

A HUB IDEA: Coastal Emergency Intelligence

Can Coastal Community Emergency Operational Management Be Made More Efficient, Effective and Equitable via Enhanced Situational Awareness and Anticipation of Risks?

Ashlea Milburn, University of Arkansas
Jorge Gonzalez, City College of New York
Richard Lathrop, Jr., Rutgers
Rui Liu, University of Florida
Ming Xiao, Penn State University
Xiao Yu, University of Florida

The idea in a nutshell

Coastal hazards create immediate response needs in impacted populations with operational logistics as critical for meeting those needs. Situational awareness and accurate anticipation of risks are critical for effective logistics that engages the community. We propose a new approach of emergency responders and community engagement via empowerment with high value information from next-generation cyber-physical infrastructure that will enhance situational awareness and response of Coastal Communities Emergency response (Figure 1).

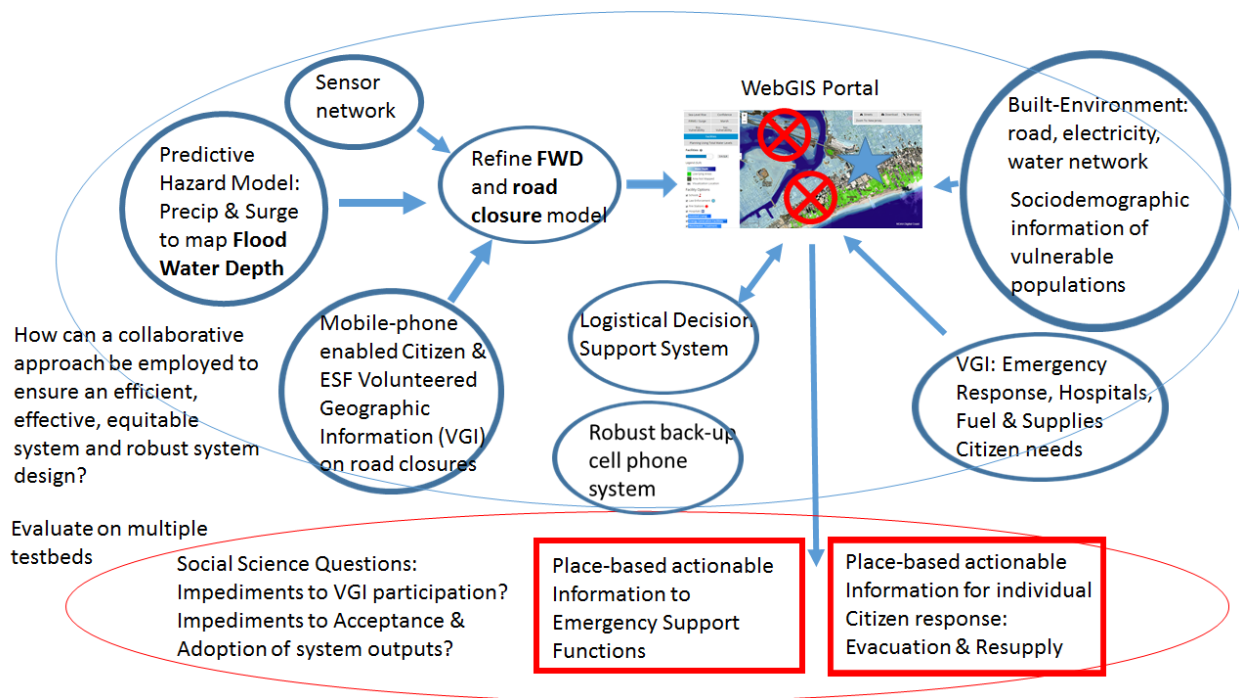


Figure 1. Conceptual model for Coastal Emergency Intelligence

Specific, differentiated recommendation

A major concern under extreme weather events in coastal communities is that events impede movement of people, goods and services negatively impacting public health and

welfare in the affected coastal communities. Recent experiences during recent tropical storms suggest that our present emergency response systems are woefully inadequate with catastrophic consequences in lives and infrastructure. The long term impacts of these disasters often result in expanding the socio-economic gaps with long term impacts in the economic disadvantage communities. The positive note is that the effectiveness of these emergency responses has a great potential to be enhanced by the integration and synthesis of disparate data streams from distributed sources at multiple temporal & spatial scales, and by making this information available to a wide and diverse audience of end-users. Undergirding such a system presents the opportunity for next generational hydrological, hydrodynamic and weather models able to forecast floodwater depth and velocity, and extreme winds at street and building scales, and associated impacts on the infrastructure and people refined by real-time sensors and volunteered geolocated information. Public domains of geo-spatial information of the local coastal hydro-weather risks coupled with logistic decision support tools are needed to serve as central integrating platforms and as means to provide location-based actionable information to end-users. Further, we suggest a collaborative approach to design such a system that engages academic researchers, the private sector and emergency service providers as effective tool to break these barriers.

Key related research questions are whether a collaborative approach of stakeholders and scientist will ensure a more efficient, effective, equitable and robust system. Ultimate success hinges on understanding, and addressing impediments to the participation of citizens and first responders in volunteering real-time information and responding to more granulated shared information of anticipated levels of risks. What are the hurdles to participation in terms of access to and adoption of technology? Similarly can the impediments to the acceptance and adoption of information outputs and recommended strategies by the various end-users be addressed? What are the governance structures and funding models needed to make the system sustainable?

We refer to this approach as Coastal *Emergency Intelligence (CEI)*. To enable the CEI, we anticipate a CoPE Hub consisting of multiple academic institutions collaborating with key stakeholders and private industry and supported by test-beds geographically distributed across the nation. The Hub should use best practices to promote transparency in the management, inclusion and diversity, transformative coastal risk science and education. We hypothesize that CEI will increase the efficiency, effectiveness and the equity of the response effort. We envision the CEI system can be employed to support longer range planning and risk assessment through the development of scenarios.

What impact or value does it seek to deliver?

The Broader Impacts of CEI include saving lives and minimizing damage to the built environment through more efficient, effective and equitable response to extreme events.

The Broadening Participation will be accomplished through employing a collaborative science approach that seeks to engage and empower a wide range of impacted stakeholders including:

- emergency services;
- all possible citizens from all sectors and demographics; and,
- policy- and decision-makers.

The proposed research program will require a convergent approach that will enable the new scientific field of *Coastal Emergency Intelligence* that encompasses:

- transformational understanding of human response to coastal emergencies; and,
- build next-generation sensing, modeling and network analysis capabilities driven by stakeholders and community needs.

What is the reasoning or supporting evidence behind it, if any?

A key reasoning for this 'CoPe-Hub Idea' is the recent catastrophic events along the Atlantic coastlines with consequences in human lives and properties attributed to the slow and ineffective response during and after the events (i.e. Hurricanes Sandy, Harvey and Maria). Furthermore, the literature supports the concept of emergency managers responding significantly more efficient if community scale information is provided on near real-time basis as the event progresses (Cole, Daniel, et al., 2017, *Journal of Hydrology*). The spatio-temporal resolution needed for operations management is not provided in existing sensing and forecasting capabilities.

The Hub Idea on *Coastal Emergency Intelligence* will fill these gaps by engaging stakeholders and citizens and by providing reliable sensing capabilities and accurate coastal/urban forecasts at usable scales to emergency managers and citizens.