

Project 13d: Resource Allocation Based on Critical Infrastructure (Zimmerman)

This project is developing quantitative indicators of critical infrastructure use, capacity, spatial distributional characteristics, and value as a basis for a risk-based resource allocation prioritization system to protect those infrastructures.

Modeling Areas: Risk Management (Primary), Risk Assessment, Economic Analysis,

Application Areas Supported: Infrastructure Protection, Transportation Security

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Other Investigators:

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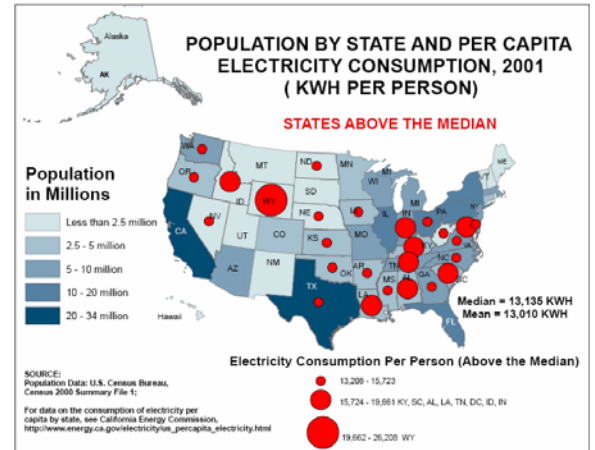
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Extent of electricity consumption per capita nationwide and spatial consumption clusters provides the basis for resource allocation-based decision tools in the area of critical infrastructure

Brief Description:

Critical infrastructures are potential targets of terrorism. The characteristics of their location, capacity, consumption, and value affect user populations, and are important risk factor inputs to homeland security resource allocation decisions for states, urban areas, and other geographic areas. This research focuses on analytical tools in decision analysis, policy evaluation, and other evaluation techniques for decisions and policy choices aimed at resource allocation based on and for the deployment and operation of infrastructure and the application of infrastructure security systems for homeland security programs.

Objectives:

To develop measures and apply methodologies to enable comparisons to be made among alternative resource allocation frameworks, with tools transferable to other areas.

Major Products and Customers:

This work will result in *products* in the form of transferable tools and applications consisting of quantitative indicators of infrastructure location, capacity, consumption, and value. A set of specific quantitative tools and selected applications for decision-makers, educators, and researchers will be provided in terms of a guide, toolbox, publications, and educational activities. In addition to the tools, this research provides demonstrations of what indicators to use, when, and how to prioritize infrastructure facilities for the allocation of resources. *Customers* include students and decision-makers such as managers of infrastructure operations and security in government and in companies, e.g., utility providers and security managers in the telecommunications, transportation, water and electric power and other energy industries.

Interfaces with other CREATE Projects:

We expect this project to interact closely with the Risk-Based Resource Allocation case study projects throughout CREATE, e.g., those underway at USC and the University of Wisconsin-Madison, as well as the Infrastructure Assets project for CREATE at NYU.

Interfaces to non-CREATE Projects:

NYU's research relates to the work at other DHS centers that is related to the role of infrastructure for emergency response, which is the scope of the DHS Center for the Study of High Consequence Event Preparedness and Response at Johns Hopkins, and also to research work on the social and economic behavioral dimensions of infrastructure hazards, which is the scope of the Homeland Security Center for Behavioral and Social Research on Terrorism and Counter-Terrorism at the U. of Maryland. This work also dovetails with research currently underway at another DHS funded academic center, the Institute for Information Infrastructure Protection (I3P) managed by Dartmouth College, which focuses on the use of Supervisory Control and Data Acquisition (SCADA) systems in the oil and gas industry.

Technical Approach:

1. *Indicators*. This task will identify, characterize, and quantify indicators for:

- Location, capacity, consumption, and asset value (infrastructure dimensions)
- Critical nodes or intersection points, where vulnerabilities may become magnified
- Infrastructure facility or usage structures/networks that are not easily defined in terms of political boundaries
- Interdependencies that may lead to vulnerability

2. *Metrics*. This task will develop the following metrics:

- Directionality Metric (which infrastructures cause vulnerabilities to other infrastructures and the direction of that effect)
- Cascading Effects Metric (how much effect will one infrastructure have on another when it fails or is attacked)
- Location and Concentration Metrics (concentration measures as a potential vulnerability to attack or consequences, i.e., to locate and quantify the magnitude)

3. *Evaluation Tools*. Review and show how analytical and evaluative tools and approaches can be applied to infrastructure vulnerability problems incorporating the indicators for a couple of representative cases.

- Economic Accounting Frameworks; Spatial Analysis Methods (GIS) applicable to characterizing buffer zones; Statistical Estimation Models; and Policy analyses

4. *Selected Comparisons*. Depending on data availability, calculations for indicators and selected decision and evaluation tools will be compared to priorities implicit in Office of Infrastructure Protection (OIP) grant programs, under the Urban Area Security Initiatives (UASI) and Buffer Zone Protection Program (BZPP), and other grant programs.

The resource allocation research is designed to use inputs from the infrastructure assets project.

Major Milestones and Dates:

- Assemble and distill major indicators for resource allocation by infrastructure category (Spring 2007)
- Produce literature-based synopsis of methodologies for resource allocation (Spring 2007, ongoing)
- Produce a "How to" approach to indicators for research and education (Fall 2007, ongoing)
- Assemble databases for illustrative applications of indicators and methodologies (Fall 2006, ongoing)
- Provide comparisons between resource allocation analyses and current grant allocations, and document these findings in a White Paper and publication (Fall 2007, ongoing)