

# Chapter 38

## Participatory Environmental Planning Platform

**Soon Ae Chun**

*City University of New York, USA*

**Francisco Artigas**

*Meadowlands Environmental Research Institute, USA*

### ABSTRACT

*Natural and man-made disasters can pose various threats to the environment and humans. Proper environmental monitoring, early alerts, and response planning and execution are essential. Most government organizations adhere to top-down planning operations, issuing instructions and setting rules and regulations for people to follow. In this chapter, the authors propose a participatory environmental planning platform where environmental planning is based on the data from sensors and “human sensors” to shift from a government-centric to a participatory environmental monitoring and planning paradigm. This platform incorporates intelligent technologies to enhance environmental situation awareness, to promote participatory governance, and to allow citizens to participate in the plan execution; participation is done through local data sharing as necessary to create situation awareness and through a resource sharing provided by citizen volunteers. The authors present a prototype system that provides shared services for the regional municipal governments’ environmental planning and response coordination.*

### INTRODUCTION

Natural and man-made disaster planning and management is a critical component for urban emergency planning to minimize the impact on public safety, human and property losses, economic losses, and ecological damages. The ability to monitor, alert and mobilize to plan and manage the emergencies in highly populated urban area is an important aspect of ‘smart’ urban planning.

Low-lying, densely populated coastal areas subject to hurricanes and other storms and to man-made pollution in the form of traffic and industrial-related emissions, sewage effluents and waste dumping are particularly in need of environmental monitoring and warning systems to plan rapid response in case of disasters or continuous exposure to the environmental hazardous materials. The planning for natural and man-made environmental emergencies has the following characteristics:

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- The affected areas often encompass large areas administered by different local jurisdictional authorities.
- The planning requires all potential affected local governments and local first responders to have adequate alerts for the potential disasters.
- The planning and management of disaster response require near real-time situation awareness of affected areas and affected population.
- The response planning and management should ensure that the required resources are available and delivered in the right amount to the right place and to the right people.

In other words, the environmental disaster planning requires coordination of multi-jurisdiction responders and local authorities, effective communication and information sharing for situational awareness, and identification of resources (equipments, vehicles, evacuation sites, experts, and so on). To coordinate a large-scale disaster, local governments and responder teams traditionally form a regional committee and coordinate regular face-to-face meetings and/or virtual telephone conferences with one other to discuss and design contingency plans that can be executed in the response to actual events, and to participate in the drills to make sure the operating procedures can be smoothly followed according to plan. This group of representatives from local governments and responder units may make important planning-related policy decisions based on the lessons learned from the historical events and current situations.

This traditional planning paradigm is a government-centric solution where the planning procedure and decisions are made mostly by government entities. This paradigm has been changing toward an online planning paradigm (called e-planning) where the planning documents, forms and applications are accessible and shared via the Internet to facilitate the collaborative planning activities during recovery. However, with the explosion of social media, advanced communication networks and smart mobile devices, the e-planning paradigm now includes concerned citizens as active participants who can not only receive the planning results but also participate in contributing information to enhance the situation awareness. Citizens also participate in providing public input to evaluate the proposed and existing response plans. We call this emerging planning paradigm a “participatory e-planning,” or an “open e-planning.” The key to open e-planning is citizen participation that is in alignment with the Open Government Directive by the United States Government to increase transparency and to promote collaboration and citizen participation (Open Government Directive, 2010; Transparency and Open Government, 2009; Chun et al., 2010).

In this chapter, we propose an architectural model for a *participatory environmental planning platform* (also called open environmental planning platform or open e-planning platform) based on a multi-dimensional data model that represents data from *crowdsourcing* as well as from *environmental sensors* to enhance the environmental hazardous situation awareness and response planning. Parts of the proposed open e-planning model are implemented to a regional environmental planning government agency in New Jersey called New Jersey Meadowlands Commission (NJMC) to provide flood, air quality and water quality alerts for 14 related municipal governments. We describe and show how the situation awareness is enhanced with weather, water quality and air quality sensors, and how management of disasters may improve with citizens sharing their expertise and resources.

The chapter is organized in the following manner. First, we provide the background environment of the study, followed by a section which describes a proposed model of an *open environmental planning platform* that emphasizes improving the citizens’ awareness of environmental risks via continuous monitoring of environmental data and generating alerts for potential environmental and health risks, and improving the citizen engagement in environmental emergency response and planning via the

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