

Exploring the Potentials of a Community-Based Disaster Risk Management System (CBDRMS), the Philippine Experience

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Abstract—Because of extreme disaster events, urban poor communities like in the Philippines continue to become at risk. The Philippines has its share of many hazards such as typhoons or cyclones, flooding, surge storms, earthquake, landslides and fire. United Nations had strongly campaigned to put disaster risk management in local development planning and expand it to at-risk communities to reduce risk and alleviate poverty.

In most developing countries, a community-based disaster risk management (CBDRM) consists of disaster and vulnerability training exercises and program. This paper presents an attempt to systematize CBDRM. It is the belief of this study that technology enables emancipation among vulnerable communities and serves as the language of communication that brings resiliency and coping capacities to a progressive level.

The paper also presents a university-community engagement research project designed to build an urban poor community's disaster risk planning capacity and self-management. The research project took more than a year of data gathering, careful examination, analysis and design, software development, and user testing. This was pursued through a strong relationship and commitment to support BuklodTao, a non-government organization, and its community, Barangay Banaba.

This project has created an integrated set of solutions and strategies consisting of technology supported methods on--community profiling, vulnerability and flood hazard assessment with the use of a mapping tool, flood reporting, training and assessment of community members. The project also highlights a participatory and socially motivated early warning and monitoring methods through mobile technologies. The project has also fashioned the solution that engages the community to perform local management and gain ownership of the system and strategies. In the long run, with the use of the integrated system the community will be able to create a clear picture of its imminent hazard, calculate its risks and mobilize their members better.

The paper also outlines the value of a university-community engagement that brings about sustainable approaches that are mutually advantage, respectful and sensitive to the needs of the community.

Index Terms—Buklod tao, CBDRMS, De La Salle University, pineda, disaster risk reduction.

I. INTRODUCTION

In September 26, 2009, tropical cyclone Ketsana brought “an estimated 45cm fell in 24 hours, equivalent to a typical month's rainfall in the monsoon season and 6meters high flood in the major parts of Metro Manila” [1], Luzon, Philippines. Typhoon Ketsana uprooted 1million homes, killed 298 and destroyed Php9billion worth of crops and infrastructure. [2] This flooding disaster had caused millions of damages and affected not only the poor communities, but even the rich and middle class of Metro Manila.

On December 16, 2011, a similar incident happened in the central and southern Philippines. Typhoon Washi brought torrential rains that have caused mudslides, flash floods to the cities of Cagayan de Oro and Iligan. [3] Most families and communities were unaware when the storm came that night, washed away villages and took away over a thousand lives [4].

Community-based disaster risk management is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities”. [5] It views disaster as a challenge to the community members' vulnerability [6] and that the way to address their vulnerability is through a community-based approach that employs sustainable hazard mitigation and citizen participation approach [7] in the case of Peterborough, Ontario. Land use planning is very much tied up with disaster risk reduction. This has also been the cry of the PDR-SEA4 project implemented in 2001-2007 with Philippines, Vietnam and Indonesia as some of the grantees of the project. PDR-SEA4 project, adhering to the Hyogo framework, carried out the juncture that disaster risk reduction is very much tied to land use and local economic development [8].

II. THE BUKLOD TAO

Buklod Tao is a community-based organization and has been in existence since 1994. It has very good programs on community development, disaster risk reduction and sustainable livelihood. Buklod Tao primarily constitutes urban poor families in Banaba, a barangay situated in the intersection of two major rivers, Marikina and Nangka, in the province of Rizal, in the Philippines. Banaba is also considered as a water catchment area of the waters coming from the mountains of Rizal going down to the rivers.

At present, population is estimated at around 30,000 with

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around 2,500 households. The area is divided into seven zones or puroks.

Buklod Tao is also one of the community partners of the De La Salle University (DLSU). As community partners, Buklod Tao and DLSU share mutual interests on disaster risk reduction, education and development of the poor communities, and delivering services to the Filipino society.

In particular, Buklod Tao is highly commended to its openness on research studies, to learn new methods and technologies that will enhance community capacity. Buklod Tao has become a disaster risk management model laboratory because of its strong know-how on community development and management.



Fig. 1. Map of Barangay Banaba

III. COMMUNITY-BASED DISASTER RISK MANAGEMENT SYSTEM (CBDRMS) AND THE PANDORA

The perspective of CBDRMS has always been anchored on the community, increasing its capacities, using its good practices and soliciting the community's participation and involvement. It is the belief of this project that ICT can effectively systematize CBDRMS in many ways. Technology is a sticky chemistry that increases social responses of the community members [9] making them information and communication armed citizens. Technology capacitates the community to become self-directed, confident and resiliently informed. Technology likewise provides leverage to the community to become more involved and engaged because its members know they have technology as their armour.

The research model of the Pandora CBDRMS (community-based disaster risk management system) constitutes three elements represented in bubbles that intersect, intertwine and synergize. These are the (a)

knowledge and practice on vulnerability and disaster risk reduction; (b) the processes and technologies carefully examined and communicated with the community members to arrive at a design fitting and sensitive of their task, activities and requirements; and (c) the social constructs and artifacts that humanize and makes the Pandora entertainingly useful.

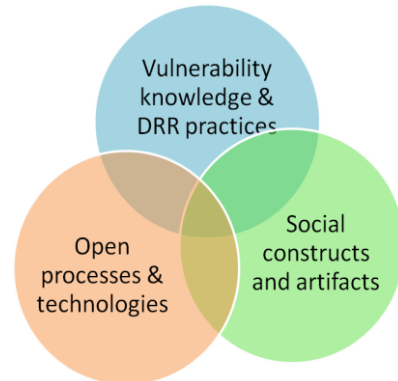


Fig. 2. The Pandora framework

These elements had inspired the author in introducing socialized methods and processes of communications within and through the system, to put the local knowledge of the community into a constructive perspective and to blend cost-effective and practical technologies.

On the onset, these bubbles are viewed to intersect or overlap on each other. But with continuous and persistent usage and practice of the Pandora, these bubbles will converge, eventually be on top of each other and become one.

IV. HIGHLIGHTS OF THE PANDORA

With these principles, the Pandora CBDRMS was conceived. Pandora is a systematized a web-based CBDRMS solution that focuses on mitigation and preparedness. Present communication and coordination practices and dissemination of information were carefully examined. These and critically studied processes were integrated with strong considerations on innovations and pragmatism. Essential tools are the community demographics, mapping of hazard areas, flood reports and people vulnerability. Flood reporting adopts a crowdsourcing model and employs mobile communication features fused in the system. Pandora was also consciously developed using open source development tools to make it cost-effective, giving more flexibility to expand and replicate it.

Community profiling. This part essentially captures vital information about the members of the community such as household data, livelihood, income, disabilities. House structure, property ownership, type of soil where the structure resides and sizes of the houses are also gathered. Community profile provides a way for Buklod Tao to determine their geographic and population risks.

Risk assessment. This has four important functions. First is automatic generation of people vulnerability permitting Buklod Tao to generate periodic and ad hoc reports to determine which areas are more at risk for having pregnant women, elderly, infants and persons with disabilities.

Mapping also complements vulnerability assessment. This also gives way to a realistic forecast of evacuation shelter and relief goods' requirements.



Fig. 3. The main page of Pandora.

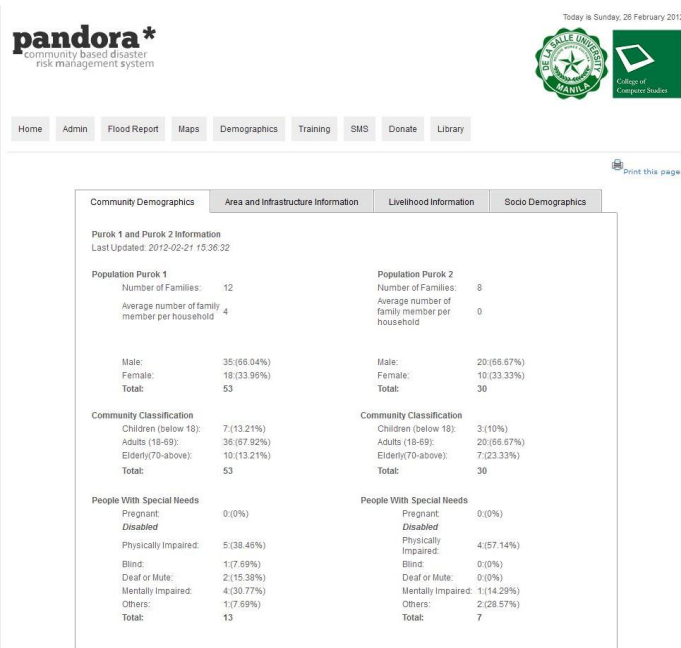


Fig. 4. The Pandora screen exhibiting community demographics of two puroks.

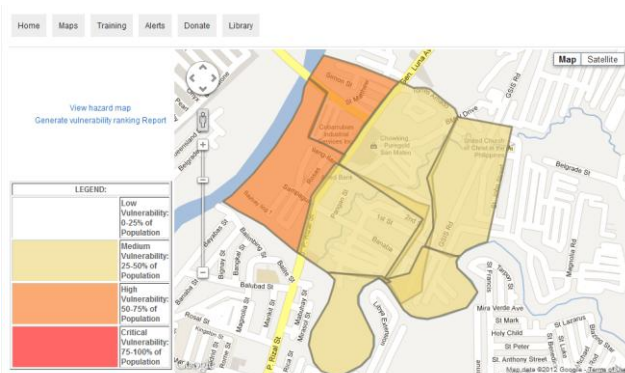


Fig. 5. The vulnerability map of Pandora, the legend shows white, pale yellow, orange and red as the color codes

Second is the hazard mapping that plots areas that may be easily affected due to the area topology, the house structures and amount of rain. The solution has not included the impact of the river overflowing and the velocity of the river water.

Third is the Tweet map. An innovative function, Pandora made a mash-up of the Google map and Twitter. The mash-up permits selection of an area in Barangay Banaba and generates all the recent tweets within a kilometer radius. This is a new way of capturing the community members' sentiments and reactions about the recent incidents.

Fourth is the mapping of crowdsourced flood reports. Crowdsourcing is a participative approach of collecting data or information from involved or concerned citizens. In the case of Pandora, it adopts a bounded crowdsourcing model of reporting flooding incidents whereby the reports published or used come from affiliated or recognized source. This means that registered members of the community may report and can escalate flooding and emergency situations without strict verifications. These registered members are constituted by the Buklod Tao community leaders, the rescue team, youth leaders, purok or zone leaders and head of the households. This function is also very much tied up with the flood reporting function using SMS.

Instead of being restrictive of flood water level measurements, Pandora made use of familiar flood water references such as ankle level, thigh-knee level, knee level, waist level, chest level and above the head. For Filipinos, this is a conventional reference of the gravity of flood situations.

Flood reporting. Flood reports come from several sources—from the Buklod Tao moderator or the members of the community. Flood reporting utilizes mobile technologies integrated in Pandora that delivers early warning to the community and escalates other urgent or important situation report to the administrators of Buklod Tao. [10]

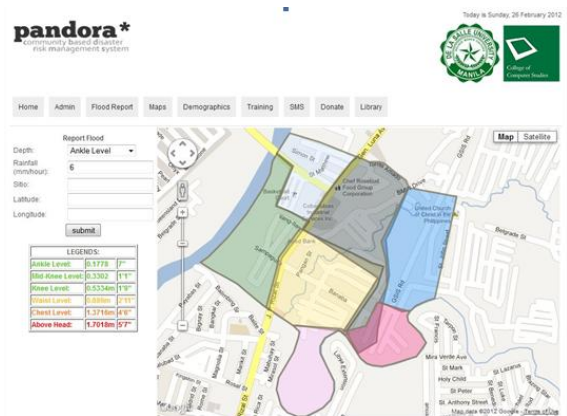


Fig. 6. This is an example of Pandora reporting flood incidents.

While push and pull methods of SMS has been around as a function for many years, what Pandora did is to integrate it with the bounded crowdsourcing of flood reports. All SMS goes through Pandora and tracked and trailed.

Members of the Buklod Tao found this flood reporting facility as the most immediate requirement at the same time the most manageable for them.

Training and assessment. Pandora is also equipped with a training manager that plans, schedules, issues certificates to attendees and manages training evaluation. Planning includes a facility permitting other partners such as the Center for Disaster Preparedness and the World Christian Aid to plan the training programs with them.

Other features of the Pandora are the online library, the

online donation facility, the Buklod Tao tweet feeds.

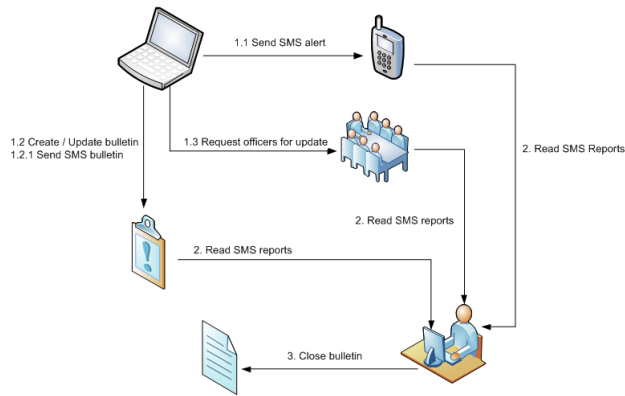


Fig. 7. The Pandora SMS push messaging method

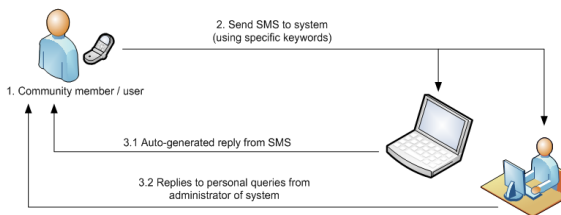


Fig.8. The Pandora SMS pull messaging method

Welcome Deecee Diego!

Send SMS Alert
View SMS Report
Add SMS Notice
Request Updates
Logout

Weather updates

Manila, PH

New: 32°C / 33°C
Cloudy
Humidity: 99%
Wind: SE at 15 km/h

Mon: 33°C / 33°C
Mostly Sunny

Tue: 32°C / 33°C
Mostly Sunny

Wed: 31°C / 34°C
Clear

Tweets

buklodtao Buklod Tao, Inc.

buklodtao: It is raining yet again. Keep safe and stay indoors.
20 hrs ago · Reply · Retweet · Favorite

buklodtao: We survived Typhoon Falcon. Water height reached 20m!
20 hrs ago · Reply · Retweet · Favorite

buklodtao: Good Afternoon... updates in weather... It is cloudy :)
10 hrs ago · Reply · Retweet · Favorite

buklodtao: Tomorrow's Wednesday! It's time to meet with the rest of the Buklod Tao officers to plan some CDRM stuff :)
90 hrs ago · Reply · Retweet · Favorite

Contact Information

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Training Assessment

"Disaster Preparedness Exercises" Training Evaluation Form date of event: 2012-02-15 on 15:00:00 - 20:00:00

Pano-marka ang mga nasa itaas ayon sa iyong pagtukol:

	Mataling pagpapantay	Sumasagayan	Patas	Di-sumasagayan	Mataling di-pagpapantay
1. Nasimot ng pagpapantay ang ating inaasahan na matutunan dito.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Ating malakasagawa ang ating mga matutunan dito sa oras ng saluna.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Malinaw na inilathad ang mga layunin ng training at nasimot ito.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Ang matatamang pagpapantay at mataling sunon at malinaw.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Mahalaga at sapat ang mga materyales sa pagpapantay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Malawak ang kaalaman ng tagapagantay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Maganda ang paglathad ng mga disenyo ng gawain sa pagpapantay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Halagap na pagpapantay ang mga layunin ng pagpapantay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Inanyayahan alon na maging aktibo sa pagpapantay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Sapat ang oras na ibinigay para sa mga tanong at talakayan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Ano ang masasabi mo sa tatatagpuan ng pagpapantay? (5 - pinakamataas, 1 - pinakamababa)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Anong mga bahagi ng pagpapantay ang kinakailangang pagbabago?

Ila pang toronto

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Fig. 9. The training assessment of Pandora in the Tagalog vernacular

V. PRESENT ISSUES AND FOLLOW-THROUGH STUDIES

Pandora's primary issue is the hosting of the mobile services. At present, Pandora is using the API tools of Globe to permit interfacing of the SMS with Pandora. Globe is one of the leading telecoms service provider in the Philippines. But the subscription fees cannot be embraced by Buklod Tao because of its unreasonably commercial rate. Buklod Tao predicts a peak requirement during the rainy season only but the present subscription requires whole year round usage.

Next, Pandora is using Google maps which makes it highly dependent on internet connectivity. At present, Pandora is focusing on disaster mitigation and preparedness. Hence Google maps may still serve its mapping function and support to decision-making. Pandora has the potential to expand and be useful during emergency response or disaster rescue operations.

Pandora was already tested by the members of Buklod Tao. There was high level of appreciation and expectation as well. Roll out has been planned but still awaiting a better mobile service subscription rates.

VI. LESSONS LEARNED

Designing a CBDRMS is not simply automating the community processes. The careful and mindful community approach is highly essential. Creation of social constructs and artifacts such as customized maps to correctly represent the puroks as sub-units of the barangay, the preferential use of body parts as reference of flood intensity or the use of twitter and SMS in a local convention had become very effective.

The Banaba map was divided into puroks that posted familiarity to the citizens enhancing the desire to use Pandora. The flood reporting through SMS fused in Pandora enhances their prowess in mobile reporting. They found the training design and assessment in the local language convenient to use and easy to understand. Purok leaders initiated taking charge of the community demographics in their respective areas. The intention of the project was achieved, to systematize CBDRM but at the same time, humanize the practice of using the Pandora CBDRMS. Ultimately, they know it is their CBDRMS.

The regular dialogue with the community leaders about their disaster and vulnerability issues gives way to deeper understanding and respect for the community.

A CBDRMS like Pandora, from conception to delivery, has made its identity in the Buklod Tao community. Buklod Tao members have been involved in the design process. Their insights and contributions were heard.

This is the way to increase community capacity through technology, determining the needs, resources and strategies of the community. [11] Give them an armor tool that will give them confidence to know their strengths and weaknesses (through community profiling and vulnerability assessment), address their needs and increase their know-how (through the training), become an information-armed citizen and play the role of a human flood sensor (through the hazard and flood reporting). ICT is a "dominant and vibrant force that leads to diffusion and application in a nation's development." [12] Evidently, a cognizant way of using technology gives way to

a creative, conscientious, respectful CBDRMS congruent to the interests of the community.

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This project extends its respect and gratefulness to Manuel “Ka Noli” Abinales, the founding head and director of Buklod Tao and the cheerful warm-hearted members of Buklod Tao. Appreciation also goes to the developers of Pandora namely, Janine Vincente Casas, Dennis Dominic Diego and Quino James Legaspi. The author of the paper had closely worked with the developers on the design and development of Pandora for over nine months until the system presentation and testing in the Banaba, San Mateo community.

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She started engaging in disaster management studies in early 2009. Her past and present DM works are focused on flood prediction, volunteer management, logistics management, epidemics and early warning systems. And in the heart of these projects is the desire to help the deserving poor Filipino communities.

She had the opportunity to present her DM projects in Indonesia and Maryland, USA together with researchers from Florida State University, her e-learning and social media stints in different parts of Asia, the KSA, Greece and Sweden.

She has also designed the new course electives, IT and Emergency Management and the Social Media elective in the IT Department. It is her hope to see the Emergency Management as a core part of the curriculum, adhering to the thrusts of the Hyogo framework. She also conducts teacher training on e-learning and social media for higher education.

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