



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**FUNDING FOR FIRST RESPONDERS FROM A
THREAT AND PREVENTION APPROACH**

by

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June 2004

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APPROACH**

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Submitted in partial fulfillment of the
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ABSTRACT

It has been thirty-three months since the United States was attacked by terrorists on September 11th 2001. Yet, in distributing grants to States and localities to build their capacity for homeland security, the Nation continues to rely on funding formulae that are deeply flawed. Many grants are distributed in ways that ignore need-driven criteria, such as where terrorists are most likely to strike and which targets are most critical. This thesis develops an alternative formula that takes need into account (and therefore is much more likely to send funds where they are required). After reviewing need-driven formulae from a range of fields that might be applied to homeland security, I use the Analytical Hierarchy Process (AHP) to break the objectives of homeland security capacity-building into discreet, measurable components. Then, I analyze the criteria that should be used to build a grant allocation process to accomplish those objectives, including population density, criticality of infrastructure, the threat to a municipality, vulnerability to that threat, and terrorism prevention. The resulting formula is far better structured than the current system to put homeland security grant funds where the Nation most needs them.

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I need to close this acknowledgement page by dedicating this thesis to my 343 fellow firefighters that lost their lives in the attacks on our country occurring on September 11th 2001. Hopefully many will read this thesis, keeping in mind that the correct allocation of funds is essential to protect this country from the ravages of terrorism. Hopefully the correct allocation of funds will prevent other attacks as well as better prepare first responders across the country from ones that are not preventable. From September 13th 2001 through December 20th 2001 I attended a funeral or memorial service for someone who died in the attacks, on the World Trade Center, on every day except three. I pray that no other municipality has to face what New York did.

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EXECUTIVE SUMMARY

The establishment of the Department of Homeland Security provides an excellent opportunity to improve the allocation of assistance funds to States and localities through the Office for Domestic Preparedness (ODP). Currently, many of the ODP funding calculations are based either on arbitrary allocations mandated by Congress or by per capita-based allocations. This approach ignores the fact that some jurisdictions face a more severe threat than others, and therefore should receive greater funding. Moreover, States can (and usually do) withhold 20% of the funding they receive under the present funding programs, even in cases where a threat-driven analysis would indicate that cities would deserve a greater (or, in some cases, lesser) funding share.

This thesis argues that threat-driven approaches can and should be incorporated into the allocation of funding by ODP. This thesis looks at many other funding options that have been used in other agencies as well as different countries where the needs basis for funding is represented. I examined some formulas that have been used by other municipalities in funding homeland security grants. Based on those approaches, I developed a model for the DHS to consider using in the Federal funding allocation process.

I incorporate criticality, population density, threat, vulnerability and prevention into a formula that provides for significant improvement over per-capita approaches alone. The formula uses the Analytic Hierarchy Process (AHP) (developed by Thomas Saaty in the early 1970's), which has been used to solve complex problems in many areas of science and social science. The AHP process makes it possible to apply a weighted approach for my proposed five criteria for a homeland security funding allocation. I also specify ways to measure each of the criteria of the formula. The need for the DHS to adopt a formula with measurable objectives is essential so funds can be delivered to the municipalities where the requirements are greatest, and also where the needs are not being met. My proposed formula makes that possible.

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I. DEFINING THE PROBLEM

The Department of Homeland Security (DHS) plays a critical role in building State and local capacity for homeland security (HS), through the distribution of grant funding to States and localities through the DHS' Office for Domestic Preparedness (ODP). Currently, many of the funds distributed by the ODP are allocated either on a per-capita basis (i.e., according to the population in a State), or through the allocation to each State of an arbitrary .75 percent of the total available grant funding.

Many policymakers believe that the country as a whole needs to build HS capacity and that the present formulas are the fairest way to allocate the limited resources of the Government. I disagree. The funds should go to where they are needed, based on where terrorists are most likely to strike. After two and a half years of funding cycles under the present formula grants, municipalities that are unlikely to be terrorist targets continue to get massive amount of funds. Money for homeland security is too scarce to be wasted, and needs to be allocated in a more sensible, threat-driven way.

The importance of prevention reinforces the need to move toward a threat-driven approach. The President of the United States has indicated in his National Strategy for Homeland Security that "prevention of terrorist attacks in the United States" is the first and highest priority in his strategic objectives for the Nation.¹ Shouldn't the funding allocation formula used by Department of Homeland Security also take into account the primacy of prevention, so that funds will be sent where – due to the threat – prevention requirements are most significant?

The DHS is making important progress in that direction. Homeland Security Presidential Directive-8 (HSPD-8) directs that the DHS assistance for first responder preparedness will be based "on assessments of population concentrations, critical infrastructures, and other significant risk factors, particularly terrorism threats, to the extent permitted by law."² HSPD-8 also is a good start in mandating the development of a funding

¹ National Strategy for Homeland Security, July 16, 2002, Page vii, retrieved March 27, 2004 from <http://www.whitehouse.gov/news/releases/2003/12/20031217-6.html> National Strategy for Homeland Security

² Homeland Security Presidential Directive-8, retrieved March 25, 2004 from <http://www.whitehouse.gov/news/releases/2003/12/20031217-6.html>

allocation formula that incorporates measurable criteria. But much more needs to be done to restructure the overall allocation system for grant distributions by the DHS.

In this thesis, I propose that the DHS adopt a new method of allocating grant funds, driven by criteria that include the criticality of potential targets within a jurisdiction, population density, threat, vulnerability and prevention priorities. This approach draws on the Analytic Hierarchy Process (AHP) – a well recognized and widely used tool for decision-making – to weight and integrate the criteria into an effective funding allocation formula. The resulting formula is vastly superior to the present arbitrary allotment of .75 percent of available grant funds to each State, and also better than the allocation of funding on a per capita basis. It results in a formula that is much more likely to allocate funds where they are needed to defeat terrorism.

A. CURRENT ALLOCATION FORMULA

The allocation of homeland security grant funds on an arbitrary (as opposed to a need-driven) basis rests in United States law. The terms of that law are as follows:

MINIMUM AMOUNT- Each State shall be allocated in each fiscal year under this section not less than 0.75 percent of the total amount appropriated in the fiscal year for grants pursuant to this section, except that the United States Virgin Islands, America Samoa, Guam, and the Northern Mariana Islands each shall be allocated 0.25 percent.³

Grants awarded on a competitive basis also often have arbitrary constraints, even when they do take need-based criteria into account. The assistance to Firefighter Grant Program that the Federal Emergency Management Agency (FEMA) administered before being transferred to the ODP is based on a competitive grant process. That competitive process is supposed to get funds where they are required. However, the limiting factors imposed on municipalities are problematic. The limit on the amount of money a department can apply for at present is

³ H. R. 3162 section 1014c, (Patriot Act), retrieved March 25, 2003 from http://www.eff.org/Privacy/Surveillance/Terrorism/20011025_hr3162_usa_patriot_bill.html

\$750,000.⁴ To be fair, this system has not been designed as a needs system for terrorist prevention; it is based on a needs basis for fire response. Sometimes, the two go hand in hand. Sometimes, they do not. But the larger problem remains: by placing arbitrary limit on funds, rather than allocating funds strictly on the basis of requirements, there is a risk that funds will not go where they are most needed. Allocating homeland security assistance on a per-capita basis suffers from the same basic flaw.

There are some benefits to arbitrary and per-capita driven allocation systems, but the shortfalls far outweigh them. Allocating funds by an arbitrary number or by population is simple. Take the money appropriated, divide by the .75% and then by the population of each state and you have the amount that goes to each state. You can invest 10 minutes and you have a funding allocation. When you use these two formulas, you also have the tendency to remove the political process from the equation. If the politicians are removed from the equation, so (perhaps) is political meddling.

Efforts to build a needs-driven system may appear too difficult or too vulnerable to manipulation. In a recent article by Martin Edwin Andersen and Alice Lipowicz, the authors note that objective criteria may be difficult to identify: “Is measuring the probability of a <terrorism> act a science, a matter of opinion, a guess — or politics? Maybe it's all four, but it's also a lot more than a theoretical exercise for state and local governments maneuvering for federal anti-<terrorism> funds.⁵

Arbitrary and per-capita based allocations may also reflect a desire to be “fair” to all States and local municipalities. If funds are allocated on the basis of need, you may get an argument from one politician or another that his or her constituents didn’t get their fair share. I argue that as a nation it is more important that we protect our most valuable and vulnerable assets and, by doing so, all citizens get their fair share. The cost/benefit ratio of the nation will be managed better and the end product will be a country that is less vulnerable to the effects of terrorism.

⁴ AFGP Fire Prevention & Safety Grants About 2003 Fire Prevention and Safety Grants, retrieved May 31, 2004 from <http://www.usfa.fema.gov/fire-service/grants/safetygrant/03-prev-grants-about.shtm>

⁵ Martin Edwin Andersen and Alice Lipowicz, CQ Staff, “You Do the Math, Congress Says, Grappling With New Formulas for State and Local Grants,” CQ Homeland Security Website, Posted October 21, 2003, retrieved November 14, 2003

When the funds are distributed and some small town in a rural state gets funding to enhance the hazardous materials response of the fire department and the department purchases haz-mat equipment, can anyone tell me that expenditure best protects the country when there isn't a possible target within a thousand miles? Yet, what is the possibility of those same citizens visiting a large city and being involved in an incident? Or, what is the economic cost to that same small town when the food supply of the nation is tampered with or Capitol Hill is closed due to a possible biological weapons attack? Has anyone estimated the stock market's impact on pension systems after 9/11 which affected every American? The money has to be spent to protect the likely targets.

B. SUPPORT FOR CHANGE

Secretary Ridge has stated before Congress on a number of occasions that change is necessary in the DHS' approach to allocating grant funds. He notes that:

the formula used in the past shouldn't be used in the future because it doesn't take into consideration some of the special needs that certain communities have and certain states have that are substantially greater than others.⁶

One reason that change is so necessary is that resources for homeland security are limited, and therefore need to be allocated wisely. A report by the Council on Foreign Relations, "Emergency Responders: Drastically Underfunded, Dangerously Unprepared," summarizes the problem we confront:

If we knew that there was going to be a terrorist attack sometime in the next five years but did not know what type of attack it would be, who would carry it out, or where in the United States it would occur, what actions would we take to prepare and how would we allocate our human and financial resources to do so?⁷

This is the true challenge that the nation has to face daily. The United States certainly will experience another terrorist attack. Will we be ready? Will we be able to protect the citizens of this country the way they deserve to be protected? Will we expend the funding in

⁶ Hernandez, Raymond, "New York Officials Complain of Unfair Share of Homeland Security Money," New York Times, 30 March 2003.

⁷ Emergency Responders: Drastically Underfunded, Dangerously Unprepared, Report of an Independent Task Force Sponsored by the Council on Foreign Relations, June 2003, 1.

the correct areas? All of us have to try to answer these questions with the fate of our country in mind. The Council on Foreign Affairs estimated that “America will fall approximately \$98.4 billion short of meeting critical emergency responder needs during the next five years if current funding levels are maintained.”⁸ If this is true, we need to make sure that the available funds go to the areas of greatest need.

The U.S. Conference of Mayors report, “90 Percent of Cities Left Empty-Handed Without Funds From Largest Federal Security Program,” puts the emphasis on getting direct funding to cities – as opposed to going through the convoluted process of passing the funds through the States. Gary, Indiana, Mayor Scott King states:

Not only are we last in line for funding, we are the last in line to be consulted about what it takes to protect our citizens....Cities know their needs best. State bureaucrats are in no position to decide whether or what kind of protective suits or communications equipment we need for homeland security.⁹

Will the legislators listen or will it be politics as usual? Will the politicians actually put the money where it is needed, where the vulnerabilities are? Will the money go to where the critical infrastructure is located? Will the funds go where the population density is such that it continues to attract attacks from the terrorists? Should cities need to go through the State to get its funds? There are cities that do not need their money running through the State to apply it correctly. If so, why does the Federal Government make the requirement of State passage mandatory? If the critical infrastructure is located in a city where there is a threat, there is no need for the State to get involved unless the State decides to protect that critical infrastructure.

My congratulations go to the Government Accounting Office (GAO) for picking up on much of what was discussed in the report conducted by the Council on Foreign Affairs, but also for adding a key new item for change: the ability to have measurable performance goals must be incorporated into the funding formula and reported to Congress as a need. “Reforming Federal Grants to Better Meet Outstanding Needs,” GAO-03-1146T states the following:

We noted at the time that the national strategy’s initiatives often did not provide a baseline set of performance goals and measures for homeland security.¹⁶ Then and now—over a year later—the nation does not have a comprehensive set of

⁸ Emergency Responders: Drastically Underfunded, Dangerously Unprepared, Report of an Independent Task Force Sponsored by the Council on Foreign Relations, June 2003, 2.

⁹ The United States Conference of Mayors “U.S. Conference of Mayors Announces: 90 Percent of Cities Left Empty-Handed Without Funds From Largest Federal Security Program” September 17, 2003 http://www.usmayors.org/uscm/news/press_releases/documents/homelandfunding_091703.pdf

performance goals and measures against which to assess and upon which to improve prevention efforts, vulnerability reduction, and responsiveness to damage and recovery needs at all levels of government.¹⁰

Both Republicans and Democrats alike want to make changes to the current system. In two bills recently introduced to Congress, we see the chance for bipartisan politics merging in response to this nagging question of how the money should be spent.

House Republicans and Democrats on the Select Committee on Homeland Security are talking about collaborating on legislation meant to streamline the homeland security funding process for first responders. A committee spokeswoman declined to say whether two separate bills -- introduced by Rep. Christopher Cox (R-Calif.), who chairs the committee, and ranking minority member Rep. Jim Turner (D-Texas) -- would be merged.¹¹

These are not the only politicians who have introduced legislation to try to fix this distribution problem. Senator Clinton (D-NY) also has introduced legislation so that funds would go directly to first responders in middle and large communities. This is a good start in putting the money where the population density warrants it, but once again, it doesn't take into consideration the threat to and the vulnerability of the community.¹² Without threat and vulnerability analysis, the money could be going to the wrong places. Shouldn't communities with threat-driven prevention programs be afforded some additional funds?

Key legislators are also beginning to insist that as the DHS distributes funds, States and localities be held accountable for spending it wisely. The following statement shows how the frustration of the country has finally boiled over into Congress. Rep. Hal Rogers (R-Ky), Chairman of the House Appropriations Committee on Homeland Security, recently demanded that the ODP immediately issue a plan that specifies to States and local first responders the "minimum essential capabilities" that the Federal Government expects from them when grants are awarded.¹³

¹⁰ GAO report 03-1146T taken from website <http://www.gao.gov> November 15, 2003.

¹¹ Sarkar, Dibya, "DHS grants bill could be bipartisan," FCW.COM, posted November 4, 2003, retrieved November 14, 2003.

¹² Press release by Senator Clinton taken from the web site <http://web.lexis-nexis.com/universe/document>, retrieved on September 27, 2003.

¹³ Strohm, Chris, *Lawmakers demand standards for homeland security grants*, retrieved March 21, 2004 from <http://govexec.com/dailyfed/0304/031804c1.htm>

Of course, politicians can be part of the problem. Legislators sometimes attempt to direct Federal resources in ways that help them get reelected, but may not meet genuine national needs. Congress recently denied a \$261 million request for NYPD counterterrorism training and equipment, along with \$277 million denied to the FDNY in the same areas of preparedness. Simultaneously, Congress approved in the \$397.4 billion Omnibus Appropriations Bill \$202,500 for the Nation's Cherry Festival, \$560,000 for a Montana sheep study, \$500,000 for improved catfish health and, to top it off, \$90,000 on the National Cowgirl Hall of Fame.¹⁴ Politicians and government employees see that there is a need to spend the money correctly so that the country is protected from the effects of terrorism. As American citizens we all need to band together to ensure that our elected officials and government employees spend our precious money in the correct manner.

Given the temptations of "pork," and the risk that the allocation of funds can be politicized, the present formula grants approach to distributing grants have a certain appeal. They are difficult to tamper with. Need-driven criteria may be more difficult to develop and apply. But the war against terrorism is too serious to continue to take the easy way out. As noted by Paul Posner, General Accounting Office's Managing Director of Federal Budget Issues and Intergovernmental Relations, the bottom line question is: "What impact will the grant system have in protecting the nation against terrorism?"¹⁵ The Department of Homeland Security is in its infancy and represents the largest and most comprehensive reorganization of the Federal Government in more than 50 years. Are we not going to demand that all of this reorganization do some good? We have to ensure that these most vital funds are going to attack the problem. By allocating these funds under the existing procedures, there is no way to ensure that the monies are attacking the problem in the most effective way. Chapter II examines "lessons learned" from other grant mechanisms that might be applied to the challenges of improving the DHS system.

¹⁴ Feiden, Douglas, "Congress Loves Pork Finest and Bravest Lose out to Hogs," New York Daily News, 23 March 2003.

¹⁵ Sarkar, Dibya, "DHS doles out \$2.2 billion in grants, FCW.COM, posted November 4, 2003, retrieved November 14, 2003.

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II. FUNDING FORMULAS

A. COMPARISON OF GRANTS

Many of the departments, offices and bureaus that make up the Federal Government have served as the administrators for grants to States and local municipalities across a wide range of programs. Other democracies have also pioneered new approaches to grant allocation. At least some of these grants are allocated on the basis of need, and therefore provide models that might be adapted to serve the special requirements of homeland security. This Chapter analyzes the alternative approaches to funding distribution reflected in these models. The Chapter also reviews recent initiatives by the DHS that relate to the funding allocation process, and examines the implications for opportunities to develop a better allocation system.

B. ALTERNATIVE METHODS OF FUNDING

In doing my research, I have found that the funding for domestic preparedness is not the only program where distribution of funds has been contentious. This problem does not appear to be unique to the United States. Other funding systems across a range of governmental functions -- from health care to housing grants -- are under scrutiny as well, and a number of new approaches to need-driven funding allocations have emerged.

1. Health Care Funding Formula

In a report published by the British Columbia Medical Association, titled “Regional Health Care Funding Formula,” some of the same problems that I have shown in the ODP formula also exist. In a survey to which more than 900 physicians responded, “less than 1% of physicians are interested in capitation as a payment modality.”¹⁶ In addition to the British Columbia Medical Association delineating the problem, the Minister of Health received a letter in 1999 from the Health Association of British Columbia, stating “that the implementation of an

¹⁶ British Columbia Medical Association web site (January 2002), Regional Health Care Funding Formula retrieved, February 27, 2003, from <http://www.bcma.org/IssuesPolicy/IssueBackgrounders/regionalfundingformula.asp>

equitable, population needs-based funding formula is a top priority, and that the lack of a population needs-based funding formula is directly impacting the effective delivery of health services to the people of British Columbia.”¹⁷

The report continues and proposes the following formula that is based not only on population, but also on age, gender and socio-economic status, all of which reflect on the proportion of funding that is needed to have a fair and robust system. This proposal was successfully adopted in the 2002/2003 fiscal year. The implication for homeland security funding is that there can be need-based criteria related to population, and my proposal will explore that possibility (especially in regards to the population density of a municipality).

2. Housing and Urban Development Funding Formulas

The Housing and Urban Development Department (HUD) of the U.S Federal Government is in charge of administering a number of grant programs. As far as I have determined, all of their programs are based, at least partially, on needs. I will review a number of them and show how they distribute funds by meeting certain needs-based criteria. It would be easy for them to just use the per capita formula that the Office of Domestic Preparedness uses, but they do not. They actually developed a system that appears to deliver the funds where they are most needed. Not only did they develop a needs-based system, but it varies for the different grants they offer. It may be because they have been administering these grants for a number of years and have had the time to develop these much-needed systems.

The first program I will discuss dealing with HUD financing is the state-administered Community Development Block Grants (CDBG). This program gives states the flexibility to administer the grant to its needs. The states must assure the following.

- Formulate community-developed objectives.
- Decide how to distribute the funds among communities in non-entitlement areas.
- Ensure the recipient communities comply with applicable State and Federal laws and requirements.¹⁸

¹⁷ Health Association of British Columbia. (1999, February). *Population/Needs-based Funding Formula Letter*. retrieved February 27, 2003 from <http://www.ha.bc.ca/info/item.cfm/policywork/Fundingformulaletter>

¹⁸ Dept. of Housing and Urban Development web site State Administered CDBG retrieved March 2, 2003, <http://www.hud.gov/fdaloc.cfm>

HUD determines the amount of each grant by a formula that uses several objective measures of community needs, including the extent of poverty, population, housing overcrowding, age of housing and population growth lag in relationship to other metropolitan areas.¹⁹

The next program that I reviewed is the Comprehensive Grant Program (CGP). This program “makes funds available to help public housing agencies correct physical and management deficiencies and keep units in the housing stock safe and desirable places to live. The CGP gives large Public Housing Authorities (PHA) discretion for planning specific improvements and facilitates long-term planning by providing funds annually on a formula basis.”²⁰ In this program, the municipality must have a public housing agency, which is not unlike having an asset that might be targeted by terrorists.

The third program of interest under the HUD grant program is titled Housing Opportunities for Persons with AIDS (HOPWA). Under this program, there are funds available to deal with housing issues for people with AIDS, and families with members who have AIDS. Again, the department has given the municipalities some flexibility in assigning the monies to address the task. “These include, but are not limited to, the acquisition, rehabilitation, or new construction of housing units; costs for facility operations; rental assistance; and short-term payments to prevent homelessness. HOPWA funds also may be used for health care and mental health services, chemical dependency treatment, nutritional services, case management, assistance with daily living, and other supportive services.”²¹

These grants by Housing and Urban Development have one thing in common. They are predominately based on need. Could you imagine monies for AIDS families dispensed per capita? There are some states with a population with very few families experiencing the ravage caused by the deadly virus. How about spending money for housing designed for a municipal housing complex, only to find out that the city didn’t have any AIDS victims. HUD would take

¹⁹ U.S. Dept. of Housing and Urban Development web site State Administered CDBG retrieved March 2, 2003, <http://www.hud.gov/fdalloc.cfm>

²⁰ U.S. Dept. of Housing and Urban Development web site Comprehensive Grant Program (CGP) retrieved March 1, 2003 from <http://www.hud.gov/fdalloc.cfm>

²¹ U.S. Dept. of Housing and Urban Development web site State Administered CDBG retrieved March 2, 2003 from <http://www.hud.gov/fdalloc.cfm>

a beating if they provided grants solely on a per capita basis. They have tried to do their job and at least allocate the funds to areas where the money is needed.

3. Iowa Homeland Security Funds Distribution Formula

Another instructive example is the way that Iowa distributes homeland security funding to local jurisdictions. Iowa doesn't take the easy route. They established a number of categories that were taken into account to meet the important criteria for Iowa. They included critical assets, people (population) and agriculture infrastructure. In developing priorities, it was established that the majority of assets were concentrated in fewer than one-third of Iowa's counties.²² The population centers became the focus for counter bio-terrorism strategies and agriculture was identified as a universal critical asset for all Iowa counties. The value of the critical asset was defined as the **numerical criticality score** derived from a mathematical formula measuring asset criticality and vulnerability used in the state's Critical Asset Protection Plan.²³

The following is an account of how the formula was developed. Under Iowa's Critical Asset Area three sub-groups were developed. They were:

- Criticality
- Vulnerability
- Threat

They further divided criticality into eight sub-groupings. The sub-groups are:

- Mass causality
- Essential emergency response
- Economics
- Key military facilities
- Critical infrastructure role (mostly transportation assets)
- Input to the government

²² Gordan, Ellen, *The Iowa Homeland Security Initiative*, 2002 Federal Homeland Security Funds Distribution Formula.

²³ Gordan, Ellen, *The Iowa Homeland Security Initiative*, 2002 Federal Homeland Security Funds Distribution Formula.

- Symbolic targets
- Information technology of an asset.

Under the Vulnerability area of the formula the following five subgroups were utilized:

- Visibility
- Access
- Cyber access
- Site specific hazards
- Collateral damage potential

Under the critical asset area of the formula Iowa also included threat as a factor. They knew that this was an important factor but were unable to come up with sub-groups that could be measured objectively. At the time of using this formula threat was factored in as a constant across all counties. They continue to strive to develop this area. As I address this area in my formula I concluded that the DHS needs to be involved with States and localities to help them develop and apply this criterion. It is beyond the scope of a local municipality, since they do not have all the information necessary to develop measurable factors.

All of the subgroups were evaluated by severity and scope. They were given two numerical values between 1 to 5. The final score was the product of the severity and scope for a maximum value of 25. Then each score was converted into a percentage. By representing the numerical scores as a percentage, you remove much of the artificial weighting produced by using eight sub-groups under critical assets and five sub-groups under vulnerability and a constant under threat.²⁴ I have normalized the values to 1 in my formula to take this same effect into account.

The population portion of the formula was simply the number of people living in a county divided by the number of people living in the state. Once again this was represented in a percentage. This goes a long way in addressing the premise that terrorists want to go after population centers. In my formula I go one step further and factor in population by density.

²⁴ Telephone conversation between author and AJ Mumm chief planner, Iowa Department of Public Defense Homeland Security and Emergency Management Division and the author, May 13, 2004.

The Agro-Terrorism portion of the formula was derived from the total market value for each county divided by the total market value for the State. Once again this was expressed in a percentage.

The three percentages were then added together divided by three to come up with the Funding Formula Factor for each county. This factor was then applied to total funds available to the counties to determine the amount of funds disbursed to each county.²⁵

Iowa needs to be commended on recognizing the necessity for developing a needs-based formula for the distribution of funds to the counties. They certainly were ahead of the rest of the country as well as the Federal Government in identifying the need to develop a needs based approach that can be measured.

4. New York State Homeland Security Funding Formulas

New York State has also recognized that funding for municipalities should be needs driven. New York State has based the 04 State Homeland Security Program (SHSP) and the 04 Law Enforcement Terrorism Prevention Program (LETPP) on Population Density, Critical Infrastructure and Sites of Targets. As of the date of this thesis they have not released the formula behind the allocations of funds.

5. Nunn-Lugar Domenici Domestic Preparedness Program

The country started training and equipping first responders by passing the National Defense Authorization Act of 1996.²⁶ This act launched the Nunn-Lugar Domenici Domestic Preparedness Program. Under this program, 120 cities would be funded to increase their ability to mitigate a Weapons of Mass Destruction (WMD) attack in their community. As early as 1998, in testimony before Congress, the GAO was critical about the selection of cities, as well as noting that nothing was incorporated into the formula regarding threat, risk and vulnerability.

There was also no analysis to evaluate the extent to which the cities selected for the program were at risk of a terrorist attack warranting an increased level of preparedness, or whether a smaller city with high risk factors might have been

²⁵ Gordan, Ellen, *The Iowa Homeland Security Initiative*, 2002 Federal Homeland Security Funds Distribution Formula.

²⁶ National Defense Authorization Act for the fiscal year 1996, retrieved January 7, 2004 from http://www.fas.org/starwars/congress/1995_r/h104406.htm

excluded from the program due to its lower population. In fact, in none of the seven cities we visited did the FBI determine there was a credible threat of a WMD attack, which would be one factor considered in a threat and risk assessment. In our April 1998 report, we cited several public and private sector entities that use or recommend threat and risk assessment processes to establish requirements and target investments for reducing risk.²⁷

I applaud the work of these three distinguished members of the Congress for their insight and work in the early stages of the preparation of the country's first responders, especially how they tried to get equipment directly to the first responders. The thought of going directly to cities has merit, but only when linked to a threat perspective. As we look at the history of the transfer of the majority of the grants from the ODP, first in the DOJ and now in the DHS, there is still no mention of threat, risk or vulnerability in any of the funding formulas. This has to change.

6. Urban Areas Security Initiative

In the Urban Areas Security Initiative (UASI) of 2003, the government attempted to deliver funding to the correct areas. Funding went to the seven areas that, for the most part, constituted the most likely targets. "This financial assistance is being provided to address the unique equipment, training, planning and exercise needs of large, high-threat urban areas..."²⁸

CITY NAME	TOTAL
New York City	\$24,768,000
National Capital Region	\$18,081,000
Los Angeles	\$12,422,000
Seattle	\$11,201,000
Chicago	\$10,896,000
San Francisco	\$10,349,000
Houston	\$ 8,634,000 ²⁹

Table 1. Funding for UASI 2003

²⁷ GAO report COMBATING TERRORISM: *Observations on the Nunn-Lugar-Domenici Domestic Preparedness Program*, retrieved January 10, 2004 from <http://www.gao.gov/archive/1999/ns99016t.pdf>

²⁸ '03 Urban Areas Security Initiative 1 retrieved January 10, 2004 from <http://www.ojp.usdoj.gov/odp/docs/fy03uasigrant.txt>

²⁹ '03 Urban Areas Security Initiative 1 retrieved January 10, 2004 from <http://www.ojp.usdoj.gov/odp/docs/fy03uasigrant.txt>

Certainly, New York and the National Capital Region experienced terrorism firsthand. Los Angeles, along with the above-mentioned two cities, also has experienced threats. The UASI funding formula used the following criteria:

Funding for this program was determined by formula using a combination of current threat estimates, critical assets within the urban area, and population density. The formula is a weighted linear combination of each factor, the result of which is ranked and used to calculate the proportional allocation of resources.³⁰

We finally see the words *threat estimates*, *critical assets* and *population density* as part of the formula, and the Federal Government must be applauded for finally recognizing that need should be included in the process. The Nation still has to move forward to develop a formula for the entire country that takes need into account. I will include a number of the above criteria, as well as introduce a prevention element in my formula, to do just that.

You would think that the Federal Government would continue to fund the areas above by either the same or similar formula in future rounds, but somehow that changed in the UASI II of fiscal year 03, with 41 cities or counties being funded.³¹ In the fiscal year 04, the UASI grant raises the urban areas to 50. These grants, like UASI 03, mention “high-threat, high-density, urban areas.”³² They just do not seem to follow the same criteria at UASI 03. The government goes from seven areas to 50 in a year’s time. Why? Was there more information on threat, need or was it something else--like politics--that led to the increase of urban areas from seven to 50? Mention of threat estimates, critical assets and population density is absent in UASI 04. Why? This is one formula that the government almost got right.

Another troubling criterion put into the USAI 03 II and the USAI 04 is the requirement that funding requests go through the states. The states are required to pass at least 80 percent of the money to the named municipalities, but the 20 percent they can keep has once again nothing

³⁰ ‘03 Urban Areas Security Initiative 1 retrieved January 10, 2004 from <http://www.ojp.usdoj.gov/odp/docs/fy03uasigrant.txt>

³¹ ‘03 Urban Areas Security Initiative 2 retrieved January 10, 2004 from <http://www.ojp.usdoj.gov/odp/docs/UASIIIFY03GrantAppFinal.txt>

³² Fiscal Year 2004 Urban Areas Security Initiative Grant Program: Program Guidelines and Application Kit, retrieved January 10, 2004 from <http://www.ojp.usdoj.gov/docs/fy04uasi.pdf>

to do with threat, risk vulnerability, prevention or, for that matter, anything else. Once again, the question has to be asked, why?

C. HOMELAND SECURITY PRESIDENTIAL DIRECTIVE 8

Homeland Security Presidential Directive 8 (issued December 2003) is considered by many to be the ultimate fix for moving forward against the threats of terrorism. The directive has strong wording in the preparedness realm of homeland security:

(1) This directive establishes policies to strengthen the preparedness of the United States to prevent and respond to threatened or actual domestic terrorist attacks, major disasters, and other emergencies by requiring a national domestic all-hazards preparedness goal, establishing mechanisms for improved delivery of Federal preparedness assistance to State and local governments, and outlining actions to strengthen preparedness capabilities of Federal, State, and local entities.³³

I agree that there are many aspects of this Directive where the administration is correct. Among the excellent features of the directive are:

- Mandatory setting of timelines with regard to making the Secretary of Homeland Security establish and deliver to the President a National preparedness goal by the DHS FY 2006 budget submission.³⁴
- The coordinated interagency grant process.³⁵
- The adoption and approval of State strategies by September 2005³⁶
- The mandate of having the Federal Government incorporate other factors into establishing a formula that is actually worth the paper it is written on, as specified in Section 10 as follows:

(10) In making allocations of Federal preparedness assistance to the States, the Secretary, the Attorney General, the Secretary of HHS, the Secretary of Transportation, the Secretary of Energy, the Secretary of Veterans Affairs, the Administrator of the Environmental Protection Agency, and the heads of other Federal departments and agencies that provide assistance for first responder preparedness will base those allocations on assessments of population concentrations, critical infrastructures, and

³³ Homeland Security Presidential Directive-8, December 17, 2003, page 1

³⁴ Homeland Security Presidential Directive-8, December 17, 2003, page 2

³⁵ Homeland Security Presidential Directive-8, December 17, 2003, page 2

³⁶ Homeland Security Presidential Directive-8, December 17, 2003, page 3

other significant risk factors, particularly terrorism threats, to the extent permitted by law. ³⁷

My problem with this Directive is it does not go far enough. It does not sufficiently take into account the need to have prevention programs as one of the criteria to obtain funds. It does not take into account activities that actually work in a quantifiable way to be a pre-requisite to receive funds. My formula takes this into account and deals with the preliminary aspects of quantifying the prevention approach.

The Directive also offers a very narrow definition of prevention. The definition is as follows:

(i) The term "prevention" refers to activities undertaken by the first responder community during the early stages of an incident to reduce the likelihood or consequences of threatened or actual terrorist attacks. More general and broader efforts to deter, disrupt, or thwart terrorism are not addressed in this directive.³⁸

There certainly are aspects of response that make the reduction of secondary and tertiary affects of terrorist events important criteria in the objectives that an Incident Commander mandates in the establishment of the Incident Action Plan (IAP). The reduction of the effects of a terrorist event as well as accidental or naturally occurring incidents is sound thinking. It also follows the National Incident Management System NIMS protocols. Nevertheless, It is ludicrous to think this is where prevention starts. Prevention starts in planning for the all hazards approach long before an event happens. Given the importance of preventing any terrorist event from ever occurring, all jurisdictions must treat prevention as a top priority. This thought is also in keeping with the first objective of the National Strategy for Homeland Security. "Prevent terrorist attacks within the United States;"³⁹

I also take exception to the use of the word prevent or prevention that is used 12 times in this three and a half page document, many times with a connotation that is more than just after a terrorism event has occurred. If it was the Administration's position only to use the prevention aspect in this document in the after-attack perspective, the President may need to issue another directive that deals with first responders in pre-event prevention guidelines

³⁷ Homeland Security Presidential Directive-8, December 17, 2003, page 3.

³⁸ Homeland Security Presidential Directive-8, December 17, 2003, page 2.

³⁹National Strategy for Homeland Security, July 16, 2002, Page vii, retrieved March 27, 2004 from <http://www.whitehouse.gov/news/releases/2003/12/20031217-6.html>

Most important, however, even if the correct prevention criteria were adequately specified by HSPSD-8 and related documents, the DHS still lacks a systematic way of integrating and weighting those criteria into an overall funding allocation process. The next chapter proposes a method to provide for such an integrative mechanism.

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III. PROPOSED FORMULA

A. INTRODUCTION OF THE ANALYTIC HIERARCHY PROCESS (AHP)

Until now the Federal Government has arbitrarily put values on the criteria used in funding allocation formula. The proper weighting of the values to each criterion to be used in allocating funding is an important challenge. The Analytical Hierarchy Process (AHP) provides an excellent approach to this problem. Developed at the Wharton School of Business by Thomas Saaty, the AHP allows decision makers to model a complex problem in a hierarchical structure showing the relationships of the goal, objectives (criteria), sub-objectives, and alternatives (See Figure 1). Uncertainties and other influencing factors can also be included.⁴⁰

The AHP has been applied to a wide array of specific issues. In his 1980 book The Analytic Hierarchy Process, Saaty attributes the origins of this process to his effort in 1971 to develop contingency planning for the Department of Defense. Other areas he studied in the following years include the 1972 work on the economic, political and military status within Egypt during Middle East unrest and the “No Peace, No War” concept as well as the Sudan Transport Study in 1973.⁴¹ As the process matured, others took hold of the concept and continued the work in different areas. Dr. Robert Kupperman worked for the Arms Control and Disarmament Agency, in analysis of terrorism, while others worked in the conflict in Northern Ireland.⁴² This process continued to be accepted as depicted in 1990 when the European Journal of Operational Research published a special issue consisting of 18 articles dealing with applications of AHP to different segments of science and business. A few of the titles of the articles are:

- Equitable allocation of livers for orthotopic transplantation.
- A decision aid in the public debate on nuclear power.

⁴⁰ Saaty, Thomas., *The Analytic Hierarchy Process*, New York, N.Y., McGraw Hill, 1980, Publications, Pittsburgh, 1996. page 4.

⁴¹ Saaty, Thomas, *The Analytic Hierarchy Process*, New York, N.Y., McGraw Hill, 1980, Publications, Pittsburgh, 1996, ix.

⁴² Saaty, Thomas, *The Analytic Hierarchy Process*, New York, N.Y., McGraw Hill, 1980, Publications, Pittsburgh, 1996, ix.

- An industrial bond rating model based on the Analytic Hierarchy Process⁴³

The AHP provides decision makers with a system to assign the proper values to criteria within a given decision-making formula.

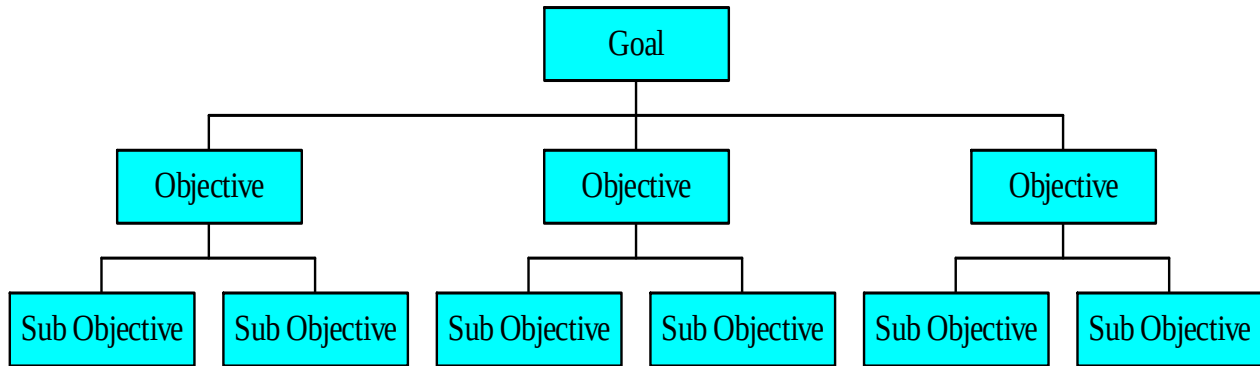


Figure 1. Hierarchy

As shown above, you take the complex problem and decompose it into criteria that can be measured, by using objectives and sub-objectives until criteria can be measured. The Analytic Hierarchy Process can be applied to many of the complex problems that are being faced within the Department of Homeland Security at present. I will use a simple example to illustrate how this process can work as well in showing some of the beginning steps in applying it to the complex funding formula.

1. Example of the Analytic Hierarchy Process

Let's say we wanted to purchase a vehicle. There are a lot of criteria that could be used to compare different choices. For our example, we will limit the criteria to price, color, and performance. Although we have three criteria, we will compare two at a time. We first set up the process to see if one criterion is more worthy than the others. This will develop into a process where the different criteria will be weighted. The following table is the criteria that are used to develop the weighted averages while using the Analytic Hierarchy Process. It is based on the premise that it is relatively easy to compare two different criteria. You use the pairwise comparisons that enable you to make the entire process simpler.

⁴³ Srinivasan, V. and Bolster, P.J. An industrial bond rating model based on the Analytic Hierarchy Process European Journal of Operational Research Volume 48, Number 1, September 5, 1990.

Verbal scale	Numerical values
Equally important, likely or preferred	1
Moderately more important, likely or preferred	3
Strongly more important, likely or preferred	5
Very strongly more important, likely or preferred	7
Extremely more important, likely or preferred	9
Intermediate values to reflect compromise	2, 4, 6, 8

Table 2. Fundamental scale for pairwise comparisons

The pairwise comparison using the criteria above in the previously mentioned example would look like this:

	Color	Price	Performance
Color	1	1/7	1/9
Price	7	1	1/5
Performance	9	5	1

Table 3. Weighting Criteria to Purchase a Vehicle

The first step is to compare each criterion to itself, i.e., color to color, price to price and performance to performance. The scores would all be one, meaning they are equally important, likely or preferred since you are comparing them to themselves. Thus the diagonal values are all ones. In this example the first column compares color to price and performance. The 7 indicates that price is very strongly more important, likely or preferred to color, and the 9 indicates that performance is extremely more important, likely or preferred to color. The next step is to place the reciprocal values in the row across from color. The color is very strongly less important, likely or preferred to price and, extremely less important, likely or preferred to

performance. The only criteria without values are a comparison of performance and price. If we believe that performance is strongly more important, likely or preferred than the price, we put a 5 at the intersection of performance and price and a 1/5 at the intersection of price and performance.

The next step is to normalize the weights to a 0 to 1 scale by adding up the columns and dividing the values by the total of the column. We then choose any of the columns and use the values in that column to weight the relative importance of the criteria. Shown in table 4 and 5.

	Color	Price	Performance
Color	1	1/7	1/9
Price	7	1	1/5
Performance	9	5	1
Total	17	43/7	59/45

Table 4. Normalizing the Values

	Color	Price	Performance	Weighted Ave
Color	1/17	1/43	5/59	.15
Price	7/17	7/43	9/59	.24
Performance	9/17	35/43	45/59	.62
Total	1	1	1	1.01

Table 5. Normalized Weights

To make this difficult process somewhat easier there is a computer program that was developed called “Expert Choice” to assist in much of the math involved in the process. Booz, Allen Hamilton’s International Infrastructure Team, compared results from subject matter experts with mathematical equations, and confirmed that this computer process is reliable.⁴⁴

⁴⁴ Booz Allen Hamilton Infrastructure Team, Reproducing Calculations for the Analytical Hierarchy Process retrieved March 14, 2004 from <http://mdm.gwu.edu/Forman/Reproducing%20AHP%20calculations.pdf>

2. Applying the Analytical Hierarchy Process to First Responder Funding

In this application of the Analytic Hierarchy Process the goal would be to provide the necessary funds to first responders to “continue to provide planning, equipment, training, exercise, and management and administrative funding to emergency prevention, preparedness, and response personnel”⁴⁵ as per the wording in the 2004 Homeland Security Grant Program.

The objectives (measurable) would be to:

- Identify what constitutes critical infrastructure
- Identify and fund areas where if a terrorist attack occurs will cause the greatest casualties
- Identify and fund areas where the greatest threats are
- Identify and fund areas where the vulnerabilities are highest
- Identify areas where prevention programs designed to reduce terrorist acts are working

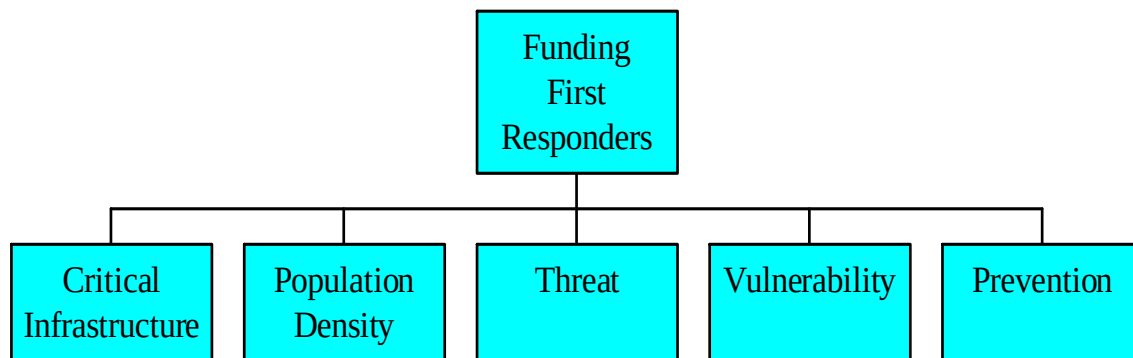


Figure 2. Funding Formula for First Responder Matrix

Some of the objectives have sub-objectives and they are laid out in each of the sections on the individual criteria below. Remember with AHP we need to continue down the levels in the hierarchy until we can measure the objectives.

⁴⁵ The FY 2004 ODP Homeland Security Grant Program (HSGP), page ii

B. CRITICALITY

Before the nation can decide where funding for first responders should go, they need to decide what is critical. How can the criticality of potential targets in a jurisdiction best be assessed and taken into account for grant allocation purposes? There appears to be an overwhelming sense that the entire infrastructure in each and every city and state is critical to that municipality. In a limited form, this is a correct statement but, in most cases, the municipality exaggerates that criticality. Also, what may be critical to a State or city may not be critical to the Nation. Once the Nation uses common criteria to assess criticality, then the Federal Government can say what they will and will not protect.

If the Federal Government passes money to a State to protect the top 10 critical assets, by national standards, and the State feels that they have 20, the State then will need to decide how to protect the rest. If a priority is in a city, the State may elect to pass that money to the city for them to protect it. The same example presented for the State exists for the cities. If the city gets the money through the State or directly from the Federal Government, they need to provide protection for that priority. If they choose to provide additional or more comprehensive protection for priorities that are not recognized as national or State priorities, they can do so at their expense.

In the National Strategy for Homeland Security, the administration announced 13 sectors that are critical to the survivability of the nation. They are agriculture, food, water, public health, emergency services, government, defense industrial base, information and telecommunications, energy, transportation, banking and finance, chemical industry, postal and shipping.⁴⁶ The administration also has noted that some other key assets need to be included in the mix as well, as we can see by the following quote.

In addition to our critical infrastructure, our country must also protect a number of key assets—individual targets whose destruction would not endanger vital systems, but could create local disaster or profoundly damage our Nation's

⁴⁶ National Strategy for Homeland Security, pg. 30, retrieved on January 18, 2004, from http://www.whitehouse.gov/homeland/book/nat_strat_hls.pdf

morale or confidence. Key assets include symbols or historical attractions, such as prominent national, state, or local monuments and icons.⁴⁷

When we add monuments and icons to the list of critical infrastructure, we have 14 sectors with which to deal.

The members of the Center of Infrastructure Expertise took these 14 sectors and developed a computer program that attempts to streamline the process of determining the criticality of a facility. Their analytical process is based on the criticality, accessibility, recoverability, vulnerability, espyability, and redundancy (CARVER) of an entity.⁴⁸

The technology that CARVER was based on was transferred to the private sector and developed into another tool called CARVER².⁴⁹ This tool allows municipalities to rank their own critical infrastructure and merge it into State and national data bases to allow the country to better assess what is critical. We will not be able to have a national data base of critical infrastructure until the entire nation uses the same analysis tool. This tool goes a long way in preparing the country to use a common set of criteria. With that said there are some problems with this model. One of the problems is that all of the criteria is weighted the same. This means that all of the components are equal. I do not think you will get everyone to agree what the measures are, but certainly everyone will say they are not all equal. Further work in this area has to be accomplished.

The tool mentions interdependency but doesn't incorporate a numerical value in the formula to account for that. Once again more work in this area needs to be done.

Albert Laszlo Barabasi has been credited with discovering that many naturally occurring networks are linked together by hubs. In many of these networks the hubs are not formed at random like most things in nature, but by a scale-free network. In a scale-free network there are some hubs that are more important than other hubs. The more important hubs are linked to many other hubs. Professor Ted G. Lewis of the Navel Postgraduate School in Monterey California is applying this phenomenon to critical infrastructure CI sectors. He has discovered

⁴⁷ National Strategy for Homeland Security, pg. 30, retrieved on January 18, 2004, from http://www.whitehouse.gov/homeland/book/nat_strat_hls.pdf

⁴⁸ NI² Center for Infrastructure Expertise Critical Infrastructure and Key Asset Analysis Software.

⁴⁹ National Infrastructure Institute Center for Infrastructure Expertise website, retrieved on January 18, 2004, from <http://www.ni2cie.org/people.html>

that many of the critical infrastructure sectors fall under this scale-free system. By associating this scale-free process to CI it shows that there are some pieces of CI that are more critical. This creates a third problem with the CARVER² model.

Figure 3 depicts how the power/energy sector is interconnected with the other sectors of critical infrastructure. If a terrorist attack is perpetrated against the power/energy sector it is obvious that a greater overall effect could certainly be part of the problem. This is especially true when the result of the attack makes the repair of the problem difficult. If the time that the power/energy sector is down is extensive the effectiveness of the attack is greater. The power/energy sector needs to factor in a quick repair and turnaround time. Spare parts should be common and available on a moments notice. But that is a topic for some one else to figure out. I bring it up here because CARVER² does not take this interdependency into account. In the final formula there has to be a interdependency section.

Also the AHP can be used by all sectors to analyze the difficult choices presented to them in figuring out the policies of how to cope with an attack on each and every sector. Where to place resources is certainly a question that comes to mind? Where to spend money on buying or leasing equipment are always options that need to be decided? The possibility of joining with competitors and sharing the cost of ensuring the network continues to operate should be explored.

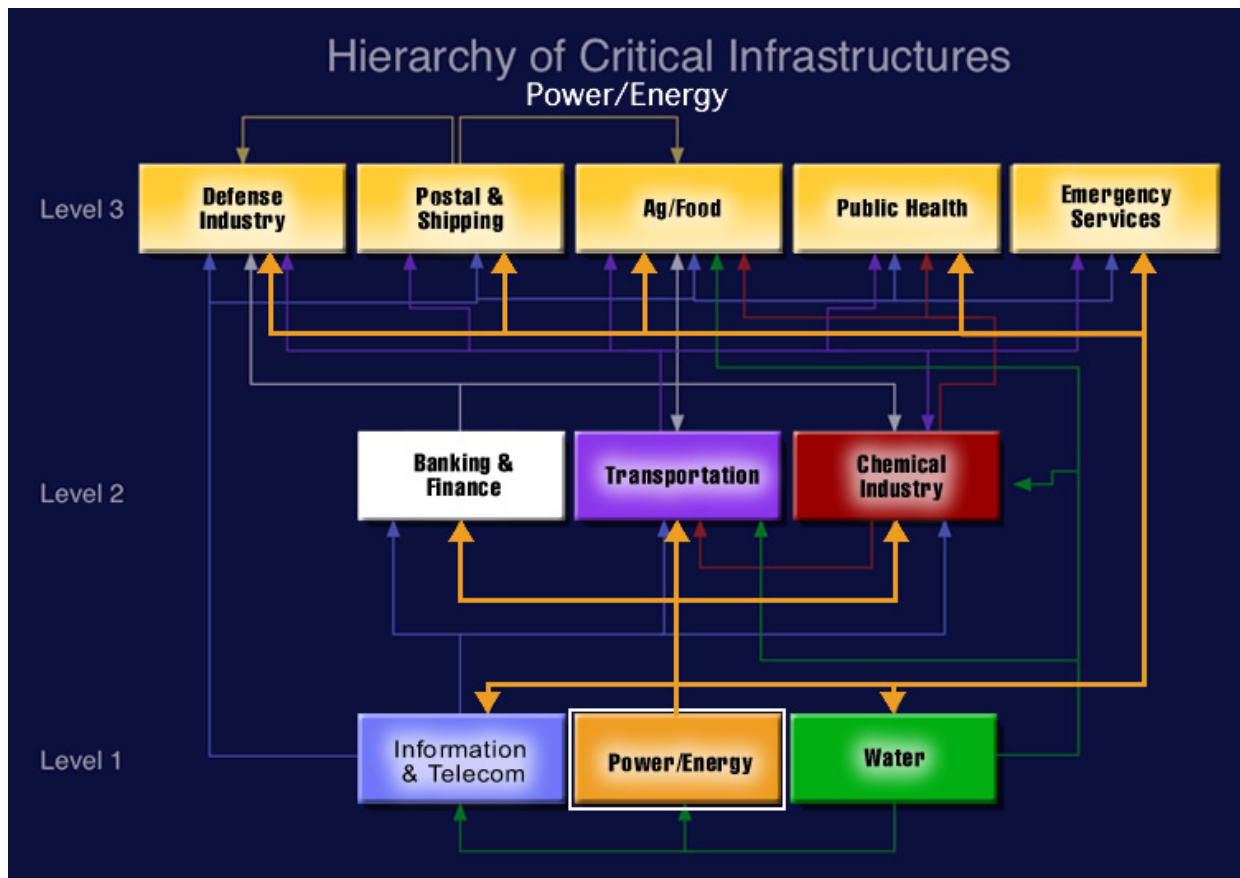


Figure 3. Hierarchy of Critical Infrastructure Power/Energy⁵⁰

Until a better matrix is developed, it will remain necessary to the necessity to use either CARVER² or some equivalent assessment tool. We cannot continue to throw money at a problem and hope that it is going to the correct places, especially when we can use a formula and reduce the amount of money spent and obtain a better result.

In order to develop a measured quantity for critical infrastructure I propose the following hierarchical structure. In doing so you can assign weights and measurements across the Nation that conform to identify truly critical infrastructure.

⁵⁰ Lewis, Ted naval Postgraduate School Critical Infrastructure CS 3660 class: Website on Vulnerability Analysis and Protection, Power/Energy Section, retrieved May 14, 2004 from https://www.hsld.org/course/studies.cfm?course_id=51&cci=cs3660_0302_pes

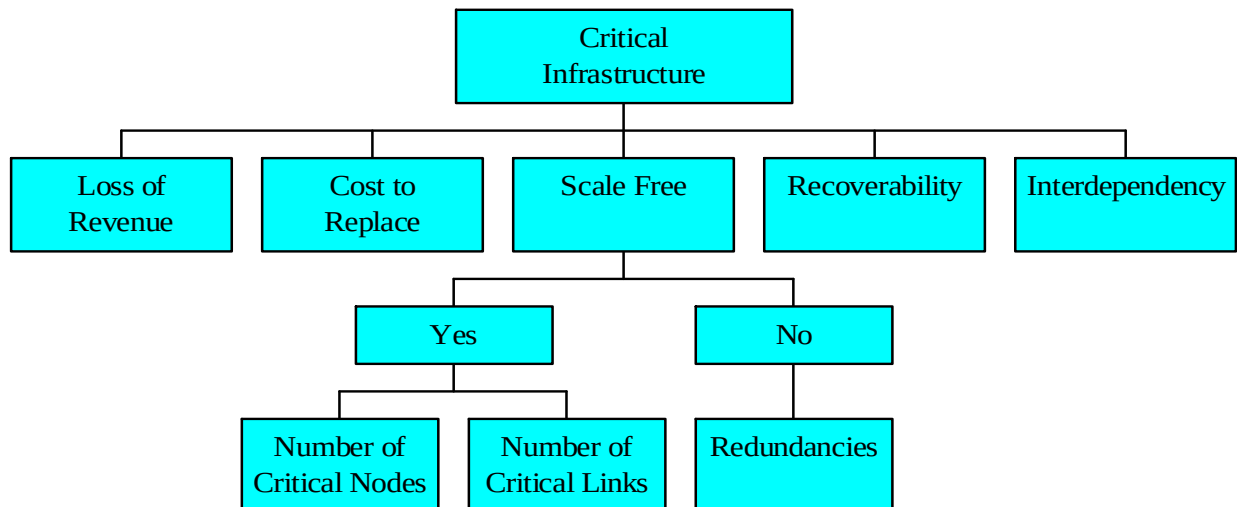


Figure 4. Criticality Hierarchy

C. POPULATION DENSITY

In Chapter I, I strongly attacked the use of population as a criterion for allocating grants. You may wonder why I am including it here. When I began on this project, I thought the population should not play a roll at all in the grant process, and then I realized that that is a key criterion in the mind of the enemy. The new terrorists want to kill as many people as possible. In order for terrorists to kill many people with the limited resources they have, they must maximize each and every attack. To accomplish this, they need to attack the areas of the country where the population is concentrated. Where else does this occur but in the big cities? As I have stated before, this has been recognized, first with allocations in the Nunn-Lugar Domenici Domestic Preparedness Program and then again with the Urban Areas Security Initiative (UASI). My proposal brings the population factor into the formula, combined with a density factor. Thus both a large and a concentrated population criteria are taken into account.

In order to develop a measured quantity for population density I propose the following hierarchical structure. In doing so you can assign weights and measurement across the Nation that conform to population density.

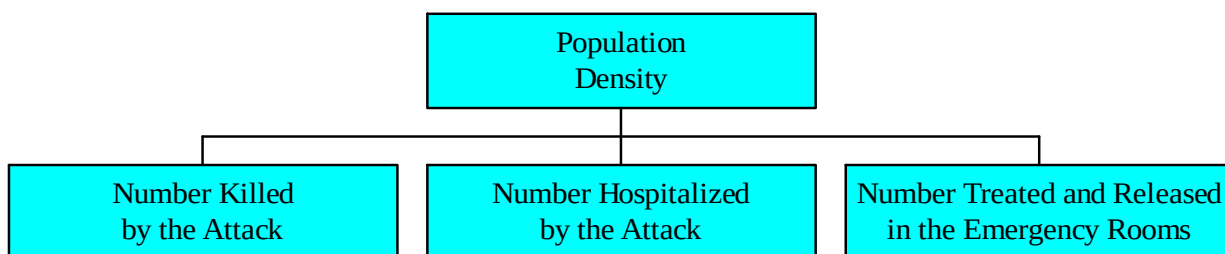


Figure 5. Population Density Hierarchy

I would propose that the ODP formulates a number of attack scenarios, and then have all entities that are applying for the grants run the scenarios in their communities (similar to the process in the latest UASI grant, where cities took the worst case scenario and assigned specific fatalities to each of the specific areas in question). My suggestion is to take three different attacks scenarios and average the results. As long as all grant requests use the same scenarios the results will correlate. The following are three proposed attacks that would certainly tax the first responder community.

- A 1 Kiloton nuclear device that has been detonated.
- A biological attack consisting of 1 pound of military grade anthrax.
- 2 gallons of VX sprayed over a square mile.

The weather in each of the events would have to be the same. The instructions would include the placing of the event in an area that would cause the most damage to the community. Each of these scenarios has the ability to be modeled to allow for a fair assessment of the community involved.

The Census Bureau has a multitude of population data on the country, data that pinpoint where people live. Even so, I have been unable to find a table that covers what I propose. However, the following sections of a few tables come close.

Source: US Census Bureau

Released: March 12, 1996

Revised: June 26, 2000 (Corrected population number for Alaska)

Pop.	Sq.Ki.	Sq.Mi	Sq.Ki.	Sq.Mi	Name
29760021	403970.7	155973.2	73.7	190.8	California
279182	1910.1	737.5	669.7	1734.5	Alameda County
1113	1913.1	738.7	0.6	1.5	Alpine County
30039	1534.7	592.6	19.6	50.7	Amador County
1487536	73.5	28.4	20239.1	52419.	4 New York County
220756	1354.5	523.0	163.0	422.1	Niagara County ⁵¹

Table 6. Land Area, Population, and Density for States and Counties:
1990

The preceding sections of this table classify the population by square mile and square kilometer and then by States and counties within the State. In order to be useful for my formula, it should be categorized by population by square mile or square kilometer and then ranked in descending order.

⁵¹US Census Bureau retrieved January 22, 2004, from
http://www.census.gov/population/censusdata/90den_stco.txt

	4/1/2000 census population	4/1/1990 census population	Numeric population change 1990– 2000	Percent population change 1990– 2000	Size rank 1990	Size rank 2000
New York, N.Y.	8,008,278	7,322,564	685,714	9.4	1	1
Los Angeles, Calif.	3,694,820	3,485,398	209,422	6.0	2	2
Chicago, Ill.	2,896,016	2,783,726	112,290	4.0	3	3
Houston, Tex.	1,953,631	1,630,553	323,078	19.8	4	4
Philadelphia, Pa.	1,517,550	1,585,577	68,027	4.3	5	5
Phoenix, Ariz.	1,321,045	983,403	337,642	34.3	10	6

Table 7. Top 50 Cities in the U.S. by Population and Rank

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The section of the preceding table does not show the density factor, but surely alludes to the fact that the population of more than eight million in New York City continues to attract terrorists who are looking for a suitable target.

In order for my formula to work, a table with the following criteria, ranked in descending order must be established:

⁵² Top 50 Cities in the U.S. by Population and Rank, retrieved January 16, 2004, from <http://www.infoplease.com/ipa/A0763098.html>

Land Area, Population, and Density for States and Cities		
Population	Population / Sq. Mi.	Name

Table 8. Population by Density

D. THREAT

To develop a correct threat matrix of an entity, you must have access to the appropriate intelligence. Not working in or having access to the intelligence sector, it is difficult to determine precisely how this should happen. Using a theoretical approach, I will propose a process that I feel will work. There are several ways to approach the threat aspect; one way appears to be the most feasible.

First, the responsibility of creating a threat matrix can be assigned to the Department of Homeland Security. They are supposed to have the correct, up-to-date data to support such an endeavor. Officials from the DHS confer regularly with the DoD, DOJ, CIA and FBI as well as other Federal intelligence agencies. In theory, they should be able to develop an accurate matrix. Since the threat entity of the nation changes constantly, this should be the last factor incorporated into the formula and be presented just before the allocation goes for a vote. Just as the threat changes from year to year, this part of the formula must change, too. The biggest drawback to this approach is that there is no input from the States and locals, something that is always a contentious subject.

The second factor to incorporate into this part of the formula is that municipalities can develop their own threat matrix from the information they have. It should include surveillance, intelligence and other information that the municipality has been able to gather. It is likely that this matrix will not be as accurate as one developed by the Federal Government, since it will not have all available intelligence. One advantage of this approach is that it would foster buy-in from the States and local municipalities, since they were part of the process and their information was used. The biggest disadvantage is that the final outcome would not truly

dictate an accurate threat matrix for the country and that is what we ultimately are trying to accomplish.

A third process--and what I think would be the most viable one--is to facilitate a joint process, a Federal/State/local tie-in to develop the matrix. You could have a group of intelligence agents from each State, including the District of Columbia and Commonwealth of Puerto Rico, plus the U.S. Territories, along with representatives from the top 25 areas of population densities (cities) and join them with representatives from all of the Federal branches of intelligence agencies. In essence this would form a National Information and Analysis Center (NISAC). This group would and should work on tracking the threats for many reasons, not just to develop this formula, but as an asset to the law enforcement community and the entire country. They should have intimate knowledge of all the terrorist activities that threaten this country. This group should be devoted to the problem of terrorism at all times.

Washington State has incorporated some criteria into the allocation of funds in their 2004 ODP State Homeland Security program to region/counties by using threat as a criteria. They need to be commended by taking the lead in doing so. The following threat matrix incorporates their thinking by using measurable criteria.⁵³ There may be other threat criteria that are used by intelligence agencies that are measurable, and if so they should be added to the hierarchy.

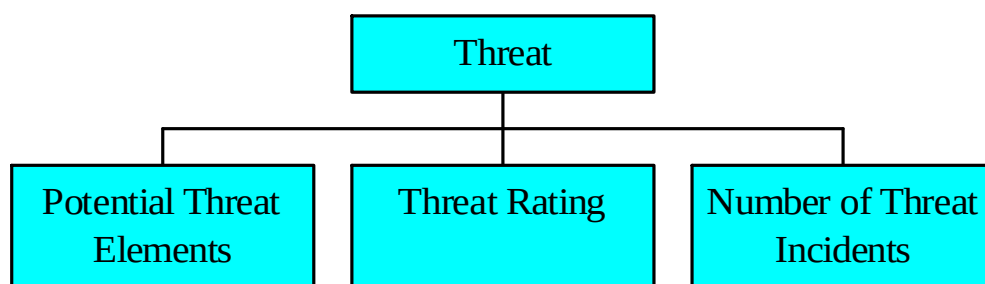


Figure 6. Threat Hierarchy

⁵³ Washington State Military Department, Military Division, presentation titled FY 2004 ODP State Homeland Security Program resource Distribution Algorithm, provided by Glen Woodbury division director, March 21, 2004.

E. VULNERABILITY

The aspect of vulnerability also brings up another difficult criterion to measure. How do you know if you are vulnerable? How do you know that you have taken the necessary steps to reduce and eliminate the vulnerability? How do you know when you have enough protection? Is it when there are no more attacks? Is it when there are no more attempted attacks? Is it when there are attacks but no one dies? Is it when there are attacks and only a few people die? What is the level of protection that will be acceptable?

Six people were found dead and 1,042 people were injured. The authorities believe that the bombers drove two vehicles into the underground parking garage, transferred the explosives into one vehicle and drove off in the other one. The explosion caused over \$500 million in damage. The World Trade Center remained closed for close to a month.⁵⁴

This is one account of the 1993 bombing of the World Trade Center. Obviously, the country was vulnerable, but the destruction wasn't enough to change the thinking of those in charge. Will this country accept the fact that if a terrorist group wants to have some influence, there is nothing that can be done to prevent some acts from occurring?

Is the aspect of domestic terrorism vs. international terrorism a question that should be addressed? Oklahoma City left a substantial number of Americans dead.

Rescue workers pulled 169 bodies from the rubble, some of them children from a daycare inside the building. Hundreds were injured.⁵⁵

This event certainly showed that the United States was vulnerable, but 169 people dead didn't change our minds regarding how we should approach terrorism.

Not until 3,110 people died in the attacks of September 11th did this country start to "get it." Currently, it appears that the allowable vulnerability level is set very high. How long will that last? If there are no more attacks, will the funding and programs die out? Does the next attack have to be a nuclear device or a widespread biological weapon to continue the high level

⁵⁴ Blackwood, Ryan, February 26, 1993 - World Trade Center Bombing, retrieved January 26, 2004, from <http://members.tripod.com/bblink/wtc.html>

⁵⁵ Clark, Tony, The worst terrorist attack on U.S. soil: April 19, 1995, retrieved January 26, 2004, from <http://www.cnn.com/US/OKC/daily/9512/12-30/index.html>

of protection? Will the priority shift to Social Security reform? Will Medicare dictate shifting massive amounts of money away from Homeland Security?

If you look around the world there are many terrorist groups that have caused havoc in many areas, some for a long time. Is the American population capable of accepting some terrorism? They have in the past. Israel certainly accepted the stark realism that its citizens will have to live with the fear--if not actual terrorist attacks--probably forever. The French are still victims of terrorist acts caused first by colonizing Algeria and now by supporting the secular government that is in power there. This question of how much terrorism or, better yet, what level of vulnerability to terrorism, is acceptable, is the foundation of this section. I propose that there is no acceptable level. Any acceptable level will be a wedge upon which terrorist cowards will try to expand. Only when the United States continues to take this hard line will the World "get it." The cost of this will be extremely high and will have to be sustained over a long period of time, but the alternative is a country that will always live in fear. This is why it is important to ensure that the money gets to the correct places.

So how do we fit vulnerability into a formula for funding first responders? The President and the ODP have taken the first steps in this process and must be commended for their leadership in this area. The National Strategies published by the Administration put all players on the same page. By making the urban areas establish a multi-year strategic plan regarding how they intend to use the monies, ODP is proceeding in the correct manner. This plan, in part, is based on the threat and how the municipality is reducing vulnerability to that threat.

The following is a vulnerability matrix that could be used in the formula for assigning funds. The category of number of Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) sites was taken from the work of Washington State⁵⁶ and the category of accessibility and building composition is taken directly from the CARVER² model.⁵⁷ There are certainly other vulnerability criteria that could be used. This is an example of what a vulnerability matrix could look like.

⁵⁶ Washington State Military Department, Military Division, presentation titled FY 2004 ODP State Homeland Security Program resource Distribution Algorithm, provided by Glen Woodbury division director, March 21, 2004.

⁵⁷ NI² Center for Infrastructure Expertise *Critical Infrastructure and Key Asset Analysis Software*.

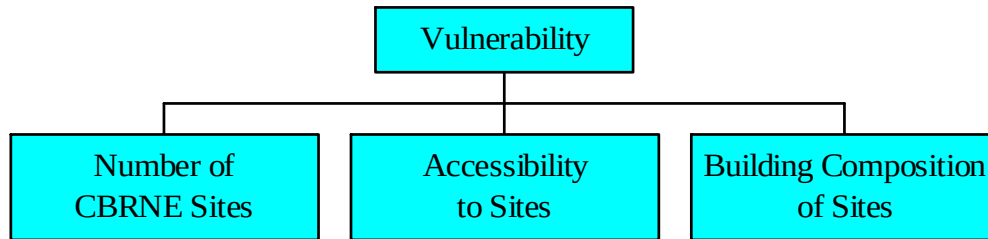


Figure 7. Vulnerability Hierarchy

F. PREVENTION

First responders must be prepared to minimize the consequences of an attack on our country. Much of this paper is based on that premise. A new philosophy that has been introduced recently is to use first responders in a prevention role. The term, “first preventer” has been introduced into the literature and the prospect needs to be defined.

As the example citation makes clear, the term first preventers is based on the existing phrase first responders (1980), the first official personnel on the scene of an accident, attack, or disaster. Much of the discussion on the structure and funding of the Department of Homeland Security has focused on turning first responders into first preventers by giving them access to some of the resources normally available only to the security and intelligence communities. For example, by coordinating databases, local police would have the ability to run extensive background checks on suspicious individuals.⁵⁸

My premise is that if a municipality doesn’t involve itself in a prevention role then they should not be eligible for federal funds. This proposal should not only should include law enforcement, but other agencies as well. Fire departments are a natural extension of the program. Their inspectors are inside buildings all the time. They are allowed access to areas where law enforcement entities must:

- Be invited in.
- Have exigent circumstances.
- Or obtain a warrant.

Not only do fire departments have access to buildings while performing fire inspections, but they are on the street responding to and returning from fires and emergencies all of the time. In New York City alone, the Fire Department responded to 2,159,357 calls for assistance during

⁵⁸ The Word Spy website, retrieved January 18, 2003, from <http://www.wordspy.com/words/firstpreventers.asp>

2003 and provided 183,403 Fire Code Regularity Inspections.⁵⁹ This equated to a lot of time interacting with the people who live, work and visit the city. We need to teach our “First Preventers” to look for the signs of terrorist activities.

The following may be the first mention of funding such a program.

The Federal Emergency Management Agency (FEMA) has had, and continues to have, a cornerstone role in better securing the homeland from all threats: natural or human-made. It has been a mere seven months since FEMA became a part of the Department of Homeland Security (DHS), but DHS and FEMA have made good progress in securing the homeland. With strong bipartisan support in Congress, we provided more than \$4 billion in equipment and training to the first preventer and first responder communities, all within the last six months.⁶⁰

As this program is developed, we should look to incorporate other agencies that have extensive contact with the public as well. One example that comes to mind is the Department of Buildings. The program could be expanded to the public sector as well. Utilities and delivery companies such as the postal service, UPS, Fed Ex, etc. certainly could be represented in this initiative. This will continue to increase the vigilance of many people and allow many more eyes and ears to focus on the prevention aspect of terrorism.

The thought of not allowing or limiting funds to municipalities that do not partake in a “first preventer” role would mark a dramatic shift. There may be a huge pushback but the same approach is incorporated into Federal HSPD-5 which will require adoption of the National Incident Command System (NIMS) as a condition to receive funds in the Federal FY 05 budget.

Beginning in fiscal year 2005, Federal departments and agencies shall make adoption of the NIMS a requirement, to the extent permitted by law, for providing Federal preparedness assistance through grants, contracts, or other activities.⁶¹

The process of adopting NIMS is moving forward, and the requirement for “first preventor” programs should be incorporated into future requirements for grant funding.

⁵⁹ Fire Department City of New York Annual Report 2003

⁶⁰ *FEMA Update The View From the Top*, retrieved February 5, 2004, from <http://www.colorado.edu/hazards/o/novo03/novo03a.html>

⁶¹ Homeland Security Presidential Directive HSPD-5 page 283, retrieved February 5, 2004, from <http://library.nps.navy.mil/homsec/docs/dhs/HSPD5.pdf>

The need for a community to have a robust system of detecting and preventing terrorist attacks is mandatory. This has to be part of any future funding formula that is produced by the Department of Homeland Security. This is the only way to make sure that municipalities are trying to stop attacks. There also has to be a provision in the formula for not penalizing communities that do a good job. Otherwise we may get the sentiment that if we prevent terrorist acts from occurring we will have our funding cut. What is the motivation for preventing events from occurring? This section of the grant process should include a provision for at least partial salary reimbursement to communities that have a successful prevention program.

I propose a few ideas in my matrix for preventability. Many of these are not tried and true but some have showed promise and are outlined in the following section on best practices. When communities are protecting farm fields, monuments like Mount Rushmore or the New Years Eve ceremony in New York City, there has to be a plan in place to reduce the vulnerability from attack. This plan needs to have a prevention component. Whether it is flying random flights over the corn fields, having federal park police conducting random sweeps of the monument, or having fire and police departments walking in the crowds in Times Square with radiological meters, all have a preventability component to them. All of these activities make it harder for terrorists to perpetrate an attack as well as a component to apprehend criminals, thus preventing crime. If the crime that is stopped, prevented is terrorist related so much the better.

The second part of this initiative is to see if the prevention programs are working. This may take time and a statistical analysis must be completed. An entire set of metrics must be developed. As with the above criteria preventability is no different and will need a group of subject matter experts to develop out fully. This set of criteria is beyond the scope of this paper. The matrix below is a first attempt to create a measurable set of criteria. The following, a preventability matrix, will be the hardest of the criteria to measure.

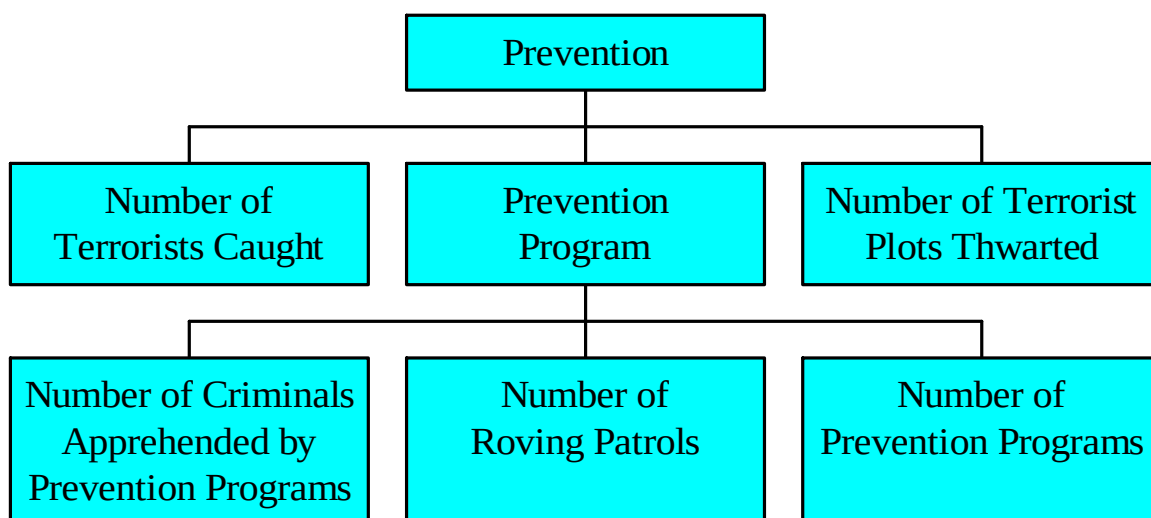


Figure 8. Prevention Hierarchy

G. BEST PRACTICES

I will present a number of best practices that have been instituted during the past few years and have shown promise in the area of prevention. The need to make these practices available to others should be incorporated in the state and local directorate at the DHS. There are a number of communities that have been actively seeking and establishing prevention initiatives. I will discuss a few that appear to be making a difference.

Los Angeles has taken the lead in this area under the initiative of Sergeant John Sullivan when they instituted the LA Terrorism Early Warning (TEW) Group Model in 1996. As Sullivan describes the mission of the group, we see how the vision of an all-inclusive task force can work.

The Los Angeles County Terrorism Early Warning (TEW) Group is a multilateral, multidisciplinary effort to monitor open source data to identify trends and potential threats, monitor specific threat information during periods of heightened concern, assess potential targets, and perform net assessments to guide decision-making during actual events.

We bring in each discipline, law enforcement, fire, health, we bring in the FBI, and they all form part of the command architecture. We also bring in outside agencies to participate in the process.... We rely on the members of the InterAgency Board [for Standardization and InterOperability], the Defense

Consequence Management Systems Office; in fact, members of those different entities serve as adjunct members of our Terrorism Early Warning Group.⁶²

What appears to have helped this group is the multi-agency approach and a reliance on using only open source information. By doing so, the process that slows down many investigations is eliminated and promotes quicker assessments and actions. Many other communities are looking at the LA model for use in their communities.

I feel the Nation is receptive to accepting the importance of prevention. Some municipalities are accepting it at a faster rate than others. If you look at the web site of the New York State Office of Public Security, there is a list of prevention activities that have been initiated. I will take just one as an example, again because of the inter-agency approach to solving a problem.

Governor Pataki announced the first results of a Fraudulent Documents Task Force in Queens, which stemmed from a coordinated effort undertaken by the Office of Public Security, the Queens District Attorney, the New York State Police, the New York City Police Department, the Department of Motor Vehicles, the Port Authority of New York and New Jersey Police Department, New York State Inspector General's Office and the Social Security Administration Inspector General's Office. Hundreds of arrests have been generated as a result of this operation which was designed to take down fraudulent ID mills operating in New York, and combat the illegal acquisition of state driver's licenses or non-driver ID's and other terrorism precursor crimes. The Task Force has continued its work in interdicting terrorism precursor crimes in other New York counties and has become a national model for multi-jurisdictional counter-terrorism efforts by law enforcement. [July 2002]⁶³

The New York Police Department web site lists numerous activities that are being used to deter terrorist activities (thus, hopefully, preventing terrorist events from occurring). The department has initiated an operation named Atlas. The following is an abstract of what the initiative contains:

With the raising of the national alert level from yellow to orange, the New York City Police Department has stepped up anti-terrorism precautions under Operation Atlas. Under Operation Atlas, the Police Department has launched a coordinated defense of the city, using regular patrols as well as police officers

⁶² Sullivan, John P., *Integrated Threat and Net Assessment: The L.A. Terrorism Early Warning (TEW) Group Model*, retrieved January 31, 2004, from, <http://www.rand.org/nsrd/bioterr/pdf/cp-Sullivan.pdf>

⁶³ New York State Office of Public Security website, retrieved on January 31, 2004 from <http://www.state.ny.us/security/response.html>

equipped with heavy weapons to safeguard landmarks, houses of worship, bridges, tunnels, subways, and the transportation system generally. The alert level in New York City was already at orange, indic[a]ting a high risk of attack. Operation Atlas has been underway since the war in Iraq began in March 2003. The staffing and assignments of Operation Atlas change with changing conditions. Operation Atlas has received high marks from the Secretary of Homeland Security, Tom Ridge, who called it a "model for other communities to follow." Secretary Ridge also stated that, "there is no city in this country that does a better job of working across the board to prevent terrorism than the City of New York."⁶⁴

Some of the components of the operation can be instituted into any community with little or no financial costs associated with them. They involve moving patrols around the city in a random manner. By moving them around, the police department is able to cover more areas with fewer personnel. If a terrorist group is scouting out its next attack and observes one of these roving teams, the hope is that the group will abandon that target and move to another. These actions accomplish two things:

- Prevent an attack from occurring.
- Allow more time to ascertain the individuals who are plotting the attack and, hopefully, that will lead to apprehension.⁶⁵



Heavily armed HERCULES teams are deployed randomly throughout the city.⁶⁶

⁶⁴ NYPD website, retrieved on February 5, 2004, from <http://www.ci.nyc.ny.us/html/nypd/html/atlas.html>

⁶⁵ Guerrira, Vincent, Capt. NYPD, interviewed by author, February 3, 2004.

⁶⁶ NYPD website, retrieved on February 5, 2004, from <http://www.ci.nyc.ny.us/html/nypd/html/atlas.html>

There is evidence that many criminals who commit petty crime are linked to terrorist groups. The Police Department of the City of New York has instituted a program in the subway system that has been very successful in apprehending low-level criminals. This now allows the police to question them and run background checks for links to terrorist organizations.

Train Order Maintenance Sweeps,” TOMS”, are deployed to arrest fare evaders and others, whose initial low-level offences are often precursors of more serious crimes in the subway system. TOMS may discourage or even intercept a terrorist attack.⁶⁷

The NYPD web site also shows a sense of cooperation within other agencies for a coordinated effort in terrorism prevention programs.

HAMMER teams, police and fire department experts in hazardous materials, are deployed jointly.⁶⁸

HAMMER “Hazardous Assessment Mitigation Mobile Emergency Response” teams first were formed during the anthrax attacks on the City of New York in the fall of 2001. It was realized that it would take a concerted effort by multiple agencies to be able to secure a sample, mitigate the scene, transport the sample to a testing facility and investigate the multiple events occurring on a daily basis. These teams then were expanded to cover many of the special events that occur in the city on a regular basis. The United States Tennis Open playoff and World Series games played in recent years are a few events where HAMMER teams have been deployed.

H. COMBINING FACTORS

Now that we have a comprehensive list of comparative factors to review, we still have to decide how to allocate the funds. It would be easy to say you need to get into the top 10 to be funded, but that would exclude most of the country and certainly not get favorable support from Congress.

So, my proposal would work on a sliding scale where the top 10 entities would receive 50 percent of the funding; the second 10 would receive 25 percent of the funding; the next 10

⁶⁷ NYPD website, retrieved on February 5, 2004 from <http://www.ci.nyc.ny.us/html/nypd/html/atlas.html>

⁶⁸ NYPD website, retrieved on February 5, 2004 from <http://www.ci.nyc.ny.us/html/nypd/html/atlas.html>

would receive 13 percent of the funding the next 10 would receive six percent of the funding; and so on. This approach is unique because as the system develops and the threats and vulnerability change the appropriation to municipalities will change. As the threat changes, the appropriation changes and then the amount of funding to different municipalities will change. As this process continues, it removes politics from the equation. It truly is based on criticality, population density, threat, vulnerability and the prevention activities of an entity. This system would provide the nation with an approach that allocates money where it is needed. It is a system that will change the amount a municipality receives from year to year based on hard and fast criteria that actually are linked to aspects of terrorism and not arbitrary, or subjective, factors.

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IV. CONCLUSION

Strong support exists within the DHS and Congress for change in the current system for allocating grant funds for homeland security. The nation is ready to enact a better, need-driven formula. Need-oriented criteria are used in the allocation of funds by other US agencies (and by nations around the world). Need is also being used by a number of States to disburse homeland security funds to local municipalities at the present time. These communities are looking for more guidance and better ways to measure whether the criteria they are using are correct, or whether there is a better approach to allocate funds. The Federal Government needs to take a leadership role in this regard.

I have proposed that the DHS adapt the Analytic Hierarchy Process (AHP) to build out a formula for grant allocation. The AHP takes complex problems and decomposes them into criteria that can be applied and measured, by using objectives and sub-objectives. The AHP has been used for over 30 years in many fields that have the same or greater degree of complexity as homeland security. There is no reason why it cannot be used in developing improved formulas for homeland security grant allocation.

The need for subject matter experts in all the criteria incorporated in my proposed formula will be essential to apply it effectively. No one person will have all of the answers. I believe the most important contribution of this thesis is my effort to describe the process by which decision makers might collaborate, within the AHP framework, to build the necessary funding allocation formula. It is clear, however, that a better, more needs-based allocation system can and must be developed. This thesis proposed an integrated set of criteria that could be used to build such a system, and a way to weight those criteria that supports the Administration's Homeland Security Strategy. The thesis also examines emerging best practices that can be taken into account in measuring the effective use of funds, and applying them to meet the needs of the Nation.

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