Road Not Taken?" Foreign Affairs, Vol. 55, No. 1 (October 1976); Thomas Enders, "OPEC and the Industrial Countries: The Next Ten Years," Foreign Affairs, Vol. 53, No. 4 (July 1975).

*Event 172: European Community and Japan erect prohibitive trade and investment restrictions which effectively deny market access to the United States.*

Alastair Buckan, Europe's Futures, Europe's Choices (New York: Columbia University Press, 1969); David Calleo, "The European Coalition in a Fragmenting World," Foreign Affairs, Vol. 54, No. 1 (October 1975); Frank Gibney, Japan: The Fragile Super Power (Tokyo: E. Tuttle Company, 1975).

*Event 174: United States and other developed countries negotiate multilateral agreements with LDC's, assuring access to raw material supplies for consumer nations and stable export earnings for producing nations.*

Secretary Kissinger, "Energy, Raw Materials, and Development: The Search for Common Ground," presented before the Conference on International Economic Cooperation, December 16, 1975; and "UNCTAD IV: Expanding Cooperation for Global Economic Development," presented before the United Nations Conference on Trade and Development, May 6, 1976; Brookings Institution, Tripartite Report, Trade in Primary Commodities: Conflict or Cooperation (Washington, DC: 1974).

*Event 181: An indexing system for all wages, prices, interest rates, and profits is established.*

For a balanced treatment of pros and cons see Jai-Hoon Yang, "The Case for and against Indexation: An Attempt at Perspective," Federal Reserve Bank of St. Louis Review, Vol. 56, No. 10 (October 1974).

For historical treatment see Thomas M. Humphrey, "The Concept of Indexation in the History of Economic Thought," Federal Reserve Bank of Richmond Economic Review, Vol. 60 (November-December 1974).

*Event 182: Accelerated depreciation allowances are approved and become law (20 percent increase over 1975 levels).*

Joseph A. Pechman, Federal Tax Policy, rev. ed. (New York: W. W. Norton & Company, Inc., 1971); Henry J. Aaron, Inflation and the Income Tax (Washington, DC: Brookings Institution, 1976).

*Event 184: Corporate profits distributed as dividends are no longer taxed.*

Joseph A. Pechman, Federal Tax Policy, rev. ed.; Henry J. Aaron, Inflation and the Income Tax.

*Event 185: In order to improve municipal finance conditions, Federally subsidized municipal securities are established and issued.*

Richard Rosenbloom, "A Review of the Municipal Bond Market," Federal Reserve Bank of Richmond Economic Review, Vol. 62, No. 2 (March-April 1976); Richard A. Debs, "New York City's Economy--Some Long-Term Issues: Remarks," Federal Reserve Bank of New York Monthly Review, Vol. 57, No. 11 (November 1975).

*Event 191: The European Community negotiates a series of preferential trade agreements with OPEC countries embodying preferred EC access to OPEC crude oil at below world prices and OPEC discrimination in favor of EC exports, in exchange for EC technology, technical assistance, and lower tariffs on OPEC manufactured products.*

David Calleo, "The European Coalition in a Fragmenting World," Foreign Affairs, Vol. 54, No. 1 (October 1975); James Chan and Earl Ravonal (eds.), Atlantis Lost: U.S.-European Relations After the Cold War (New York: New York University Press, 1976); Charles Gati, "The Forgotten Region," Foreign Policy, No. 19 (Summer 1975).

*Event 197: Development of North Sea oil and natural gas and further growth in nuclear power in France, the United Kingdom, Italy, and West Germany enable Europe to supply 65 percent of its energy needs.*

The International Research Group, Energy: The Recent Crisis and the Future Prospects for the EC (European Community) and Japan, done on contract for FEA (1974); Commission of the European Communities, Energy for Europe: Research and Development (Brussels: May 1974); Thomas Enders, "OPEC and the Industrial Countries: The Next Ten Years," Foreign Affairs (July 1975); Henri Simonet, "Energy and the Future of Europe," Foreign Affairs (April 1975).

*Event 206: Escalating guerrilla warfare and a radicalization of Latin American governments leads to expropriation of foreign assets and renunciation of debts to developed countries.*

David Fromkin, "The Strategy of Terrorism," Foreign Affairs (July 1975); Abraham Lowenthal, "The United States and Latin America: Ending the Hegemonic Presumption," Foreign Affairs (October 1976); Karl Schmitt and David Bucks, Evolution or Chaos (New York: Praeger, 1963); Arpud Von Lazar and Robert Kaufman, Readings in Latin American Politics (Boston, MA: Allyn and Bacon, 1969).

*Event 207: Mexico and Brazil, with significant offshore oil production, join OPEC.*

Dankwart Rustow and John Mugno, OPEC: Success and Prospects (New York: New York University Press, 1976); Fernando Pedreira, "Decompression in Brazil?" Foreign Affairs (April 1975); Abraham Lowenthal, "The United States and Latin America," Foreign Affairs (October 1976).

*Event 208: Venezuela withdraws from OPEC.*

Theodore Moran, "Why Oil Prices Go Up; OPEC Wants Them," Foreign Policy, No. 25 (Winter 1976); Norman Galli, "The Challenge of Venezuelan Oil," Foreign Policy, No. 18 (Spring 1975); Joseph Jager and Eleanor Steinberg, Energy and U.S. Foreign Policy (Cambridge, MA: Ballinger, 1974).

*Event 210: Completion of a Treaty of Peace and Friendship with the PRC leads to very large Japanese investments in Taiching oil reserves and annual purchases of more than 60 million tons of crude oil from the PRC.*

Choon-ho Pack and Jerome Alan Cohen, "The Politics of China's Oil Weapon," Foreign Policy, No. 20 (Fall 1975); Alexander Eckstein, "China's Trade Policy and Sino-American Relations," Foreign Affairs (October 1975); Kazuskige Hirasawa, "Japan's Emerging Foreign Policy," Foreign Affairs (October 1975); Joint Economic Committee, Soviet Economic Prospects for the Seventies (Washington, DC: U.S. Government Printing Office; 1973).

*Event 211: Settlement of the Kuril Islands dispute with the Soviet Union is followed by very large Japanese investments in Siberian raw material development--oil, gas, and lumber primarily--including Japanese construction of a pipeline from Tyumen oil fields with Soviet repayment in crude oil.*

Ibid.

*Event 213: Japanese completely liberalize trade and investment restrictions on imports of goods and capital.*

Frank Gibney, Japan: The Fragile Super Power (Tokyo: Charles E. Tuttle Company, 1975); David Calleo and Benjamin Rowland, America and the World Political Economy (Bloomington, IN: Indiana University Press, 1973); Edwin Reischauer, The United States and Japan (New York: Viking Press, 1965).

*Event 217: Japanese programs to stimulate technological innovation achieve technological parity or superiority in data processing, electric automobiles, and pollution abatement equipment.*

U.S. Department of Commerce, Technology Enhancement Programs in Five Foreign Countries (Washington, DC: 1972).

*Event 220: OPEC countries continue to spend large portions of their oil revenues on imports of products and technology.*

Dankwart Rustow and John Mugno, OPEC: Success and Prospects (New York: New York University Press, 1976); Joseph Jager and Eleanor Steinberg, Energy and U.S. Foreign Policy (Cambridge, MA: Ballinger, 1974); Thomas Enders, "OPEC and the Industrial Countries: The Next Ten Years," Foreign Affairs (July 1975).

*Event 224: The International Energy Association and OPEC agree to an indexation plan for linking crude oil prices to general level of inflation in manufactured products.*

Thierry de Montbriad, "For a New World Economic Order," Foreign Affairs (October 1975); Tom Fares, "The United States and the Third World: A Basis for Accommodation," Foreign Affairs (October 1975); Jahangir Amuzegar, "The North-South Dialogue: From Conflict to Compromise," Foreign Affairs (April 1976).

*Event 225: North Sea, Mexican, and PRC oil enter world markets in large volumes, causing OPEC exports to fall to 25 million barrels per day or less.*

Khodadad Farmanfarmaian et al., "How Can the World Afford OPEC Oil?" Foreign Affairs (January 1975); Thomas Enders, "OPEC and the Industrial Countries: The Next Ten Years," Foreign Affairs (July 1975); Theodore Moran, "Why Oil Prices Go Up: OPEC Wants them," Foreign Policy, No. 25 (Winter 1976).

# 4. CROSS-IMPACT ANALYSIS

## Introduction--Methodology

One important consideration in constructing scenarios is that the characteristics of the events which significantly shape each scenario, and which result from it, should be consistent. Unless care is taken, events which are described in the narratives easily can be mutually exclusive. In other terms, the likelihoods of occurrence of the events should be consistent with the sense of the scenario. And the likelihood of one event should be consistent with the likelihoods of all other events for each scenario.

In this study, cross-impact analysis[1] (developed initially by Gordon and Helmer in the late 1960's and used by many industrial concerns) was employed to ensure that the consistency was maintained among the likelihoods of the key and NAS events. This analytic technique is based upon the premise that the occurrence (or non-occurrence) of an event will influence the likelihood (or probabilities of occurrence) of other events. Certain events, by their occurrence, make it impossible for other events to occur. If Mr. Jones is not nominated for President he will not be elected. Conversely,

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[1] T. J. Gordon and H. Hayward, "Initial Experiments with the Cross-Impact Matrix Method of Forecasting," Futures, Vol. 1, No. 2 (December 1968), pp. 100-116; T. J. Gordon, "Cross-Impact Matrices: An Illustration of Their Use for Policy Analysis," Futures, Vol. 1, No. 6 (December 1969), pp. 528-531; T. J. Gordon and H. S. Becker, "The Use of Cross-Impact Matrix Approaches in Technology Assessment," in M. J. Cetron and B. Bartocha (eds.), The Methodology of Technology Assessment (New York: Gordon and Breach, 1972), pp. 127-136; T. J. Gordon and H. S. Becker, "Analysis of Ailing Products --It's Decisions That Count: A Case Study of R&D Decision Methodology," presented at the Industrial Research Institute (Glastonbury, CT: The Futures Group, October 1971; revised February 1972).

the occurrence of certain events makes other possibilities more likely than they otherwise would have been. Increases in crude oil prices by OPEC are likely to increase inflation rates in the United States, at least in the near term.

Several specific and often thought-provoking steps are required to complete a cross-impact analysis:

1. Listings of events which might occur during the time period of interest and which are believed to be important to the specific problem under consideration (in this case important to the shape of parameters or trend curves depicting socio-economic conditions for each of the scenarios).

2. Estimating the probability of occurrence of each event during the time period of interest (e.g., by 1990 for each scenario).

3. Estimating how the occurrence (or non-occurrence) of each event in the selected set will affect the probability of occurrence of all other events (i.e., completing the non-impact matrix[2]).

4. Using the cross-impact matrix, or model, resulting from the above estimates and adjusting the event probabilities (from step 2) or the conditional probabilities (from step 3) where inconsistencies exist.

A fifth step is often employed to assess the likely effect of contemplated policies on the probabilities of all the events in the set. This step is used to assist in policy formulation and choice. Indeed this aspect of policy analysis is one of the major reasons for employing cross-impact analysis. In this step candidate policies are formulated. In one method of analysis, the policies might be treated as events. As such they would be included into the above process. The other analytic approach is to estimate

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[2]In the matrix the entry in a cell represents the probability of occurrence of the event listed at the head of that column under the presumption that the event in that row has occurred.

how each policy might affect the probabilities of each of the events (i.e., adjustments would be made to the probabilities prepared in step 2. The matrix then would be used (as described in the references) to determine what the event probabilities would be in light of the coupling or cross-impacts among events due to the estimates of the conditional probabilities from step 3. It is this latter method of using cross-impact analysis which is recommended when policy analysis is the basic focus of the research.

But as noted earlier in this study, the technique was employed here to improve the consistency among the probabilities of occurrence of each of the events for the scenarios which were being investigated. This discipline was brought to bear because of the relationships among mutually dependent events that must be explored when cross-impact analysis is applied. For example, limits exist on the conditional probabilities (from step 3) of mutually likely events. Having once decided upon the likely probability (from step 2) of the two mutually probable events, upper and lower limits exist for the probability of occurrence of one event under the assumption that the other is certain to occur (or not to occur). Indeed, such limits have long been recognized by statistical theory. In simplified form they can be described as follows.

As probability of occurrence represents the number of times in alternative future worlds in which an event may occur, we can view the limits on the mutual occurrence of two probabilistic events in terms of the maximum and minimum coincidence of their occurrence in such future worlds. If we have two events, the first with a probability of 80 percent and the second 40 percent, the maximum coincidence in their occurrence results when four out of the ten times the second event can occur happens in those eight worlds when the first event is anticipated to occur.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ← Potential "Future Worlds" |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $P_1$ = 0.80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| $P_2$ = 0.40 | 2 | 2 | 2 | 2 | | | | | | | ← Maximum Coincidence |
| | | | | | | | 2 | 2 | 2 | 2 | ← Minimum Coincidence |

The minimum likelihood of occurrence of the second event if the first occurs exists when the worlds in which the latter does not occur are completely occupied by the second event with the remaining chances for occurrence of the second event happening in coincidence with the first. In this case, two out of the ten times the second event can occur it does so in worlds which do not include the first event, leaving two of eight times when they can occur jointly. These limiting conditions can be expressed mathematically:

If $E_1$ occurs:

Minimum probability of $E_2$ = 2/8 (0.25)

$$P_{max} = \frac{P_2 - (1 - P_1)}{P_1} \quad (\geqslant 0)$$

If estimates are made of conditional probabilities which lie behind these limits, clearly one of the estimates is irrational. Hence, one can then reassess the probabilitites assigned to each of the events or to the conditional probability and adjust one or all of those estimates accordingly.

Additional insights become available which also are directly pertinent to real world planning. These relate to the improved ability to view which events from a set of probable events are truly worthy of further consideration. Once a cross-impact matrix has been constructed it is easy to scan the rows and columns to determine whether or not an individual event will cause significant changes in the likelihood of the others if

it were to occur.[3] Conversely, it is easy to view from such estimates where events are highly reactive to the occurrence of other events. If items are not influential or do not respond to other eventualities, one becomes hard pressed to rationalize a need for their continued consideration. Hence, cross-impact analysis illuminates which events are the actors (or big swingers) and which are the reactors in the play.

As noted earlier, it is not unusual for estimates of conditional probability to lie outside of the limits. This situation occurred in a few instances in this study, based upon the initial estimates of event probabilities that were made by the study team. Of course, when such a situation arises the estimator is forced to re-evaluate <u>all</u> his estimates. The initial probabilities (from step 2) of the mutually likely events should be reassessed along with the conditional probabilities (from step 3). When that is done, a new but now internally consistent view of the future as to the likelihood of important events can be prepared.

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[3]Having obtained such insights and having resolved important discrepancies in event probabilities or in conditional probabilities, the non-occurrence matrix then can be computed from:

$$P_{2,(1)} = \frac{P_2 - (P_1 \times P_{2,1})}{1 - P_1} \qquad (0 \leqslant P_{2(1)} \leqslant 1)$$

Where $P_1$ = probability of the impacting event in the time period of interest.

$P_2$ = probability of the impacted event in the time period of interest.

$P_{2,1}$ = probability of the impacted event if the impacting event occurs.

$P_{2,(1)}$ = probability of the impacted event if the impacting event does not occur.

Thus the discipline created by cross-impact analysis requires that the thought process be carried one or two steps further than is typical in analyzing events and their probabilities. Such soul searching often illuminates inconsistencies in judgments--judgments frequently applied to making decisions which can prove the difference between realistic and meaningful planning--and in policy analysis.

The results of the cross-impact analysis conducted in the study are shown in Table 1. They represent probabilities of occurrence by 1990 for Scenario R for each of the events shown. The numbers in each cell of the matrix are the conditional probabilities. They designate the probability of occurrence of the event listed at the head of each column under the assumption that the event in the row has occurred. The initial probabilities of each event are listed below the event number at the head of each column.

Mathematical solution of the matrix showed that none of the event probabilities changed by more than a few percent. Comparison of the calibration probabilities, which are found from the solution of the matrix, with the initial probabilities is given in Table 2. The small differences between the calibration probabilities and the event probabilities indicate that all the probability judgments are consistent with each other.

## Insights Obtained from the Cross-Impact Analysis

The study team found a small number of significant inconsistencies in its initial estimates of event probabilities and conditional probabilities. Although the matrix required that 3422 estimates of conditional probabilities be made, in only four cases were significant changes in the estimates of

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Table 1

OCCURRENCE PROBABILITIES

| | | E 1 | E 2 | E 3 | E 4 | E 5 | E 6 | E 7 | E 8 | E 9 | E10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 1 | 0.30 | 0.20 | 0.80 | 0.75 | 0.60 | 0.45 | 0.20 | 0.52 | 0.52 | 0.32 | 0.31 |
| 2 | 0.70 | 0.13 | 0.70 | 0.80 | 0.65 | 0.45 | 0.20 | 0.50 | 0.52 | 0.30 | 0.30 |
| 3 | 0.75 | 0.25 | 0.92 | 0.75 | 0.65 | 0.45 | 0.26 | 0.65 | 0.65 | 0.26 | 0.28 |
| 4 | 0.60 | 0.20 | 0.73 | 0.75 | 0.60 | 0.45 | 0.10 | 0.40 | 0.40 | 0.26 | 0.25 |
| 5 | 0.45 | 0.20 | 0.68 | 0.73 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 6 | 0.20 | 0.22 | 0.70 | 0.75 | 0.55 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 7 | 0.50 | 0.22 | 0.70 | 0.70 | 0.57 | 0.45 | 0.22 | 0.50 | 0.47 | 0.28 | 0.28 |
| 8 | 0.50 | 0*22 | 0.70 | 0.70 | 0.57 | 0.45 | 0.22 | 0.40 | 0.40 | 0.28 | 0.20 |
| 9 | 0.30 | 0.21 | 0.70 | 0.72 | 0.60 | 0.45 | 0.20 | 0.48 | 0.48 | 0.30 | 0.35 |
| 10 | 0.30 | 0.21 | 0.70 | 0.72 | 0.60 | 0.45 | 0.20 | 0.45 | 0.48 | 0.44 | 0.30 |
| 11 | 0.60 | 0.21 | 0.73 | 0.72 | 0.63 | 0.45 | 0.23 | 0.35 | 0.35 | 0.18 | 0.45 |
| 12 | 0.30 | 0.21 | 0.70 | 0.65 | 0.70 | 0.45 | 0.45 | 0.45 | 0.45 | 0.26 | 0.27 |
| 13 | 0.50 | 0.18 | 0.73 | 0.78 | 0.63 | 0.48 | 0.20 | 0.53 | 0.60 | 0.32 | 0.33 |
| 14 | 0.30 | 0.20 | 0.75 | 0.75 | 0.60 | 0.46 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 15 | 0.40 | 0.21 | 0.79 | 0.77 | 0.65 | 0.45 | 0.25 | 0.53 | 0.57 | 0.32 | 0.33 |
| 16 | 0.10 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 17 | 0.10 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.75 | 0.80 | 0.61 | 0.50 |
| 18 | 0.20 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.65 | 0.65 | 0.44 | 0.40 |
| 19 | 0.10 | 0.20 | 0.73 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.20 |
| 20 | 0.40 | 0.20 | 0.70 | 0.65 | 0.60 | 0.45 | 0.20 | 0.65 | 0.65 | 0.34 | 0.50 |
| 21 | 0.30 | 0.13 | 0.72 | 0.70 | 0.57 | 0.45 | 0.17 | 0.25 | 0.30 | 0.15 | 0.25 |
| 22 | 0.15 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 23 | 0.45 | 0.17 | 0.73 | 0.75 | 0.60 | 0.45 | 0.18 | 0.30 | 0.30 | 0.16 | 0.20 |
| 24 | 0.70 | 0.20 | 0.70 | 0.70 | 0.60 | 0.45 | 0.20 | 0.52 | 0.52 | 0.31 | 0.31 |
| 25 | 0.50 | 0.25 | 0.82 | 0.77 | 0.60 | 0.45 | 0.35 | 0.53 | 0.52 | 0.32 | 0.32 |
| 26 | 0.45 | 0.20 | 0.77 | 0.77 | 0.60 | 0.45 | 0.30 | 0.55 | 0.53 | 0.33 | 0.33 |
| 27 | 0.40 | 0.20 | 0.73 | 0.75 | 0.60 | 0.49 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 28 | 0.70 | 0.17 | 0.88 | 0.75 | 0.60 | 0.45 | 0.17 | 0.50 | 0.50 | 0.30 | 0.30 |
| 29 | 0.50 | 0.17 | 0.77 | 0.78 | 0.60 | 0.45 | 0.20 | 0.53 | 0.57 | 0.28 | 0.28 |
| 30 | 0.50 | 0.22 | 0.77 | 0.77 | 0.62 | 0.45 | 0.22 | 0.51 | 0.51 | 0.32 | 0.31 |
| 31 | 0.70 | 0.17 | 0.77 | 0.80 | 0.63 | 0.48 | 0.20 | 0.66 | 0.68 | 0.42 | 0.42 |
| 32 | 0.80 | 0.20 | 0.73 | 0.76 | 0.60 | 0.41 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 33 | 0.50 | 0.02 | 0.82 | 0.80 | 0.70 | 0.45 | 0.02 | 0.47 | 0.47 | 0.28 | 0.28 |
| 34 | 0.30 | 0.23 | 0.70 | 0.60 | 0.47 | 0.45 | 0.20 | 0.35 | 0.35 | 0.30 | 0.20 |
| 35 | 0.20 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 36 | 0.40 | 0.22 | 0.73 | 0.75 | 0.60 | 0.46 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 37 | 0.30 | 0.0 | 0.73 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 38 | 0.30 | 0.48 | 0.72 | 0.75 | 0.63 | 0.45 | 0.21 | 0.51 | 0.51 | 0.31 | 0.31 |
| 39 | 0.20 | 0.20 | 0.70 | 0.75 | 0.62 | 0.45 | 0.22 | 0.50 | 0.50 | 0.30 | 0.30 |
| 40 | 0.40 | 0.23 | 0.70 | 0.75 | 0.60 | 0.48 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 41 | 0.30 | 0.18 | 0.70 | 0.76 | 0.60 | 0.45 | 0.20 | 0.54 | 0.20 | 0.32 | 0.33 |
| 42 | 0.30 | 0.20 | 0.70 | 0.75 | 0.61 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 43 | 0.10 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 44 | 0.20 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 45 | 0.40 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 46 | 0.50 | 0.20 | 0.70 | 0.80 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 47 | 0.60 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 48 | 0.30 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 49 | 0.45 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 50 | 0.15 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 51 | 0.45 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 52 | 0.35 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 53 | 0.45 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 54 | 0.35 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 55 | 0.25 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 56 | 0.35 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 57 | 0.30 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 58 | 0.40 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |
| 59 | 0.40 | 0.20 | 0.70 | 0.75 | 0.60 | 0.45 | 0.20 | 0.50 | 0.50 | 0.30 | 0.30 |

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Table 1 (Cont.)

| | | E11 | E12 | E13 | E14 | E15 | E16 | E17 | E18 | E19 | E20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 1 | 0.20 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 2 | 0.70 | 0.60 | 0.30 | 0.60 | 0.30 | 0.40 | 0.11 | 0.07 | 0.20 | 0.14 | 0.30 |
| 3 | 0.75 | 0.65 | 0.27 | 0.52 | 0.30 | 0.42 | 0.11 | 0.07 | 0.20 | 0.11 | 0.40 |
| 4 | 0.60 | 0.55 | 0.27 | 0.50 | 0.30 | 0.41 | 0.09 | 0.10 | 0.20 | 0.10 | 0.36 |
| 5 | 0.45 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 6 | 0.20 | 0.63 | 0.32 | 0.50 | 0.30 | 0.43 | 0.11 | 0.10 | 0.20 | 0.10 | 0.40 |
| 7 | 0.50 | 0.55 | 0.23 | 0.30 | 0.30 | 0.40 | 0.09 | 0.11 | 0.20 | 0.10 | 0.36 |
| 8 | 0.50 | 0.40 | 0.20 | 0.50 | 0.30 | 0.42 | 0.08 | 0.13 | 0.20 | 0.10 | 0.20 |
| 9 | 0.30 | 0.50 | 0.25 | 0.30 | 0.30 | 0.42 | 0.09 | 0.11 | 0.30 | 0.10 | 0.36 |
| 10 | 0.30 | 0.55 | 0.27 | 0.50 | 0.30 | 0.42 | 0.09 | 0.11 | 0.30 | 0.10 | 0.34 |
| 11 | 0.60 | 0.60 | 0.49 | 0.60 | 0.30 | 0.45 | 0.09 | 0.13 | 0.20 | 0.07 | 0.40 |
| 12 | 0.30 | 0.95 | 0.30 | 0.60 | 0.30 | 0.50 | 0.12 | 0.10 | 0.20 | 0.10 | 0.30 |
| 13 | 0.50 | 0.62 | 0.30 | 0.50 | 0.30 | 0.43 | 0.14 | 0.05 | 0.18 | 0.12 | 0.30 |
| 14 | 0.30 | 0.60 | 0.30 | 0.52 | 0.30 | 0.47 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 15 | 0.40 | 0.65 | 0.33 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.36 |
| 16 | 0.10 | 0.60 | 0.30 | 0.55 | 0.30 | 0.40 | 0.10 | 0.05 | 0.16 | 0.12 | 0.40 |
| 17 | 0.10 | 0.65 | 0.35 | 0.39 | 0.30 | 0.55 | 0.04 | 0.10 | 0.24 | 0.10 | 0.49 |
| 18 | 0.20 | 0.65 | 0.33 | 0.50 | 0.30 | 0.45 | 0.07 | 0.35 | 0.20 | 0.07 | 0.40 |
| 19 | 0.10 | 0.60 | 0.30 | 0.30 | 0.30 | 0.40 | 0.08 | 0.10 | 0.20 | 0.10 | 0.40 |
| 20 | 0.40 | 0.75 | 0.40 | 0.65 | 0.30 | 0.45 | 0.12 | 0.07 | 0.20 | 0.10 | 0.40 |
| 21 | 0.30 | 0.30 | 0.15 | 0.58 | 0.30 | 0.14 | 0.17 | 0.33 | 0.32 | 0.07 | 0.26 |
| 22 | 0.15 | 0.60 | 0.30 | 0.50 | 0.30 | 0.55 | 0.10 | 0.10 | 0.20 | 0.08 | 0.36 |
| 23 | 0.45 | 0.40 | 0.15 | 0.60 | 0.30 | 0.03 | 0.17 | 0.0 | 0.01 | 0.21 | 0.30 |
| 24 | 0.70 | 0.61 | 0.31 | 0.45 | 0.30 | 0.50 | 0.10 | 0.10 | 0.20 | 0.10 | 0.34 |
| 25 | 0.50 | 0.61 | 0.32 | 0.50 | 0.30 | 0.43 | 0.11 | 0.08 | 0.20 | 0.07 | 0.40 |
| 26 | 0.45 | 0.58 | 0.28 | 0.53 | 0.30 | 0.41 | 0.21 | 0.02 | 0.16 | 0.10 | 0.36 |
| 27 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.42 | 0.10 | 0.09 | 0.20 | 0.11 | 0.40 |
| 28 | 0.70 | 0.55 | 0.28 | 0.52 | 0.30 | 0.40 | 0.11 | 0.08 | 0.20 | 0.11 | 0.40 |
| 29 | 0.50 | 0.58 | 0.28 | 0.42 | 0.30 | 0.43 | 0.11 | 0.07 | 0.20 | 0.11 | 0.34 |
| 30 | 0.50 | 0.61 | 0.31 | 0.51 | 0.30 | 0.45 | 0.10 | 0.09 | 0.18 | 0.03 | 0.40 |
| 31 | 0.70 | 0.65 | 0.40 | 0.55 | 0.30 | 0.53 | 0.12 | 0.02 | 0.18 | 0.07 | 0.20 |
| 32 | 0.80 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.11 | 0.10 | 0.16 | 0.05 | 0.40 |
| 33 | 0.50 | 0.58 | 0.27 | 0.50 | 0.30 | 0.39 | 0.11 | 0.10 | 0.20 | 0.10 | 0.40 |
| 34 | 0.30 | 0.45 | 0.18 | 0.45 | 0.30 | 0.43 | 0.07 | 0.15 | 0.30 | 0.10 | 0.10 |
| 35 | 0.20 | 0.60 | 0.30 | 0.50 | 0.30 | 0.37 | 0.10 | 0.10 | 0.20 | 0.10 | 0.45 |
| 36 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.38 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 37 | 0.30 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 38 | 0.30 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 39 | 0.20 | 0.60 | 0.30 | 0.50 | 0.30 | 0.43 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 40 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.38 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 41 | 0.30 | 0.63 | 0.33 | 0.50 | 0.30 | 0.42 | 0.10 | 0.07 | 0.20 | 0.10 | 0.42 |
| 42 | 0.30 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 43 | 0.10 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.20 | 0.10 | 0.01 | 0.40 |
| 44 | 0.20 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.10 | 0.10 | 0.40 |
| 45 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.15 | 0.10 | 0.40 |
| 46 | 0.50 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.25 | 0.10 | 0.40 |
| 47 | 0.50 | 0.60 | 0.30 | 0.40 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.25 |
| 48 | 0.30 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 49 | 0.45 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 50 | 0.15 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.55 |
| 51 | 0.45 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 52 | 0.25 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 53 | 0.45 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 54 | 0.35 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 55 | 0.25 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 56 | 0.35 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 57 | 0.30 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 58 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |
| 59 | 0.40 | 0.60 | 0.30 | 0.50 | 0.30 | 0.40 | 0.10 | 0.10 | 0.20 | 0.10 | 0.40 |

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Table 1 (Cont.)

| | | E21 | E22 | E23 | E24 | E25 | E26 | E27 | E28 | E29 | E30 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 1 | 0.20 | 0.32 | 0.15 | 0.45 | 0.70 | 0.55 | 0.45 | 0.40 | 0.77 | 0.55 | 0.53 |
| 2 | 0.70 | 0.25 | 0.15 | 0.50 | 0.70 | 0.52 | 0.48 | 0.42 | 0.90 | 0.70 | 0.70 |
| 3 | 0.75 | 0.32 | 0.13 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.90 | 0.66 | 0.53 |
| 4 | 0.60 | 0.25 | 0.15 | 0.45 | 0.70 | 0.25 | 0.40 | 0.40 | 0.85 | 0.50 | 0.50 |
| 5 | 0.45 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 6 | 0.20 | 0.30 | 0.15 | 0.45 | 0.70 | 0.60 | 0.45 | 0.40 | 0.70 | 0.50 | 0.52 |
| 7 | 0.50 | 0.29 | 0.15 | 0.45 | 0.70 | 0.50 | 0.42 | 0.40 | 0.70 | 0.50 | 0.50 |
| 8 | 0.50 | 0.25 | 0.15 | 0.45 | 0.65 | 0.50 | 0.31 | 0.40 | 0.70 | 0.50 | 0.50 |
| 9 | 0.30 | 0.28 | 0.15 | 0.45 | 0.70 | 0.50 | 0.43 | 0.40 | 0.70 | 0.60 | 0.50 |
| 10 | 0.30 | 0.28 | 0.15 | 0.45 | 0.70 | 0.50 | 0.43 | 0.40 | 0.70 | 0.60 | 0.50 |
| 11 | 0.60 | 0.27 | 0.15 | 0.45 | 0.80 | 0.55 | 0.22 | 0.40 | 0.75 | 0.70 | 0.50 |
| 12 | 0.30 | 0.30 | 0.15 | 0.45 | 0.70 | 0.75 | 0.27 | 0.40 | 0.70 | 0.60 | 0.53 |
| 13 | 0.50 | 0.25 | 0.13 | 0.55 | 0.90 | 0.55 | 0.48 | 0.42 | 0.85 | 0.60 | 0.53 |
| 14 | 0.30 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.42 | 0.70 | 0.50 | 0.50 |
| 15 | 0.40 | 0.30 | 0.18 | 0.45 | 0.73 | 0.55 | 0.45 | 0.40 | 0.70 | 0.55 | 0.55 |
| 16 | 0.10 | 0.28 | 0.15 | 0.50 | 0.70 | 0.53 | 0.98 | 0.45 | 0.75 | 0.60 | 0.53 |
| 17 | 0.10 | 0.25 | 0.15 | 0.01 | 0.70 | 0.50 | 0.03 | 0.40 | 0.70 | 0.60 | 0.50 |
| 18 | 0.20 | 0.05 | 0.15 | 0.45 | 0.70 | 0.40 | 0.40 | 0.40 | 0.70 | 0.55 | 0.48 |
| 19 | 0.10 | 0.27 | 0.18 | 0.45 | 0.70 | 0.52 | 0.45 | 0.45 | 0.73 | 0.55 | 0.61 |
| 20 | 0.40 | 0.32 | 0.13 | 0.55 | 0.73 | 0.52 | 0.56 | 0.40 | 0.70 | 0.50 | 0.50 |
| 21 | 0.30 | 0.30 | 0.17 | 0.30 | 0.30 | 0.60 | 0.58 | 0.47 | 0.72 | 0.45 | 0.60 |
| 22 | 0.15 | 0.27 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 23 | 0.45 | 0.66 | 0.15 | 0.45 | 0.45 | 0.50 | 0.69 | 0.55 | 0.73 | 0.52 | 0.61 |
| 24 | 0.70 | 0.32 | 0.15 | 0.47 | 0.70 | 0.50 | 0.46 | 0.41 | 0.71 | 0.53 | 0.52 |
| 25 | 0.50 | 0.30 | 0.14 | 0.47 | 0.70 | 0.50 | 0.46 | 0.41 | 0.72 | 0.52 | 0.53 |
| 26 | 0.45 | 0.29 | 0.15 | 0.48 | 0.70 | 0.52 | 0.45 | 0.41 | 0.72 | 0.50 | 0.53 |
| 27 | 0.40 | 0.30 | 0.15 | 0.46 | 0.70 | 0.51 | 0.46 | 0.40 | 0.72 | 0.52 | 0.42 |
| 28 | 0.70 | 0.30 | 0.15 | 0.47 | 0.70 | 0.55 | 0.47 | 0.41 | 0.70 | 0.57 | 0.56 |
| 29 | 0.50 | 0.37 | 0.15 | 0.47 | 0.73 | 0.52 | 0.48 | 0.41 | 0.77 | 0.50 | 0.54 |
| 30 | 0.50 | 0.37 | 0.12 | 0.49 | 0.72 | 0.58 | 0.47 | 0.41 | 0.77 | 0.80 | 0.50 |
| 31 | 0.70 | 0.37 | 0.15 | 0.47 | 0.70 | 0.52 | 0.54 | 0.42 | 0.87 | 0.70 | 0.57 |
| 32 | 0.80 | 0.31 | 0.12 | 0.45 | 0.70 | 0.40 | 0.48 | 0.26 | 0.72 | 0.52 | 0.45 |
| 33 | 0.50 | 0.31 | 0.15 | 0.45 | 0.70 | 0.75 | 0.46 | 0.40 | 0.71 | 0.51 | 0.57 |
| 34 | 0.30 | 0.25 | 0.15 | 0.40 | 0.63 | 0.55 | 0.24 | 0.40 | 0.70 | 0.57 | 0.53 |
| 35 | 0.20 | 0.33 | 0.17 | 0.55 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 36 | 0.40 | 0.30 | 0.15 | 0.52 | 0.70 | 0.50 | 0.45 | 0.47 | 0.70 | 0.52 | 0.55 |
| 37 | 0.30 | 0.30 | 0.15 | 0.52 | 0.70 | 0.50 | 0.45 | 0.47 | 0.70 | 0.50 | 0.53 |
| 38 | 0.30 | 0.30 | 0.15 | 0.45 | 0.70 | 0.52 | 0.45 | 0.41 | 0.70 | 0.51 | 0.51 |
| 39 | 0.20 | 0.32 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.51 | 0.50 |
| 40 | 0.40 | 0.29 | 0.15 | 0.43 | 0.70 | 0.50 | 0.45 | 0.42 | 0.70 | 0.50 | 0.50 |
| 41 | 0.30 | 0.35 | 0.15 | 0.47 | 0.70 | 0.50 | 0.46 | 0.40 | 0.70 | 0.50 | 0.50 |
| 42 | 0.30 | 0.20 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 43 | 0.10 | 0.50 | 0.15 | 0.01 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 44 | 0.20 | 0.10 | 0.15 | 0.50 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 45 | 0.40 | 0.15 | 0.15 | 0.35 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 46 | 0.50 | 0.35 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.60 | 0.50 |
| 47 | 0.50 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 48 | 0.30 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 49 | 0.45 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 50 | 0.15 | 0.30 | 0.20 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 51 | 0.45 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 52 | 0.25 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 53 | 0.45 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 54 | 0.35 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 55 | 0.25 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 56 | 0.35 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 57 | 0.20 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 58 | 0.40 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |
| 59 | 0.40 | 0.30 | 0.15 | 0.45 | 0.70 | 0.50 | 0.45 | 0.40 | 0.70 | 0.50 | 0.50 |

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Table 1 (Cont.)

| | | E31 | E32 | E33 | E34 | E35 | E36 | E37 | E38 | E39 | E40 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.20 | 0.20 | 0.20 | 0.40 |
| 1 | 0.20 | 0.70 | 0.80 | 0.40 | 0.30 | 0.20 | 0.40 | 0.30 | 0.20 | 0.20 | 0.40 |
| 2 | 0.70 | 0.80 | 0.85 | 0.40 | 0.30 | 0.20 | 0.50 | 0.32 | 0.30 | 0.30 | 0.45 |
| 3 | 0.75 | 0.80 | 0.83 | 0.35 | 0.30 | 0.20 | 0.40 | 0.20 | 0.30 | 0.20 | 0.38 |
| 4 | 0.60 | 0.60 | 0.80 | 0.60 | 0.36 | 0.20 | 0.40 | 0.49 | 0.30 | 0.20 | 0.45 |
| 5 | 0.45 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.42 | 0.34 | 0.32 | 0.20 | 0.35 |
| 6 | 0.20 | 0.70 | 0.80 | 0.40 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.25 | 0.40 |
| 7 | 0.50 | 0.65 | 0.80 | 0.48 | 0.36 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 8 | 0.50 | 0.41 | 0.80 | 0.40 | 0.55 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 9 | 0.30 | 0.55 | 0.80 | 0.45 | 0.28 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 10 | 0.30 | 0.60 | 0.80 | 0.47 | 0.41 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 11 | 0.60 | 0.65 | 0.80 | 0.48 | 0.36 | 0.20 | 0.40 | 0.30 | 0.30 | 0.23 | 0.40 |
| 12 | 0.30 | 0.70 | 0.80 | 0.40 | 0.36 | 0.20 | 0.40 | 0.30 | 0.30 | 0.23 | 0.40 |
| 13 | 0.50 | 0.85 | 0.82 | 0.55 | 0.51 | 0.20 | 0.42 | 0.30 | 0.27 | 0.20 | 0.45 |
| 14 | 0.30 | 0.70 | 0.81 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 15 | 0.40 | 0.73 | 0.80 | 0.48 | 0.29 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 16 | 0.10 | 0.85 | 0.82 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 17 | 0.10 | 0.80 | 0.80 | 0.50 | 0.18 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 18 | 0.20 | 0.60 | 0.78 | 0.50 | 0.28 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 19 | 0.10 | 0.73 | 0.85 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 20 | 0.40 | 0.85 | 0.77 | 0.53 | 0.01 | 0.20 | 0.40 | 0.30 | 0.40 | 0.30 | 0.40 |
| 21 | 0.30 | 0.65 | 0.83 | 0.47 | 0.28 | 0.20 | 0.40 | 0.39 | 0.22 | 0.10 | 0.40 |
| 22 | 0.15 | 0.70 | 0.75 | 0.50 | 0.28 | 0.20 | 0.40 | 0.30 | 0.40 | 0.22 | 0.40 |
| 23 | 0.45 | 0.72 | 0.83 | 0.50 | 0.29 | 0.20 | 0.42 | 0.32 | 0.27 | 0.17 | 0.55 |
| 24 | 0.70 | 0.73 | 0.81 | 0.51 | 0.32 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 25 | 0.50 | 0.73 | 0.81 | 0.65 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.39 | 0.40 |
| 26 | 0.45 | 0.83 | 0.81 | 0.50 | 0.33 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.42 |
| 27 | 0.40 | 0.71 | 0.87 | 0.50 | 0.30 | 0.20 | 0.41 | 0.31 | 0.31 | 0.20 | 0.43 |
| 28 | 0.70 | 0.75 | 0.81 | 0.50 | 0.30 | 0.20 | 0.41 | 0.31 | 0.31 | 0.20 | 0.41 |
| 29 | 0.50 | 0.95 | 0.81 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 30 | 0.50 | 0.77 | 0.82 | 0.48 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.22 | 0.40 |
| 31 | 0.70 | 0.70 | 0.83 | 0.55 | 0.41 | 0.20 | 0.43 | 0.42 | 0.23 | 0.23 | 0.47 |
| 32 | 0.80 | 0.72 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 33 | 0.50 | 0.71 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 34 | 0.30 | 0.37 | 0.81 | 0.47 | 0.30 | 0.20 | 0.40 | 0.30 | 0.31 | 0.21 | 0.40 |
| 35 | 0.20 | 0.70 | 0.80 | 0.50 | 0.24 | 0.20 | 0.40 | 0.20 | 0.28 | 0.20 | 0.40 |
| 36 | 0.40 | 0.70 | 0.84 | 0.50 | 0.30 | 0.20 | 0.40 | 0.44 | 0.74 | 0.23 | 0.55 |
| 37 | 0.30 | 0.70 | 0.85 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.40 | 0.23 | 0.45 |
| 38 | 0.30 | 0.70 | 0.82 | 0.50 | 0.30 | 0.20 | 0.38 | 0.39 | 0.30 | 0.22 | 0.47 |
| 39 | 0.20 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.33 | 0.31 | 0.20 | 0.46 |
| 40 | 0.40 | 0.70 | 0.82 | 0.50 | 0.30 | 0.20 | 0.38 | 0.32 | 0.32 | 0.23 | 0.40 |
| 41 | 0.30 | 0.73 | 0.80 | 0.50 | 0.27 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 42 | 0.30 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.21 | 0.40 |
| 43 | 0.10 | 0.70 | 0.80 | 0.50 | 0.30 | 0.30 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 44 | 0.20 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.48 | 0.30 | 0.30 | 0.20 | 0.40 |
| 45 | 0.40 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 46 | 0.50 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 47 | 0.50 | 0.70 | 0.80 | 0.50 | 0.20 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 48 | 0.30 | 0.70 | 0.80 | 0.50 | 0.20 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 49 | 0.45 | 0.70 | 0.80 | 0.50 | 0.45 | 0.10 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 50 | 0.15 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 |
| 51 | 0.45 | 0.70 | 0.80 | 0.50 | 0.15 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 52 | 0.25 | 0.70 | 0.80 | 0.50 | 0.35 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 53 | 0.45 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.20 | 0.30 | 0.20 | 0.40 |
| 54 | 0.35 | 0.70 | 0.80 | 0.50 | 0.30 | 0.20 | 0.40 | 0.20 | 0.30 | 0.20 | 0.40 |
| 55 | 0.25 | 0.70 | 0.80 | 0.50 | 0.30 | 0.01 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 56 | 0.35 | 0.70 | 0.80 | 0.50 | 0.30 | 0.15 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 57 | 0.30 | 0.70 | 0.80 | 0.50 | 0.15 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |
| 58 | 0.40 | 0.70 | 0.80 | 0.50 | 0.20 | 0.10 | 0.40 | 0.20 | 0.30 | 0.20 | 0.40 |
| 59 | 0.40 | 0.70 | 0.80 | 0.50 | 0.35 | 0.20 | 0.40 | 0.30 | 0.30 | 0.20 | 0.40 |

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Table 1 (Cont.)

| | | E41 | E42 | E43 | E44 | E45 | E46 | E47 | E48 | E49 | E50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 1 | 0.20 | 0.30 | 0.32 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 2 | 0.70 | 0.28 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 3 | 0.75 | 0.28 | 0.30 | 0.10 | 0.20 | 0.40 | 0.55 | 0.50 | 0.30 | 0.45 | 0.15 |
| 4 | 0.60 | 0.28 | 0.35 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 5 | 0.45 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 6 | 0.20 | 0.30 | 0.32 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 7 | 0.50 | 0.29 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 8 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 9 | 0.30 | 0.28 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 10 | 0.30 | 0.28 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 11 | 0.60 | 0.03 | 0.33 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 12 | 0.30 | 0.20 | 0.32 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 13 | 0.50 | 0.05 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.40 | 0.30 | 0.45 | 0.15 |
| 14 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 15 | 0.40 | 0.25 | 0.33 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 16 | 0.10 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 17 | 0.10 | 0.10 | 0.30 | 0.12 | 0.20 | 0.45 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 18 | 0.20 | 0.15 | 0.30 | 0.15 | 0.05 | 0.30 | 0.55 | 0.50 | 0.30 | 0.45 | 0.15 |
| 19 | 0.10 | 0.28 | 0.30 | 0.10 | 0.50 | 0.50 | 0.30 | 0.50 | 0.30 | 0.45 | 0.15 |
| 20 | 0.40 | 0.37 | 0.30 | 0.15 | 0.25 | 0.50 | 0.50 | 0.65 | 0.40 | 0.45 | 0.15 |
| 21 | 0.30 | 0.95 | 0.10 | 0.20 | 0.20 | 0.15 | 0.60 | 0.50 | 0.30 | 0.45 | 0.15 |
| 22 | 0.15 | 0.30 | 0.30 | 0.25 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 23 | 0.45 | 0.45 | 0.27 | 0.01 | 0.05 | 0.10 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 24 | 0.70 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 25 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.45 | 0.50 | 0.30 | 0.45 | 0.15 |
| 26 | 0.45 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.60 | 0.30 | 0.45 | 0.15 |
| 27 | 0.40 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 28 | 0.70 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 29 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.40 | 0.50 | 0.30 | 0.45 | 0.15 |
| 30 | 0.50 | 0.27 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 31 | 0.70 | 0.22 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 32 | 0.80 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.30 | 0.50 | 0.30 | 0.45 | 0.15 |
| 33 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 34 | 0.30 | 0.27 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.20 | 0.01 | 0.30 | 0.15 |
| 35 | 0.20 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.40 | 0.45 | 0.15 |
| 36 | 0.40 | 0.30 | 0.30 | 0.10 | 0.20 | 0.45 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 37 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 38 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 39 | 0.20 | 0.30 | 0.38 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 40 | 0.40 | 0.31 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 41 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 42 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 43 | 0.10 | 0.30 | 0.30 | 0.10 | 0.25 | 0.20 | 0.55 | 0.50 | 0.30 | 0.45 | 0.15 |
| 44 | 0.20 | 0.30 | 0.30 | 0.05 | 0.20 | 0.35 | 0.60 | 0.50 | 0.30 | 0.45 | 0.15 |
| 45 | 0.40 | 0.30 | 0.30 | 0.13 | 0.10 | 0.40 | 0.55 | 0.50 | 0.30 | 0.45 | 0.15 |
| 46 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 47 | 0.50 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.30 | 0.50 | 0.45 | 0.45 | 0.15 |
| 48 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.20 | 0.30 | 0.40 | 0.15 |
| 49 | 0.45 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.35 | 0.10 | 0.45 | 0.32 |
| 50 | 0.15 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 51 | 0.45 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.60 | 0.30 | 0.45 | 0.15 |
| 52 | 0.25 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 53 | 0.45 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 54 | 0.25 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 55 | 0.25 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 56 | 0.25 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.30 | 0.45 | 0.15 |
| 57 | 0.30 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.50 | 0.40 | 0.45 | 0.15 |
| 58 | 0.40 | 0.30 | 0.30 | 0.13 | 0.20 | 0.40 | 0.50 | 0.40 | 0.10 | 0.40 | 0.15 |
| 59 | 0.40 | 0.30 | 0.30 | 0.10 | 0.20 | 0.40 | 0.50 | 0.40 | 0.15 | 0.55 | 0.15 |

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Table 1 (Cont.)

| | E51 | E52 | E53 | E54 | E55 | E56 | E57 | E58 | E59 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.20 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 2 | 0.70 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 3 | 0.75 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 4 | 0.60 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 5 | 0.45 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 6 | 0.20 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 7 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 8 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 9 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 10 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 11 | 0.60 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 12 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 13 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 14 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 15 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 16 | 0.10 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 17 | 0.10 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 18 | 0.20 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 19 | 0.10 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 20 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.45 | 0.40 |
| 21 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 22 | 0.15 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 23 | 0.45 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 24 | 0.70 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 25 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 26 | 0.45 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.50 | 0.40 |
| 27 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 28 | 0.70 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 29 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 30 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 31 | 0.70 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.70 | 0.40 | 0.40 |
| 32 | 0.80 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 33 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 34 | 0.30 | 0.01 | 0.82 | 0.25 | 0.25 | 0.25 | 0.35 | 0.10 | 0.05 | 0.30 |
| 35 | 0.20 | 0.45 | 0.35 | 0.45 | 0.35 | 0.01 | 0.35 | 0.30 | 0.15 | 0.40 |
| 36 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 37 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 38 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 39 | 0.20 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 40 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 41 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 42 | 0.30 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 43 | 0.10 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.80 | 0.40 |
| 44 | 0.20 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 45 | 0.40 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 46 | 0.50 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 47 | 0.50 | 0.45 | 0.20 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.30 | 0.40 |
| 48 | 0.30 | 0.50 | 0.20 | 0.50 | 0.40 | 0.25 | 0.35 | 0.35 | 0.20 | 0.40 |
| 49 | 0.45 | 0.35 | 0.30 | 0.40 | 0.30 | 0.25 | 0.35 | 0.15 | 0.20 | 0.60 |
| 50 | 0.15 | 0.50 | 0.15 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 51 | 0.45 | 0.45 | 0.01 | 0.50 | 0.40 | 0.25 | 0.35 | 0.20 | 0.40 | 0.25 |
| 52 | 0.25 | 0.01 | 0.20 | 0.45 | 0.30 | 0.25 | 0.35 | 0.15 | 0.40 | 0.45 |
| 53 | 0.45 | 0.45 | 0.25 | 0.45 | 0.10 | 0.25 | 0.35 | 0.30 | 0.40 | 0.40 |
| 54 | 0.25 | 0.45 | 0.25 | 0.25 | 0.35 | 0.25 | 0.35 | 0.20 | 0.40 | 0.40 |
| 55 | 0.25 | 0.45 | 0.25 | 0.45 | 0.35 | 0.25 | 0.30 | 0.20 | 0.40 | 0.40 |
| 56 | 0.25 | 0.45 | 0.25 | 0.45 | 0.35 | 0.20 | 0.35 | 0.30 | 0.40 | 0.40 |
| 57 | 0.20 | 0.45 | 0.15 | 0.45 | 0.35 | 0.25 | 0.35 | 0.30 | 0.50 | 0.40 |
| 58 | 0.40 | 0.55 | 0.20 | 0.45 | 0.35 | 0.25 | 0.35 | 0.40 | 0.40 | 0.35 |
| 59 | 0.40 | 0.35 | 0.35 | 0.40 | 0.30 | 0.25 | 0.35 | 0.10 | 0.20 | 0.40 |

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Table 2

CALIBRATION RESULTS

| EVENT | PROBABILITIES | | |
|---|---|---|---|
| | INITIAL | CALIBRATION | DELTA |
| E 1 | 0.20 | 0.17 | -.03 |
| E 2 | 0.70 | 0.73 | 0.03 |
| E 3 | 0.75 | 0.78 | 0.03 |
| E 4 | 0.60 | 0.61 | 0.01 |
| E 5 | 0.45 | 0.45 | 0.00 |
| E 6 | 0.20 | 0.17 | -.03 |
| E 7 | 0.50 | 0.51 | 0.01 |
| E 8 | 0.50 | 0.53 | 0.03 |
| E 9 | 0.30 | 0.29 | -.01 |
| E 10 | 0.30 | 0.30 | -.00 |
| E 11 | 0.60 | 0.60 | -.00 |
| E 12 | 0.30 | 0.31 | 0.01 |
| E 13 | 0.50 | 0.49 | -.01 |
| E 14 | 0.30 | 0.30 | -.00 |
| E 15 | 0.40 | 0.38 | -.02 |
| E 16 | 0.10 | 0.12 | 0.02 |
| E 17 | 0.10 | 0.09 | -.01 |
| E 18 | 0.20 | 0.18 | -.02 |
| E 19 | 0.10 | 0.08 | -.02 |
| E 20 | 0.40 | 0.38 | -.02 |
| E 21 | 0.30 | 0.26 | -.04 |
| E 22 | 0.15 | 0.14 | -.01 |
| E 23 | 0.45 | 0.45 | -.00 |
| E 24 | 0.70 | 0.72 | 0.02 |
| E 25 | 0.50 | 0.53 | 0.03 |
| E 26 | 0.45 | 0.44 | -.01 |
| E 27 | 0.40 | 0.40 | 0.00 |
| E 28 | 0.70 | 0.70 | 0.00 |
| E 29 | 0.50 | 0.53 | 0.03 |
| E 30 | 0.50 | 0.52 | 0.02 |
| E 31 | 0.70 | 0.75 | 0.05 |
| E 32 | 0.80 | 0.78 | -.02 |
| E 33 | 0.50 | 0.52 | 0.02 |
| E 34 | 0.30 | 0.28 | -.02 |
| E 35 | 0.20 | 0.19 | -.01 |
| E 36 | 0.40 | 0.40 | 0.00 |
| E 37 | 0.30 | 0.32 | 0.02 |
| E 38 | 0.30 | 0.29 | -.01 |
| E 39 | 0.20 | 0.21 | 0.01 |
| E 40 | 0.40 | 0.39 | -.01 |
| E 41 | 0.30 | 0.28 | -.02 |
| E 42 | 0.30 | 0.30 | 0.00 |
| E 43 | 0.10 | 0.09 | -.01 |
| E 44 | 0.20 | 0.18 | -.02 |
| E 45 | 0.40 | 0.38 | -.02 |
| E 46 | 0.50 | 0.49 | -.01 |
| E 47 | 0.50 | 0.50 | 0.00 |
| E 48 | 0.30 | 0.29 | -.01 |
| E 49 | 0.45 | 0.45 | 0.00 |
| E 50 | 0.15 | 0.15 | -.00 |
| E 51 | 0.45 | 0.47 | 0.02 |
| E 52 | 0.25 | 0.24 | -.01 |
| E 53 | 0.45 | 0.46 | 0.01 |
| E 54 | 0.35 | 0.35 | 0.00 |
| E 55 | 0.25 | 0.25 | 0.00 |
| E 56 | 0.35 | 0.35 | 0.00 |
| E 57 | 0.30 | 0.33 | 0.03 |
| E 58 | 0.40 | 0.40 | 0.00 |
| E 59 | 0.40 | 0.40 | -.00 |

conditional probability or of event probability required.[4] There were, however, many cases where the conditional probabilities were adjusted to the limits since this represented only a small change, i.e., only a few percent--which was well within the accuracy of the basic estimates.

One adjustment was made in event probability. That occurred in the case of Event 30,[5] "Congress enacts a new tax on goods and services proportional to their environmental impact, allocating these funds for environmental improvements." It had initially been estimated that for Scenario R the probability of this event by 1990 would be 0.40. The conditional probability of this event was estimated at 0.70 assuming that Event 2, "Federal guidelines are developed to serve as a voluntary framework for planning population distribution among the various states and regions," had occurred. The initial probability of Event 2 had been estimated at 0.70. Using the initial probabilities, the maximum probability of Event 30, assuming that event 02 had occurred, would be only $0.40 \div 0.70 = 0.57$. Thus, either

1. The conditional probability of event 30 was too high
2. The probability of event 30 was too low, or
3. The probability of event 2 was too high

In reexamining the initial judgments it was believed that the occurrence of Event 2, "Establishment of Federal guidelines to serve as a voluntary framework for planning population distribution," would increase markedly the

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[4] In order to keep the size of the matrix within bounds, the events selected for cross-impact analysis were limited to key and NAS events.

[5] Event numbers refer to the listing of the events in the accompanying cross-impact matrix, Table 1. The corresponding TIA number of the events is given in Table 3.

Table 3

CORRESPONDING CIA-TIA EVENT NUMBERS

| CIA | TIA | CIA | TIA | CIA | TIA |
|---|---|---|---|---|---|
| 1 | 1 | 27 | 75 | 53 | 210 |
| 2 | 7 | 28 | 76 | 54 | 211 |
| 3 | 10 | 29 | 78 | 55 | 213 |
| 4 | 11 | 30 | 77 | 56 | 217 |
| 5 | 13 | 31 | 82 | 57 | 220 |
| 6 | 47 | 32 | 84 | 58 | 224 |
| 7 | 48* | 33 | 89 | 59 | 225 |
| 8 | 23 | 34 | 171 | | |
| 9 | 30 | 35 | 172 | | |
| 10 | 34 | 36 | 93 | | |
| 11 | 40 | 37 | 94 | | |
| 12 | 42 | 38 | 95 | | |
| 13 | 45 | 39 | 96 | | |
| 14 | 46 | 40 | 97 | | |
| 15 | 63 | 41 | 100 | | |
| 16 | 65 | 42 | 111 | | |
| 17 | 67 | 43 | 181 | | |
| 18 | 151 | 44 | 182 | | |
| 19 | 152 | 45 | 184 | | |
| 20 | 51 | 46 | 185 | | |
| 21 | 53 | 47 | 174 | | |
| 22 | 54 | 48 | 191 | | |
| 23 | 55 | 49 | 197 | | |
| 24 | 56 | 50 | 206 | | |
| 25 | 57 | 51 | 207 | | |
| 26 | 59 | 52 | 208 | | |

*This event was later deleted from the event-variable matrix.

likelihood of Event 30, "Congress enacts a new tax on goods and services proportionate to their environmental impacts, allocating these funds for environmental improvements." Hence the study team was not willing to reduce the conditional probability of Event 30. The initial probability of Event 2 was then questioned. But in Scenario R, which represents a world of important government presence and resource allocations, the study team could not rationally reduce its probability below 0.70. Clearly then, the estimate of the probability of Event 30 was too low. Thus, the probability of Event 30 was raised to 0.50 to make it compatible with its conditional probability, assuming Event 2 occurs.

Three other significant adjustments which were made were of conditional probabilities. This one instance occurred in the case of Event 12, "Non-petroleum sources of primary power for ground transportation (storage batteries, fuel cells, electromagnetic propulsion, and the like) account for one-quarter of the transportation energy demand," under the presumption that Event 11 occurred. In this case the probabilities of both of the events were believed justified in light of the sense of the scenario. Event 12 was believed to have a probability of only about 1 in 3, or about 30 percent. Event 11, "Coal and nuclear stations contribute 75 percent of electrical energy," was estimated to have a probability of 0.6. Under those conditions the maximum probability of Event 12 would be 0.5. But the initial estimate of its conditional probability was 0.6. Questioning of this conditional probability led the team to recognize that, even with major expansion of coal and nuclear stations to generate electricity, enormous inroads into the current fleet of ground transportation would be required to result in one-quarter of the fleet being powered by non-petroleum resources. Such an

inroad could not realistically be anticipated between now and 1990. The conditional probability of Event 12 was reduced to 0.49.

The conditional probability of Event 16, "Transportation, communication, and energy industries become either public or quasi-public enterprises," had initially been estimated at 0.35, under the assumption that a publicly owned petroleum company was established that supplies 20 percent of the domestic market (Event 26). These two events were estimated as having probabilities of 0.10 and 0.45, respectively. Reexamination of their individual likelihoods resubstantiated these estimates and caused the conditional probability of Event 16 to be reduced to 0.21. The rationale here was that establishment of a publicly owned petroleum company controlling about one-fourth of the domestic market would result in an increase in the likelihood of the establishment of public and quasi-public enterprises in the areas of transportation, communication, and energy, as the latter would represent activities quite similar to the publicly owned petroleum company--and, indeed, would be highly dependent upon fuel from such a company. But a likelihood of 0.21 percent was felt to be sufficiently high to satisfy that condition.

The last event where significant changes were made was 29, "Federal funds for community development, to revitalize cities, increase threefold over the 1975 level." The readjustment occurred when that event was considered in light of the occurrence of Event 31, "A progressive tax is imposed on all energy usage with the proceeds funneled into energy production and conservation R&D programs." These two events had probabilities estimated at 0.5 and 0.7, respectively. It had been estimated initially that if Event 31 occurred the probability of Event 29 would be quite high, its chances of occurrence about 4:1, or a probability of 0.8. But the probabilities individually estimated for these events if they were realistic

would indicate that the conditional probability of Event 29 would be only 0.71. A reassessment of the probabilities of the individual events for Scenario R caused the study team to believe that its initial estimates of these probabilities were still reasonable. But the reconsideration of the conditional probability for Event 29 indicated that the odds of about 2:1, or a probability of about 0.70, were sufficiently high for this event. It was recognized that arguments for participation of the Federal Government in funding community development and in revitalization would be enhanced if other Government programs were established, such as the progressive tax on energy. But the probability of 0.7 under such conditions was felt to be reasonable.

Having reassessed the probabilities of all of the events by 1990 for the Resource Allocation Scenario, it was then possible to reassess the probabilities of these events for the other scenarios. The probabilities of the events in one scenario would have to be compatible with their probabilities in the other scenarios. Furthermore, the event probabilities that were estimated for 1990 also were used to help establish what the likelihoods would be at other points in time for each scenario. It would, of course, have been possible to conduct such a cross-impact analysis for several points in time for each scenario. But the additional time and resources that would have been required for such an analysis were not believed to be warranted, as the bulk of the insights were felt to have been obtained in treating Scenario R and conducting this event cross-impact analysis for 1990.

# 5. COMPARATIVE LIST OF VARIABLES PROJECTED IN THE REVISED AND ORIGINAL STUDY

Table 1 lists all of the variables projected for each of the revised scenarios and for each of the scenarios in the original study. The variables have been arranged in categories to show their relationship to the development of the scenarios. The revised scenarios include an expanded economics section and, therefore, additional variables were added as may be seen listed in the business and finance category. The revised scenarios also include an added section on international affairs, and Table 1 identifies the set of international variables which were projected.

The list of domestic demographic variables was increased to provide insight into major changes in the national population distribution. The three added variables deal with changes in degree of urbanization and with geographic population shifts. The general population characteristics projected were the same in both studies, except that the one specific age group projected in the revised study was changed to define an age group more closely related to travel demand.

Most of the domestic general economic variables were the same in both studies. Personal consumption expenditures for transportation were added as an important indicator of travel demand. Expenditures for food and beverages were dropped because it was a poor indicator of social affluence. Total Government social welfare expenditures were substituted for Federal social welfare expenditures, and together with total for all Government expenditures, which was added, provided insight into the degree of Government presence in domestic life.

## Table 1

## VARIABLES PROJECTED FOR EACH SCENARIO

| Revised Study | Original Study |
|---|---|
| **DOMESTIC SOCIOECONOMIC VARIABLES** | |
| **Demographics** | |
| Total U.S. population (including armed forces abroad) | Unchanged |
| U.S. population ages 18-64 | U.S. population over 15 |
| Resident population in the combined South and West census regions as a percentage of total resident population of the U.S. | |
| Population living in urban areas (using the 1970 definition of urban areas) as a percentage of the total resident population in the combined South and West census regions | |
| *Population living in urban areas (using the 1970 definition of urban areas) as a percentage of the total resident population in the combined Northeast and North Central regions* | |
| Median number of years of school completed by the civilian non-institutional population 25 years of age and over | Unchanged |
| **General Economics** | |
| Gross national product | Unchanged |
| Gross national product per capita | Unchanged |
| Disposable personal income per capita | Unchanged |
| Personal consumption expenditures | Unchanged |
| Personal consumption expenditures for transportation (goods and services) | |
| Personal consumption expenditures for recreation (goods and services) | Unchanged |
| | Expenditures for food and beverages as a percentage of personal consumption expenditures |
| Total government expenditures (Federal, state, and local) as a percentage of GNP | |
| Total social welfare expenditures under public programs as a percentage of GNP | Percentage of Federal budget spent on social welfare |
| **Civilian Labor Characteristics** | |
| | Percentage of the labor force in unions |
| Civilian labor force | |
| Total labor force participation rate (number of persons 16 years of age and over in the total labor force as a percentage of the total non-institutional population 16 years of age and over) | |
| Average weekly hours of production workers on private non-agricultural payrolls | Unchanged |
| Percentage of the labor force unemployed | Unchanged |

Table 1 (Cont.)

| | |
|---|---|
| **Energy and Raw Materials** | |
| Ratio of domestic production of crude oil, lease condensate, and natural gas liquids to domestic demand for refined products | |
| Estimated landed cost in U.S. of imported crude petroleum from Saudi Arabia | U.S. wellhead price of crude oil |
| Average revenues per kilowatt-hour, all sectors | |
| | Price of aluminum |
| | Price of iron ore |
| **Business and Finance** | |
| Index of industrial production | |
| Output per man-hour of all persons in the private business sector | Unchanged |
| Business expenditures on new plant equipment | |
| Capital expenditures by business for air and water pollution abatement | Unchanged |
| AAA bond yields | |
| Corporate investment funds from internal sources as a percentage of funds from all sources | |
| Long-term funds raised in credit markets | |
| Final sales of goods as a percentage of total final sales | |
| **INTERNATIONAL VARIABLES** | |
| **Demographics** | |
| Population of European Community (France, United Kingdom, and West Germany) | |
| Population of Japan | |
| Population of Latin America (Brazil, Mexico, and Venezuela) | |
| **General Economics** | |
| Gross domestic product of the European Community (France, United Kingdom, and West Germany) | |
| Gross domestic product of Japan | |
| Gross domestic product of Latin America (Brazil, Mexico, and Venezuela) | |
| **Trade and Investment** | |
| | Quality index for food exports |
| U.S. exports to the European Community (France, United Kingdom, and West Germany) | |
| U.S. imports from European Community (France, United Kingdom, and West Germany) | |
| U.S. direct investments in European Community (France, United Kingdom, and West Germany) | |
| Investments in U.S. by European Community (France, United Kingdom, and West Germany) | |
| U.S. exports to Japan | |
| U.S. imports from Japan | |
| U.S. direct investments in Japan | |
| Investment in U.S. by Japan | |
| U.S. exports to Latin America (Brazil, Mexico, and Venezuela) | |
| U.S. imports from Latin America (Brazil, Mexico, and Venezuela) | |
| U.S. direct investments in Latin America (Brazil, Mexico, and Venezuela) | |
| External public debt outstanding (including undisbursed) to U.S. for Latin | |

Variables pertaining to the domestic labor force in the revised study include the total labor force participation rate in order to indicate how economic conditions may influence the entrance of women and certain economically marginal groups into the labor force. In the revised study unemployment levels were assumed for each scenario as a defining characteristic of the scenario, and they were not projected as one of the variables. Percent of the labor force in unions was found to contribute little insight and was dropped in the revised study.

In the area of energy and raw materials the degree of independence from foreign oil sources was recognized to have an important bearing on domestic energy policy, and the ratio of domestic crude oil production to consumption was included as a variable in the revised study. Because the OPEC price to the United States of crude petroleum has a primary impact on all energy prices, the OPEC price was selected to replace U.S. wellhead price, which is essentially domestically regulated and responds to OPEC pressures. The price of electricity was included as a variable in the revised scenarios because of its sensitivity to domestic fuel economics and to overall energy demand. Specific material prices (for aluminum and iron ore) were found to contribute little to the scenarios, and these variables were not included in the revised study; rather, the situation with regard to materials was discussed in general terms in the scenario narratives.

Several of the business and financial variables (bond yields, investment funds from internal sources, long-term funds raised in credit markets) are meant to supply an understanding of the soundness of the capital market and the ability of industry to meet its investment needs. The remaining variables in this category relate to the expansiveness of domestic industry. Taken

together, the business and financial variables are used to characterize the state of the industry in this country.

The international variables in the revised study relate to U.S. economic relations with major areas of Europe, Latin America, and the Orient. The size of population and the gross domestic product reveal the growth and general level of affluence for each international area. Economic activity between the United States and each international area is characterized by the imports, exports, and investment variables.