**U.S. Resilience Dashboard Project**

**Resilience Metrics and Resilience System Tools and Methodologies**

**Mission**

To establish Key Indicators of Resilience and the Tools and Methodologies of Resilience Systems Enhancing Community Health, Human Security, and Well-Being Within Social Ecologies, Built Environments, and Natural Systems According to the One Health Paradigm

**Project Description**

The core research question for this proposal is focused on the measures of community health, human security, and well-being at all scales (individual, neighborhood, community, region, country, continent, and world) that will effectively serve Americans and their communities in times of anticipated and manifest high severity crises. In low severity crises under stable conditions, communities can achieve resilience and sustainability, by just building back to the circumstances that existed before an anticipated or current threat or crisis. In contrast, as can be witnessed in a myriad of situations in the U.S. during strategic challenges today (e.g., Detroit in collapse and bankruptcy, post-Katrina New Orleans, the New Jersey coast and the coastal areas within the New York metroplex in the post-Sandy period), current measurements and commonly used resilience tools and methodologies are failing to enable community recovery and sustainability.

Under the dynamic conditions of rapid climate change and broader global changes, for example, resilience and sustainability is not being achieved with traditional emergency management approaches to preparedness, response, relief, or even “building back better” methods of recovery alone. When communities are facing unprecedented strategic challenges with significant cascading effects, in circumstances in which the public is losing trust in their institutions, or under conditions in which the mission critical functions of the community are collapsing toward extreme vulnerability, communities require a set of functioning interdependent, multi-leveled critical operations to remain viable (at the most basic level of performance), and to enable them to thrive (at the highest level of performance). The mission of this research project is to provide a set of metrics, tools, and methodologies to communities that enable them to preserve resilience and sustainability consistent with the principles of local locus of control, community capacity building, and local value chain development, when mission critical centralized systems (such as electrical systems, natural gas systems, water systems, sanitation systems, health systems, economic systems) are collapsing or failing to meet the needs of the impacted communities, as defined by their residents.

The resilience of critical operations are made possible through a set of social, built, and natural systems that are specific to each location. Resilience and sustainability are based upon the viability of the ecosystems and social ecologies from which communities draw essential resources and services. Each community depends upon similar mission critical functions that must be customized and localized to the character, processes, expectations, and functions of their locality under current and emerging conditions. Given that communities within a robust civil society operate not as machines, but as complex adaptive systems, these mission critical functions are intrinsically interdependent in their performance over time under the changing conditions of their ecosystems and social ecologies.

For example, community members need potable water for drinking, cooking, and other uses, and the availability of these water resources will depend upon the natural systems, including surface and groundwater sources as well as a healthy ecosystem to replenish water sources and process waste streams to maintain water purity. The community members also produce human waste streams, including sewage, food waste, and nonorganic wastes; if the natural systems are overloaded or compromised and/or if the social or built infrastructures systems are incorrectly configured, these waste streams can contaminate the potable water supply and cause human sickness, injury, and death. Under crisis conditions, such as in the Gulf of Mexico following Deepwater Horizon, a single point of failure (at a well head) can create massive negative cascades polluting vast areas with toxic materials, destroying ecosystems, killing wild animals, sickening domestic animals, poisoning and depleting food supplies, negatively impacting economic systems, and fundamentally perturbing communities and broader cultures that depend upon healthy and regenerative ocean and coastal ecosystems for their very existence.

This research proposes to: 1) develop a set of key indicators of critical community operations that provide metrics for enhancing resilience and reducing vulnerability by improving mission critical functions influencing community health, human security, and well-being (as measured, for example, through morbidity and mortality statistics, as well as quality of life, functional life capacity, social equity measures, and One Health measures based upon the resilience and sustainability of all components of communities as complex adaptive systems); 2) develop, assess, and measure the prime interdependencies of the social, built, and natural systems as related to the key indicators; 3) identify and analyze the positive and negative impacts of interventions relative to the indicators and interdependencies related to community health, human security, and well-being in a One Health context; 4) incorporate the key indicators and prime interdependencies into a common core dataset, knowledge management system, and simulation model to assess categories and sets of interventions to improve the viability and enabling capacities of communities over time; and 5) establish free, open source GIS mapping interfaces and dashboards, based on a simplified, yet inclusive, set of mission critical functions providing situational awareness and Resilience System processes for local community members to understand and take action, in a unity of effort with broader hierarchical institutions within the U.S. Resilience System, on resolving gaps causing probable secondary and tertiary cascading effects within their community.

This research will be performed in partnership with the public health, healthcare and One Health communities of practice, specifically the Office of Surgeon General, the US Medical Reserve Corps, and the One Health Commission. The U.S. Surgeon General is responsible for the health and safety of citizens across the United States, and “provides Americans with the best scientific information available on how to improve their health and reduce the risk of illness and injury.  In 2010, the Affordable Care Act designated the Surgeon General as the Chair of the newly formed National Prevention Council, which provides coordination and leadership among 20 executive departments with respect to prevention, wellness, and health promotion activities.” (<http://www.surgeongeneral.gov/about/index.html>) The Medical Reserve Corps is a national network of local groups of volunteers, associated with the Office of the U.S. Surgeon General and the Assistant Secretary for Preparedness and Response (ASPR), committed to improving the health, human security, and resilience of their communities. MRC volunteers include medical and public health professionals, as well as non-medical volunteers who are interested in strengthening the public health infrastructure and improving the preparedness and response capabilities of their local jurisdictions.  MRC units identify, screen, train, and organize the volunteers, and utilize them to support routine public health activities and augment preparedness and response efforts. The Medical Reserve Corps plays a key role in times of emergency, or when community and health care infrastructures have become compromised, such as under conditions of communities impacted by, or susceptible to risks associated with, global changes (including, but not limited to, climate change), as well as in lower severity events under more stable conditions. (<http://www.surgeongeneral.gov/mrc/index.html>)

The One Health Commission is a non-profit 501C3 bringing together human medicine, animal health, public health, environmental health professionals working collaboratively using a multi-disciplinary approach. One Health provides a paradigm for understanding the cascading impacts from single points of failure in complex operating environments, such as communities impacted by climate change, natural disaster, or human-induced event. The One Health Knowledge Management System and related simulation engine being developed in conjunction with this project provides the One Health community of practice with a critical toolset for assisting communities and the institutions that serve them to manage their resilience and sustainability.

This research will directly inform, enhance, and enable the work of the Office of the Surgeon General, ASPR, and the Medical Reserve Corps, as well as the broader functions of the U.S. Resilience System, in the performance of their mission and duties during normal conditions, as well as in response to extreme conditions and events.

The research approach utilizes “grounded theory development” (Glaser and Strauss, 1967), which uses empirical data in conjunction with both inductive and deductive reasoning to construct effective hypotheses and theories. It uses rapid prototyping within the U.S. Resilience System to rapidly engage, test, and improve tools and methodologies which enhance resilience and sustainability within U.S. communities. In particular, this research will use empirical data gathered from coastal communities in the New York City Metropolitan Area that were severely damaged by Superstorm Sandy in October 2012 and suffered from massive failures of interdependent critical infrastructure systems. Data will be collected and analyzed on the status of critical operations associated with social ecologies, built environments, and natural systems affecting the communities of the Rockaways, Canarsie, Staten Island, Red Hook, and other New York coastal communities, and the current health, human security, and well-being conditions of members of these communities.

The data will be framed in a common core dataset of resilience mission critical functions. See Appendix A. The data will then be rapidly uploaded into GIS maps and dashboards providing situational awareness to community members and technical advisors assisting community members in identifying priority gaps and establishing customized and localized solution sets unique to the conditions in each impacted community and community at risk. The solution sets will then be broken down into actionable tasks and subtasks monitored and managed by the community through their customized and localized Resilience Network task server within the New York Resilience System.

The research will leverage the current research, development and pilot projects in the region coordinated under the New York Resilience System by the Health Initiatives Foundation. The New York Resilience System Knowledge Management System (NYRS KMS), with community relations and client services managed by Health Initiative Foundation, Inc. (HIFI), has been operating since the last days of October 2012. The NYRS KMS operations were initiated in the days leading up to the landfall of Superstorm Sandy in New York, as a nested sub-system of the U.S. Resilience System.

The training sessions within the communities are performed by HIFI, the One Health Commission, Future Generations and other university graduate students, and other local community-based groups. The open systems platform of the New York Resilience System and its nested subsystems down to the community and neighborhood level is currently developed and managed by Oviar Global Resilience Initiatives, Inc., based upon the Federal Emergency Management Agency’s (FEMA’s) philosophy of whole community resilience. The New York Resilience System is designed as a complex adaptive system, with a fifth generation management and governance system capabilities maximizing the attributes of focus, agility, and convergence under normal times, during low severity events, and in the midst of high severity crises potentially challenging the very survival of communities and their most vulnerable neighborhoods.

Appendix A

Community Resilience

Mission Critical Functions

* + - 1. •Housing
      2. •Environment: Health & Safety and Ecosystem Management
      3. •Shelter in Place & Evacuation
      4. •Supply Chains
      5. •Energy Management
      6. •Food Security
      7. •Clean Water
      8. •Hygiene & Prevention
      9. •Waste Management & Sewers
      10. •Transportation
      11. •Health Services
      12. •Psychosocial Resilience
      13. •Communication Systems
      14. •Coastal Protection Infrastructure
      15. •Community Security
      16. •Community Commons & Culture
      17. •Social Services
      18. •Viable Value Chains
      19. •Mitigation & Transformative Processes
      20. •Education