# DESIGNING A COMMUNITY BASED EARLY WARNING AND MAPPING SYSTEM FOR AN URBAN BARANGAY

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**Abstract:** Disasters, whether natural or man-made, often results to multiple damages and great losses in terms of material possession and human lives. Vulnerability to hazards cannot be avoided but the damages can be reduced. Disasters are magnified when the government is inadequate in managing emergency situations. These situations are often associated with the following problems: the lack of fast information dissemination, the lack of appropriate training for the community on protocols to follow during the calamity, and the lack of coordination among the government officials and their communities.

This paper introduces the development of Thera Praevenio, a community based early warning and mapping system. Thera Praevenio attempts to lessen the impact of disasters by particularly focusing on the first two steps of disaster management namely mitigation and preparedness. Thera Praevenio is a work in progress that other researchers can learn from and can continue.

The team conducted a study that is focused on the barangays at Leveriza, Manila. The civilians in the community have ease of access and of use to the following technologies: cellular phones, computers, and internet connection. As a result, the system was mainly composed of the following features: the utilization of Short Messaging Services, Google maps, social networking sites, wiki pages, and generating reports. Each feature enables the community to enhance their process of disseminating the information, to attune the processes of handling hazards, to be prepared through collaborative community discussion and recorded training details, and to bridge the gap of communication between each officials and their community.

Thera Praevenio is structured to function remotely and should be uploaded in a web server. The system can be updated through the use of computers or cellphones. With the use of defined SMS conventions, the team believes that the system can function even without internet connection or electricity.

*Keywords: early warning system, emergency preparedness, Leveriza, visual mapping, CBDRMS*

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## 1. INTRODUCTION

Natural disasters damage communities and resources but effective action by emergency services can help mitigate catastrophic effect. In contrast, manmade disasters are often results of carelessness and human error, and can be avoided or properly controlled by recognizing the potential danger and making preventive/corrective actions by informing communities.

Most hazards that lead to disasters cannot be prevented. But their effects can be mitigated. It is clear that disasters are conditioned by human activities. Hazards may be natural in origin; but due to the development of society, hazards become disasters. (Hewitt, 1996)

The Zone Leveriza is a group of barangays near De La Salle University. It is from Quirino to Vito Cruz and from M. Adriatico to Taft Avenue. The zone is composed of 15 barangays and a large creek, named San Antonio Abad, which extends to Manila Bay. This community is the test bed of the study. With the team's continues interaction with the community, the team was able to identify these different problems; *Lack of early warning dissemination in the community, Lack of appropriate training and knowledge for the community about what to do when a calamity happens, Lack of coordination among officials in the government and the community when it comes to hazard warning.* These problems do not only exist in their community; these can also be seen nationwide.

The people should be properly informed and warned about the effects of the impending calamity so that they can and will be prepare when that kind of disaster hits the area. A *warning system* is defined as a means of getting information about an impending emergency, communicating the information to those who need it, and facilitating good decisions and timely response by people in danger (Pine, 2007) and the concept of an *Early Warning* is the provision of timely and effective information, through identified institutions, that allow hazard-exposed individuals to be decisive to prevent or reduce their risk and prepare for a successful response (Grasso). *Early Warning Systems* are systems that provide warning to the community of an impending danger by collecting and providing timely information of the incoming hazard. The warnings can be used to communicate to the public that they need to prepare for the hazard's arrival, and to take actions to reduce the hazard risk.

The concept of early warning can be seen during the first two phases of the disaster management so the focus of this study is on the Mitigation and Preparedness phases.

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*Figure 1.0: Disaster Management Phase*

**Mitigation** is defined as any sustained effort undertaken to reduce a hazard risk through the reduction of the likelihood and/or the consequence component of that hazard's risk (Coppola, 2011) while **Preparedness** reduces hazards' undesirable effects through effective precautionary measures that ensure a timely, appropriate, and efficient organization and delivery of response and relief (Coppola, 2011).

In this study, the focus of the *Mitigation phase* is on the non-structural type of mitigation will be included in the scope. These non-structural approaches include early warning, hazard mapping, locating evacuation centers, information dissemination through web and mobile SMS. Community-based (or Crowd sourced) mitigation approaches will also be included such as identifying risk reduction measures that are community specific through the participation individuals from the community themselves.

While for *Preparedness phase* the team focused on the measures that will educate the public when the natural hazard is already in the particular area regardless if there are officials around to aid them or not, these would be done through training programs, community awareness, and community education.
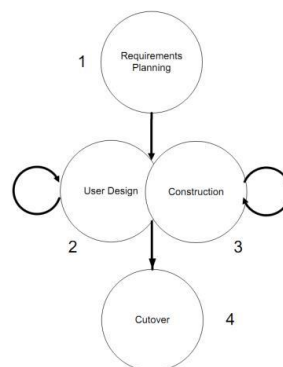
## 2. METHODOLOGY



*Figure 2.0: RAD application model*

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Rapid Application Development or RAD is an approach in Systems Development that assures better and more inexpensive systems and more rapid operation by having systems developers and end-users work together jointly in real-time to develop systems (Hofer, George, & Valacich, 2002).

Since the time for the analysis and development of the system is reduced, a fast-paced approach is required to complete the requirements and the RAD approach is the choice for projects that require a completion in a little of amount of time. User involvement is present in every RAD phase in the cycle enabling the proponents to interact with the users even during development stage.
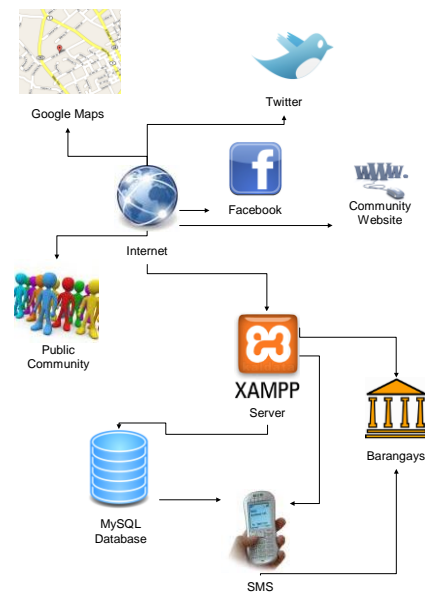


*Figure 2.1: Thera Praevenio System Architecture*

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The figure above shows how the system will behave and the features when it becomes implemented. The XAMPP server will be the server of the System while the MySQL Database will be the storage of the system's database as well as the query language to retrieve data in different structures. The system will be a web-based system so it should work with an Internet connection. Also, the community will also be provided with information they need via a community website, Google Maps, and popular social networking sites such as Twitter and Facebook. SMS will also be integrated into the system so that notification of Barangay Officials will not only be through the internet but also through mobile.

## 3. RESULT AND DISCUSSION

The system caters to the different methods of disseminating information (e.g. events, current disaster, and other announcements) to the subscribers of the system, using these different platforms; Mobile (SMS), Twitter, Facebook, and Google Maps.

The system mainly focuses on the dissemination and timeliness of arrival of the information to the people. The system also includes consolidating disaster histories of each barangay to provide more accurate reports to help the officials in their preparation for future disasters.

The system "Thera Praevenio" is a community-based early warning system, designed to effectively inform the community of Leveriza and those who are registered to the system about upcoming or on-going disasters. The system will improve the way of communication of the Barangay Officials to each other and its residents, and standardize the methods of each barangay in terms of informing their people about certain events (e.g. Trainings/Drill schedules, and disaster related reports).. The users of the system are the following; Zone Chairman, Barangay Officials, Thera Volunteers, and Other Subscriber.

The *Zone Chairman* is a barangay chairman who was elected by other barangay chairmen to be their leader and Zone Representative. The *Barangay Officials*, These are the different Barangay Officials in Zone Leveriza; Barangay Chairman, Secretary, Kagawads, and Sangguniang Kabataan. The *Thera Volunteers*, These are the people who are residents of Leveriza who registered to be volunteers and approved by the official of their official to become one (note: whose age is within the range of 12 and above). And the *Other Subscriber,* These are registered subscribers which are either residents or non-residents of zone 78 Leveriza.

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The system covers both online and short messaging service (SMS). The system is capable of sending and receiving text messages from the registered officials and subscribers to aid the creation of status reports about a calamity and is able to broadcast the announcement made by a key person (e.g. any Officer in a barangay).

Each user has different roles in using the system which can be seen in figure 3.0: The System workflow.
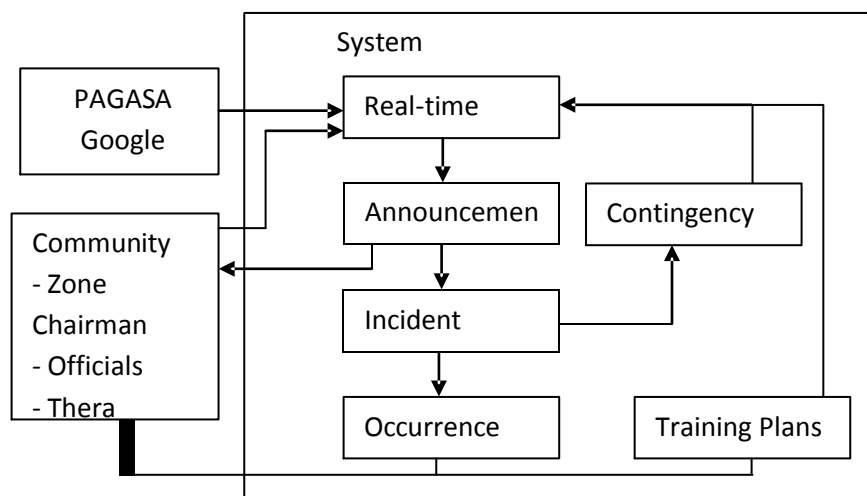


*Figure 3.0: The System Workflow*

The primary source of forecasting information and details would come via the RSS feeds from Yahoo! Weather. The RSS Feeds would be shown at the website for the people to see.

During a disaster, the people can help warn the community by texting (for subscribers only), tweeting or posting in Facebook. The Barangay Officials will receive SMS reports in their private user page and mobile phones. The Barangay Officialswill then have the decision to make announcements. The changing of status from "stable" to "on fire" or "flooded" signifies the start of the disaster.

The Barangay Officials can alert the subscribers about the current changes and escalations during the calamity. The subscribers can view the status of a barangay in the website or they can text the system for the status of a certain barangay.

Returning the status to "stable" signifies end of the disaster. An incident report will be

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created by the official of that barangay after every disaster. The incident report will be used bythe Zone Chairmanas basis to determine the contingency plan to help equip the community in terms of preparedness which can be applied to a possible reoccurrence of the calamity. The contingency plan can also be used as basis for the training plans for the community to see in the website.

The Zone Chairman has the capability to create a monthly occurrence report, which is a summary report of all the incidents faced by each barangays in that month.

## 4. CONCLUSION

Thera Praevenio, being a community based early warning system for barangay Leveriza, was able solve the following problems that the team were able to identify. These problems are the lack of early warning dissemination in the community, the lack of appropriate training and knowledge about what to do when a calamity happens, and the lack of coordination among officials in the government and in the community when it comes to hazard warnings.

These problems did not manifest before and were only experienced by the community during typhoons Ondoy and Pedring. We can safely say that the changes in our climate makes no place safe from natural calamities. The success of Thera Praevenio would be highly reliant to its users. The data received and broadcasted will always be under scrutiny because of the possibility of fraud reports.

The team was able to identify different issues about the system that are not controllable. The first issue was that the system will be less functional if the service provider will have a down time with their network. This entails upgrading their servers, multiple fiber cuts, and weather related issues. Second, there will be times where there will be delays in SMS sending and receiving due to network traffic caused by the server not being able to handle too many subscriber requests/reports. Third, there would be times where there might be delay in updating the map due to slow internet connection, bad weather condition, and internet service provider down time. Changes in the API for both Facebook and twitter might affect the coding of the system. This might cause an overhaul of the system if the syntaxes are replaced. Using twitter as a means of announcing might also be limiting due to the fact that twitter has restrictions with regards to posting tweets.

Thera Praevenio has only tackled the first two phases of Disaster Management and other researchers can further the project by developing and providing the last two phases, namely Response and Recovery. The system is structured not only for the benefit of the citizens in the community of Leveriza but also those who want to register to the system. The modules and

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functionalities of the system are flexible enough to be updated and be used in other communities.

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