Chemical Supply Chain and Resilience Project (Sandia)

In 2008, the Chemical Supply Chain and Resilience Project was expanded and placed under the direction and funding of the DHS Science and Technology (S&T) Directorate.

Following a 2007 demonstration and workshop, a number of major U.S. chemical corporations have asked to participate in the project.

Current activities include identifying the chlorine and ammonia supply chains and developing a resilience measurement capability.

Chemical Sector analysis results provide:

Assistance with **Asset Prioritization**

- Providing the framework to determine "economic criticality" for chemical production within geographic and temporal context

Assistance with **Consequence Analysis**

- Providing consequence analysis (from national, regional, and facility perspectives) of disruptions to chemical sector and/or infrastructures upon which it depends

Assistance with **Policy Analysis**

- Providing consequence analysis of policy decisions at the sector and sub-sector levels

Outreach

The strength of DHS's and Sandia's contribution to the security of our nation's chemical industry infrastructures depends on long-term partnerships with industry stakeholders and other government agencies. If you are interested in collaboration opportunities, please contact:

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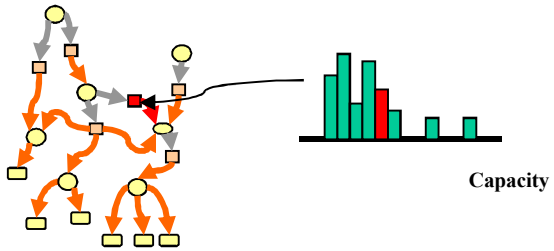
Network-Based Analysis and Insights (Loki)

Loki Identifies potentially affected chemicals and technologies by representing the chemical industry as a network of chemical dependencies



Economic Modeling (N-ABLE™)

High-fidelity microeconomic simulation provides insight into the potential economic impacts of system disruptions.

Individual, geospatially located firms are represented as collections of agents that interact in markets and through transportation infrastructures to acquire and convert chemicals to their final products.

Transportation Representation (R-NAS and ATOM)

Using the most likely source-destination flow and transportation mode per chemical, this representation allows transportation infrastructure network constraints to be integrated with commodity flow dynamics.

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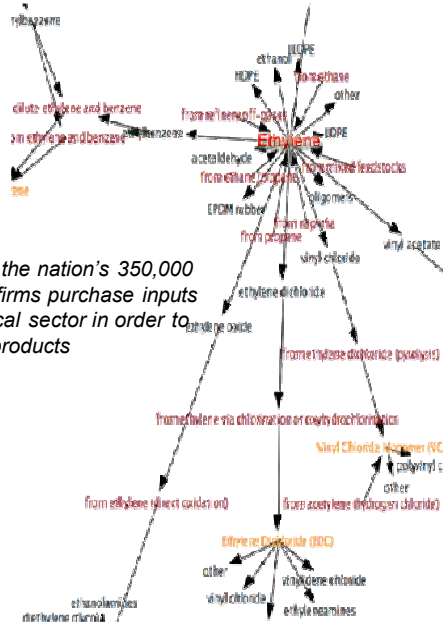
Department of Homeland Security
Science and Technology Directorate

Chemical Supply Chain and Resilience Project

Sandia National Laboratories

Chemical Infrastructure Analysis Project Background (NISAC)

In response to the identification of the U.S. chemical sector as one of the nation's critical infrastructure and key resources (CIKRs), the U.S. Department of Homeland Security (DHS) tasked the National Infrastructure Simulation and Analysis Center (NISAC) at Sandia National Laboratories (Sandia) and Los Alamos National Laboratory (LANL) with developing a modeling, simulation, and analysis capability that will allow the DHS to assess the vulnerabilities of this sector, its interdependencies with other CIKRs, its potential impacts from disruptive events (such as manmade and natural disasters), and its overall economic resilience.



The majority of the nation's 350,000 manufacturing firms purchase inputs from the chemical sector in order to fabricate their products

Chemical Sector Interdependencies

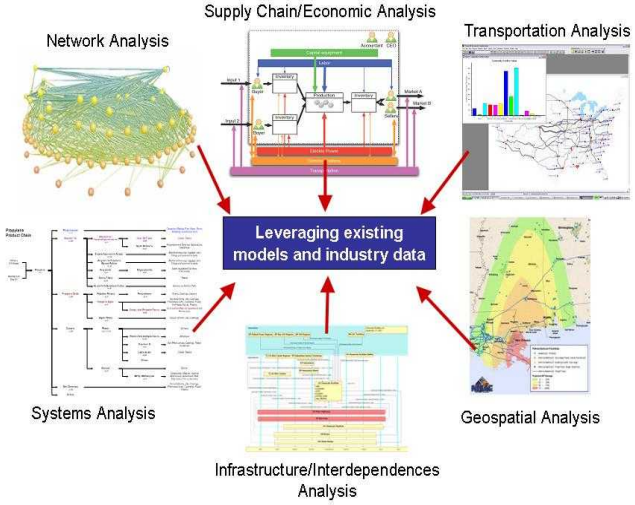
The Chemical Sector depends on several critical infrastructures—principally petroleum, energy, and transportation—and a complex, globally distributed, multistage processing chain for successful operations. Understanding how these components work together under normal and disrupted conditions is critical to chemical industry asset prioritization, consequence assessment, and policy guidance efforts.

Multiple Perspectives – Multi-faceted Problem

DHS needs to understand the chemical production system in degraded states, under new operating rules.

The Chemical Supply Chain and Resilience Project integrates a number of existing NISAC models with industry data. These models include:

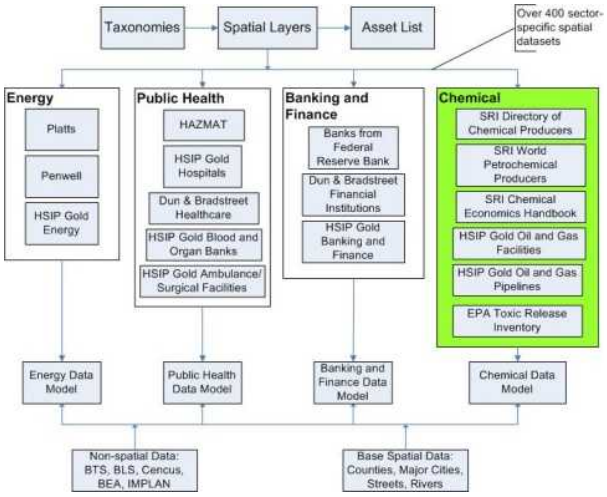
- Data modeling
- System dynamics (FastMap and FAIT)
- Network models (Loki)
- Economic models (N-ABLE™)
- Transportation models (R-NAS and ATOM)



Each of these modeling approaches provides a different but complementary perspective on the questions of interest. Sandia feeds all the models from a central data repository built from a fusion of data from SRI Consulting, DHS, the Environmental Protection Agency, the U.S. Census, and commercial infrastructure data providers.

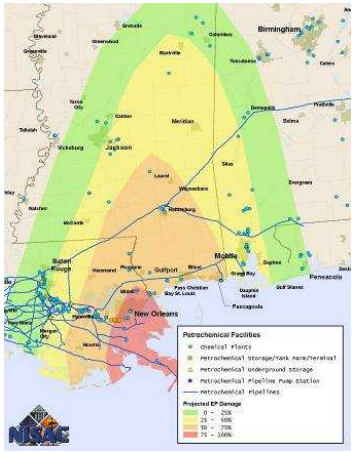
Data Modeling

Chemical Data Model – Provides integrated data to all models.



System Dynamics Modeling (FastMap and FAIT)

High-level aggregate models of the chemical production process that allow analysts to determine where system dynamics may be important.



Economic Resilience

Measures the resilience of a system to a natural or manmade disruptive event, as a function of that system's ability to recover to a desired performance level.