Matrix Approach to Coastal Community Resilience Assessment

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1. Introduction

The clean-ups and recovery following coastal storms, including Hurricane Katrina Superstorm Sandy, have been costly, lengthy, and politically contentious. The predicted increase in frequency and intensity of such storms has prompted the US Army Corps of Engineers (USACE) and other federal agencies to look beyond the traditional methods of reducing the risk to a collection of structures, and focus on how to improve the resilience of the entire system. Risk assessment guides management identifying where to harden specific components of a system. As communities and services becomes more integrated and complex, this type of protection will become prohibitively expensive and will not always be effective [1]. Recent Executive Orders on Climate Preparedness and Critical Infrastructure Security and Resilience call for a more comprehensive approach to systems management that works to not just to prepare for and absorb adverse events, but also to build our capabilities to recover and adapt [2]. To build successful, resilient systems these capabilities must be built develop in the four major networks, or domains, of a complex system: physical (infrastructure and components), information (data collection and dissemination), cognitive (decision making and governance), and social (users and citizens) [3].

2. The Resilience Matrix

The Resilience Matrix is a guide for screening level resilience assessment of coastal communities and other complex system (Fig. 1). Four columns address the four stages resilience (prepare, absorb, recover, adapt) and four rows identify the four domains of a system (physical, information, cognitive, social). Cells are populated with local stakeholder-informed metrics, both qualitative and quantitative. These 16 cells collectively summarize the functionality of a complex system. In such systems, the interdependencies and interactions are not always fully understood or are costly to investigate, but by working to assess and improve the capabilities of the system across all cells, community leaders can ensure that they are building resilience system-wide. Initially, the assessment will indicate gaps in capabilities that may lead to cascading failures across the system. The assessment does not dictate what changes or programs should be implemented but can aid communities in prioritizing projects that improve capabilities across the greatest number of cells, effectively quantifying the system-level benefit that can then be traded off against the cost of the project. The RM can also be used more generally to identify opportunities to partner with other management agencies or community groups to address weaknesses in resilience. Government agencies have traditionally

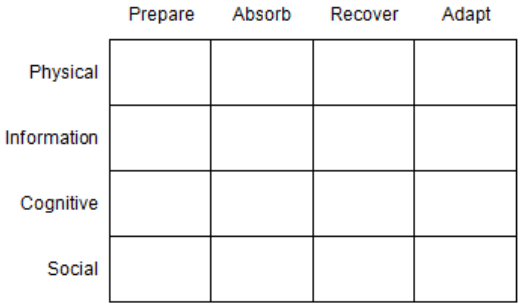

Figure 1. The Resilience Matrix assessment framework.

focused on the plan and prepare temporal phase of resilience and tend to work in parallel only within their own agency mission [4]. Resilience can be achieved in a cost-effective manner when agencies integrate their efforts, eliminate redundancies, and look to partner with non-governmental groups for area that lie outside of their authority.

The RM approach has been developed as Tier 1 of a three-tier coastal system assessment tool for the US Army Corps of Engineers Civil Works program. The Tier 1 approach provides broader system context to Army Corps decisions, ensuring that missions-specific project also align with community residents' goals and preferences. Here we demonstrate the application of the RM to coastal community resilience at two sites: Rockaway Peninsula, New York, and Mobile, Alabama. We present the flexibility of the RM methodology by using both qualitative and quantitative metrics drawn from post-Hurricane Sandy reports and a Mobile regional stakeholder workshop. The presentation of the case study results reveals the importance of ground-up communication of critical community functions and performance in developing improvement plans.

3. References

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