GAIA: Global Assimilation of Information for Action
A Systems Approach to Manage Climate Disruption Risks in Public Health and Security


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Abstract
Numerous studies and task forces have noted that projected climate disruption poses a serious threat to America's national security because it creates and amplifies instability in some of the most volatile regions of the world. The big question is how to transfer the knowledge about climate change into an assessment of impacts so that decision makers can properly manage risk. This is a problem suited for a systems engineering approach, and this approach is being implemented through the GAIA project. Here we will discuss elements of the GAIA approach and how it could be used, giving examples for a range of issues. In particular, the GAIA project can use strategic simulations and analysis as unique tools to help decision makers get a deeper understanding of the problem space and how risk can be better managed using different approaches.

The Challenge
As the unparalleled challenges and opportunities of a changing climate have been recognized, there has been a growing demand from leaders in both the public and private sectors for information and more effective ways to support climate-related decisions.

Analysis Spectrum for Informing Decision Makers

The National Security Challenge

The NRC Risk Management Structure

The NRC suggests a layering of risk management strategy to address the complex issues caused by climate variability.

APL and a Systems Approach

Methodology:
• Employ risk management and systems engineering processes
• Use strategic simulations to provide the means to assess potential options
  • Include decision makers as actors, select options based on their insight and the response of the physical and economic models

Analysis
Strategic simulations create an environment where all components interact, allowing for the unexpected to occur during operation of the simulations. They create an opportunity for users to employ strategies and assess their consequences.

Crafting Competitive and Cooperative Games

APL recommends modifying strategic simulation tool sets, used in the national security area, to develop risk management options.

Risk Analysis Is Multidimensional and Integrative

Existing data models must be transformed to form a deep understanding of the problem and its consequences and to assess alternatives to action.

APL Has Used Its Methodology in Collaboration with Different Organizations to Help Solve Their Complex Problems

• National Maritime Domain Awareness (MDA) Summit for USCG
• Maryland Emergency Management Administration
• Other DOD and National Security Sponsors

Example 1: Natural Disaster—Extreme Weather Scenarios

Objectives
• Evaluate the adequacy of prediction, warning, response, and recovery infrastructure
• Evaluate the impact of technologies and infrastructure
• Examine the dynamic of the actors required to satisfy internal constituencies and cost constraints
• Explore practices among actors and interrelated interest groups to develop synergies, efficiencies, and strategies
• Test procedures and processes

Example 2: Extreme Space Weather Problem Space

Extreme space weather events have potential multiple impacts to our infrastructure.

Example 3: Climate and Water Impacts on Security of South Asia

Objectives
• Analyze resilience and threats in the Brahmaputra River Basin
  • Determine whether and to what extent climate and water issues impact the stability and security of surrounding nations
  • Exercise statistical models of interactions between climate, water, food, health, and population
• Analyze adaptation
  • Develop a series of indicators and warnings of climate-related and environmentally induced instability

Example 4: Near Term—Climate Resilient Chesapeake Region

Objectives
• NOAA RISA project
  • APL is a Co-PI (with CIER) on a recent proposal to NOAA for a 5-year Regional Integrated Science and Assessments (RISA)
• Problem
  • Chesapeake Bay region under stress from population growth and climate change
  • Focus on water resource management
  • Bridge the disconnect between research activities and policy makers
• Solution
  • GAIA framework will play an integral role identifying SMEs and developing stakeholder data, visualization, and decision support tools

The Chesapeake Bay watershed has 8 major sub-basins and stretches from southern Virginia into New York state (Sources: VA, EPA).

http://gaia.jhuapl.edu