

# Collaborative, Stakeholder-Driven Resource Planning for Water, Energy, Food, and Security

Assessing the sustainable delivery of resources; including water, energy, food, and ecosystem services to positively affect stable and secure social, economic, and political environments internationally.

## Consistent and Sustainable Delivery of Resources

Drought, famine, poverty, terrorism, disease, conflict, social unrest, and overall state failure are just a few of the challenges we must overcome as resources become scarce in the resource-strained regions of the world. These threats can be mitigated through the consistent and sustainable delivery of resources, including fresh water, sustainable energy (fossil fuel, solar, geothermal, wind), and food; just a few of the critical components that make up the foundations for stable and secure social, economic, and political systems around the world. Maintaining resource availability on a local, regional, and global scale is vital to the design of a peaceful future.

Researchers at Sandia National Laboratories are addressing these issues in various combinations in applied science and research projects around the United States and the world, including the Aral Sea Basin, Tigris-Euphrates Basin, Libya, the Rio Grande Basin, the Willamette Basin, and other regions. These projects are aimed at managing the interdependent development of water, energy, and food systems within sustainable ecological boundaries.

## Project Development and Implementation

Knowledge and data on water, energy, food, and ecological systems are multi-sectoral and multi-disciplinary. Collaboration with many experts across many fields is crucial

## Solving water-energy-agriculture challenges and other multi-disciplinary natural resource-related issues

for a full systems understanding of interactions, interdependencies, feedbacks, and long-term consequences of remediation or management approaches. Collaboration enables transparency and cross-disciplinary dialogue. Stakeholder-driven projects give ownership to, and get buy-in from, the stakeholders. Management actions emerge from the bottom up.



## Systems Modeling

Interactions and interdependencies among multiple Earth systems over time and with changing conditions are so complex that they cannot be sorted or well-understood without computer simulations. Models allow stakeholders to conceptualize systems and to evaluate potential consequences of future strategies, adding rigor to social and economic-development planning. Developed collaboratively, these computer models represent the shared vision of the stakeholders and serve to integrate data and knowledge from across sectors and disciplines. The models help develop consensus, and are valuable tools for educating policy makers and the public on resource-management complexities.

## Vision

To enhance the nation's security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems.



## Sandia National Laboratories Decision Support Systems:

	Active Projects (As of 11/2010)	Past Projects Beginning in 1992
Domestic	<ul style="list-style-type: none"> <li>• Upper Rio Grande Simulation Model</li> <li>• Energy, Power &amp; Water Simulation Model</li> <li>• SunCity Model</li> <li>• Water, Energy and Carbon Sequestration Model</li> <li>• Gila Basin-Az Water Settlement Model</li> <li>• Electrical Grid Storage Valuation Model</li> <li>• Alternative Liquid Fuels Simulation Model</li> <li>• Electricity Generation Cost Simulation Model</li> <li>• Virtual Water Market Model</li> <li>• Geothermal Energy Tradeoff &amp; Scenario Analysis Model</li> <li>• Transition to Renewable Energy – County of Maui</li> <li>• Cut-off Grade Determination for Potash Mining in New Mexico</li> <li>• Validation and Verification of VISION Civilian Nuclear Fuel Cycle Model.</li> </ul>	<ul style="list-style-type: none"> <li>• U.S. Energy and Gas Hydrates (GH) Gas Model</li> <li>• Sandia-GM Biofuel Deployment Model</li> <li>• Renewable Energy Systems &amp; Learning Model</li> <li>• String of Pearls Model</li> <li>• Middle Rio Grande Cooperative Water Model</li> <li>• Nambe Pueblo Water Budget Model</li> <li>• Hydrogen Futures Simulations Model</li> <li>• Barton Springs Urban Growth &amp; Groundwater Sustainability Model</li> <li>• U.S.-Mexico Border Permeability Model</li> <li>• Upper Rio Hondo Water Availability Model</li> <li>• Biofuels Techno-Economic Modeling and Analysis Project</li> <li>• Climate Change Risk Assessment Model</li> <li>• Willamette Basin Temperature TMDL Model</li> <li>• Insurgency as a Business Enterprise</li> </ul>
International	<ul style="list-style-type: none"> <li>• Strategy for Water and Land Resources in Iraq Model</li> <li>• U.S.-Canada Algae Biofuel Co-Location Model</li> <li>• Libyan Water-Energy-Food Model</li> <li>• Strategic Water Allocation Demonstration Model for the Canterbury Region of New Zealand</li> <li>• Spent Fuel Management – Taipower Taiwan</li> </ul>	<ul style="list-style-type: none"> <li>• China Energy and GH Gas Model</li> <li>• India Energy and GH Gas Model</li> <li>• Electricity Generation Cost Simulation Model</li> <li>• Iraq Water-Energy-Food Model</li> <li>• The U.S./Mexico Water Management Model</li> <li>• The Rainy River Model</li> </ul>

### Capacity Building

Training regional scientists and engineers in planning and modeling approaches helps establish regional ownership in models and plans. It expands regional planning capacity and overall technical capacity. It allows modeling, planning and 'adaptive management' activities to continue once Sandia projects are completed.

### In Collaboration

Sandia has collaborated with multiple agencies and international organizations on projects relating to the work described above, including the U.S. Dept. of

State, the Center for Strategic and International Studies (CSIS), the Atlantic Council of the United States, and the National Intelligence Council. We seek opportunities to collaborate with others on similar projects that impact our global community.



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