



Translating community narratives into semi-quantitative models to understand the dynamics of socio-environmental crises



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ABSTRACT

Acute socio-environmental crises often expose systemic problems that are linked by failures in management, environmental, or social systems. If recovery efforts are to address these systemic problems, these issues and the concerns of those impacted by the crisis need to be clearly articulated, rationally represented, and communicated to those responsible for the recovery. Although participatory approaches to crisis recovery often use environmental modeling, explicit ways in which stakeholders' narratives and experiences can be translated into computer-based models for scenario analysis are not readily available to modelers or decision-makers. We present an approach to translating community narratives about crisis events using a free Fuzzy Cognitive Mapping software called Mental Modeler (www.mentalmodeler.org). We applied this process to the recent water crisis in Flint, Michigan, and demonstrate how participatory modeling can give communities a way to structure their thoughts, develop recovery actions, and communicate with those in charge of crisis recovery efforts.

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Software availability

Mental Modeler, a user friendly fuzzy cognitive mapping-based software, is freely available online at www.mentalmodeler.org and can be run online in most Internet browsers. The lead developer is Steven Gray, Michigan State University, Department of Community Sustainability, East Lansing MI 48823. Email: stevenallangray@gmail.com Phone: 646-915-2915. Models developed during workshops are available by request to the first author, Alison Singer (alison.m.singer@gmail.com).

1. Introduction

In times of socio-environmental crisis, breakdowns in trust and communication can drive the development of insular, rigid, and balkanized knowledge structures (Brown and Duguid, 2001) that

may result in developing factions that severely hinder collective policy development, making rapid recovery difficult. Such factions are represented by multiple, closed social networks (e.g., separate networks of government responders and community residents impacted by the event) with limited knowledge sharing between them. The insular nature of these closed knowledge networks may result in a series of isolated groups, each with their own explanations for a crisis' causes, consequences, and solutions, based on differences in perception, logic, and interpretation of the environmental problem (Otto-Banaszak et al., 2011) and how it is being handled (Kamo et al., 2015).

Recovery efforts to the many “wicked problems” that emerge from acute socio-environmental crises require a collective understanding of the dynamics of the issue from heterogeneous stakeholder perspectives, including those impacted by the event and those in charge of recovery efforts (Gray et al., 2012). However, gaining this type of understanding within and across social networks about a crisis as events unfold remains difficult (Kamo et al., 2015). We propose that the various beliefs about a crisis can be debated, analyzed, and used to improve collective learning and

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decision-making if this variation in understanding across groups is represented through standardized modeling techniques. Further, we suggest that such rapid participatory modeling techniques can be facilitated through easy-to-use concept mapping that translates qualitative community narratives, experiences, beliefs and stories into semi-quantitative models that test ideas about potential futures through scenario analyses. Such scenario analyses can then be used to promote community learning (Henly-Shepard et al., 2015), thereby increasing communication capacity within and between groups and improving recovery efforts.

Our work builds on recent studies that have demonstrated that including narrative processes in a learning environment increases

critical thinking and can help manage conflicts (Clark and Rossiter, 2008; Mattingly and Lawlor, 2000; Lindgren and McDaniel, 2012). Thus, we propose that models, and low barrier community-based modeling approaches in particular, can serve as visual and quantitative representations of qualitative narrative descriptions (Gray et al., 2015) by making relationships between objects or events that are experienced during crisis events explicit. Additionally, we add to the emerging discussion about the potential of software-based modeling approaches to support translating qualitative narratives into modeling scenarios (Mallampalli et al., 2016) as a means to support communication through knowledge capture, knowledge-sharing, and learning (Gray et al., 2015). Although such

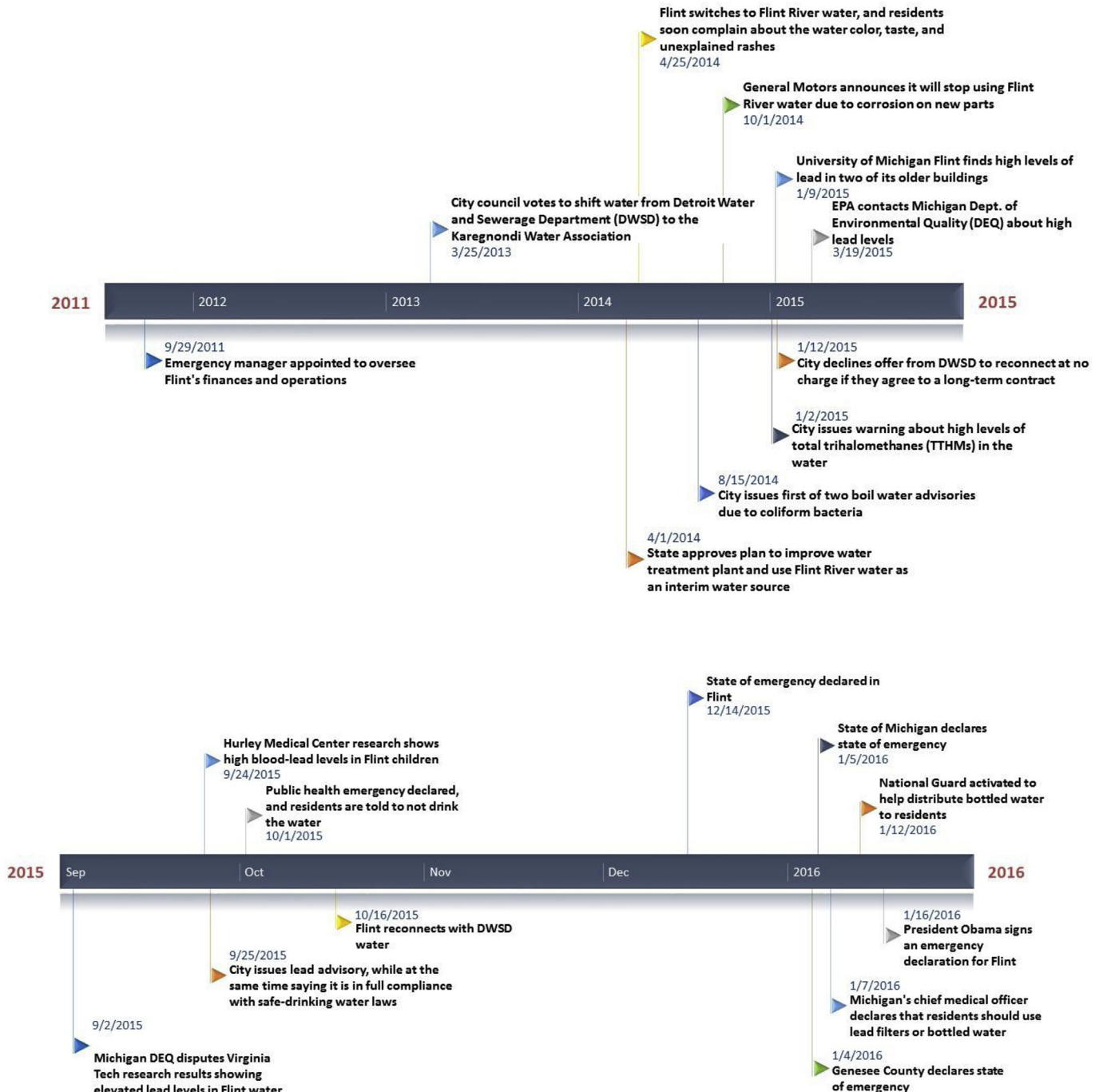


Fig. 1. Timeline of the major events in the Flint water crisis.

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