

Community Based Flood Early Warning System:

A case study on Dumangas in Philippine

Integrating Environment, Development and Management Issues

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By

Ibrahim H.Saed

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Abstract

Development practitioners are increasingly calling for integrating disaster risk management into sustainable development, considering it to be an effective strategy to reduce the disaster risks not only during, but also before disaster happens. One way to integrate disaster risk management into the development is placing people at the center of the disaster management as well as development work. The integration of disaster risk management and development should promote culture of prevention and preparedness as well as other key factors that drive communities to be severely affected, especially the vulnerable people. The Philippines was one of the few developing countries that established the community-based disaster early warning system to prevent and mitigate effects of natural catastrophes. This paper will study the Community-Based Flood Early Warning System in Dumangas in the Philippines to understand disaster management to be a key issue in sustainable development.

Introduction

Disaster refers to an outcome of several factors composed of hazards, vulnerabilities and lack of capacity of society to handle consequences of disaster (Øvland, Øyhus, 2009, P, 4). It is a serious disruption of functioning of a community and overall society involving widespread losses of human, material, economic and environment which causes negative impacts which exceed the ability of the affected community or society to cope it with its own resources (Mercy Corps, 2010, p, 15). The outcome of the disaster drives affected people to be vulnerable which makes circumstances of the affected community, system and asset to be susceptible to damaging effects of hazards (Mercy Corps, 2010, p, 14). It is often pointed out disaster by its own does not inflict fatalities to the affected society, but it is the vulnerability within the affected people and the weak capacity of the society combined with other substantial factors that determine the scale of the casualties within affected societies (Øvland & Øyhus, P, 4.).

There has been an increasing international acknowledgement, such as the Hyogo frameworks, which suggests disaster risk management efforts to be systematically integrated into policies, plans and programs, sustainable development, poverty reduction to reduce disaster risks (ISDR,2005, P,1). The integration of disaster management into the development strategies becomes a salient measure, not only to reduce risks but to prevent from development work setbacks. A central tenet of building a community-based disaster management is an active participation of at-risk communities in the activities intended to manage disaster. The Community Based Disaster Risk Reduction (CBDRR) is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks.

The CBDRR aims to reduce the scale of vulnerabilities and to enhance resilience of the community. This engagement implies recognition of people to be key ingredient of CBDRR to make decisions and implement disaster risk reduction measurement (Mercy corps & practical action, 2010, p, 16). This paper will study the Community-Based Flood Early Warning System (CBFEWS) in Dumangas, a flood prone region in the Philippines. CBFEWS intends to reduce the loss of human and economies and introduces the people to embrace the culture of dealing with unforeseen risks.

The paper is structured four sections, the introduction is followed by addressing the impact of natural disaster on development activities in section two. The role of the disaster management in the development strategies is presented in section three while section four reviews a community-based flood early warning system in Dumangas of Philippines. Finally, some conclusions will be drawn up on challenges and successes of the community-based flood early warning system in Dumangas in Philippines.

2. The impact of natural disaster in development activities

As it was briefly noted in the introduction, disaster is defined as serious disruption of the functioning of a community and society which natural disaster impacts people very broadly. The natural disaster kills people and inflicts injuries to others, destructs the social and the economic infrastructures; and degrade the environmental performances. Despite this, people are neither equally inflicted upon a loss nor they are equally able to recover. Poor households are well-known to be especially vulnerable while females and males are unlike affected. For example, standard indicators (mortality, injury and illness, economic losses, and workload changes) report higher causalities on girls and women (Enarson,2000, p,2). The literature shows that all impacts of disaster cannot be regarded as bad as devastating, possibly disaster may bring good than bad onto development work in a society. Similarly, activities aimed to respond to disaster's aftermath may not all be considered as good as its intention. "Emergency activities may do more harm than good regarding the sustainable development process due to ignorance on the long-term effects of these activities: May lead to increased vulnerability" (Øyhus, p,10).

It has become visible that one disaster may completely damage the fruits of decades of development activities. The impacts of natural disaster attracted the attention of development practitioners. Because it is not only that it victimizes severely vulnerable groups in a society such as women, children and elder and poor people, but it disrupts development efforts and investments. On the other hand, the impact of disaster on development may be reverse, as a result of disaster, new and more efficient infrastructure can be built, forcing the transition to be a sleeker and economies become more productive in the long term. In fact, some economists argue that despite the widespread destruction of hurricanes, earthquakes, floods, volcanic eruptions and ice storms, these can spur an economic growth of the affected community. This argument is challenged by proponents of critics of growth-follow-disaster line of thinking. They argue that it is ignored the fact that the money and labor that are used rebuilding infrastructures and economies have been simply redirected from other productive uses (Bernett, 2008).

When assessing the negative impact of the disaster on the people and environment, it is questionable the proper measures to employ to determine the degree of the causalities. One way to assess the causalities is using monetary measures which may often be regarded as misleading. Because a significant portion of losses has implicit values which do not have a market value. it is often difficult task to set on loss of human and environment a market value. Despite this, enormous effort has been made to value damages caused by natural disasters. In a report by the Center for Research on the Epidemiology of Disaster shows that the cost of damages caused by natural disaster in the years between 1993 to 2003 is up to US \$67 billion per year on average around the world. It signifies 14 times increase since the 1950s (Jayasinghe, 2013, p, 3). However, the increase may be related to better reporting about disasters which has recently been more visible than 1950s.

2.1 The role of disaster management in development strategies

Should disaster management be a key issue in development management?

In attempt to answer the question asked, it is apparently yes corresponding that the disaster management should be a key issue in the development management. Many have complimented the idea of disaster management to be conflated in the sustainable development. According to Hyogo framework (2005), the strategic goal one, proposes the integration of disaster risk reduction into the sustainable development. An integrated approach to disaster management and development planning is required to break the vicious circle of underdevelopment and susceptibility to disasters (Ahrens & Rudolph, 2006, p, 208). A short-term emergency management must closely be linked to a long term sustainable development activities which disaster preparedness activities must be part of the long term sustainable development activities (Øyhus,p,1) The objectives of a development oriented disaster management approach is to reduce hazards, prevent disasters and prepare for emergencies (Warfied, 2005). This objective entails the focus to be shifted from responding to aftermath of the disaster to dealing with the vulnerability within the community, which is a common problem that the disaster management and development management must address, and the next subsection discusses it.

2.2 Vulnerability as central tenet in the disaster management

According to Fussel (2007) the vulnerability refers to the capacity to be wounded. This definition implies vulnerable societies are already weakened and are more sensitive to external stress, such as tropical cyclones (Webersik, 2012, p,1).“There is ample evidence that poverty is the most important trigger which turns hazards into disasters” (World Bank, 2006 in Øyhus, p, 7). Vulnerability theme aims to be a central tenet of a proper disaster risk management system, which is integral part of development strategies. Because vulnerability is a common variable for the disaster risk management and the development work which should be addressed. The degree of the vulnerability is determinant factor of the extent disaster impacts on the affected community, as shown in the figure 1. Therefore, it is significant that disaster management must not be understood as only relief work, but as a combination of an emergency response and measures taken to reduce disaster risk in the first place (Ahrensn and Rudolph, 2006,p,208).

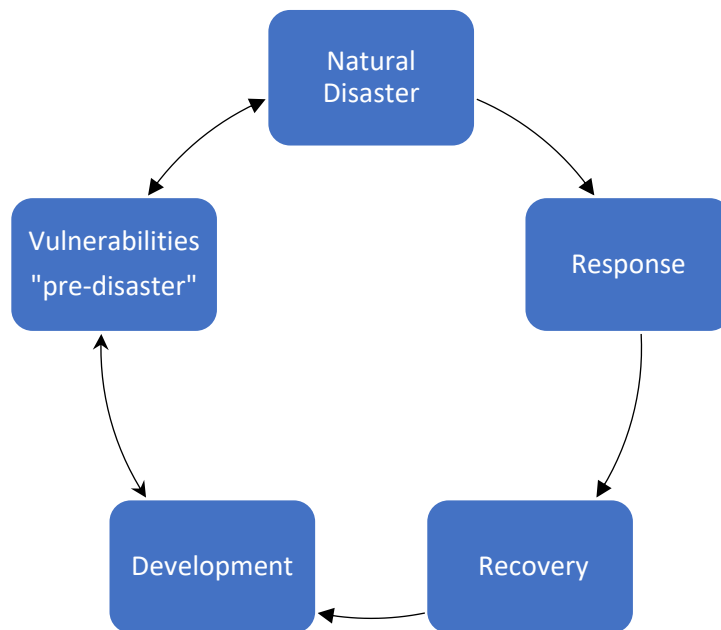


Figure 1: shows the importance of vulnerability in circular shape, and how it is connected to natural disaster before a disaster and to development. Source: by the author but the concept used was borrowed from Øyhus

Hyogo framework (2005) recommends empowering local communities and authorities to be one of the priority actions for disaster risk management. “Both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions for disaster risk reduction” (UNISDR, 2005,p,5). When at risk-communities and local institutions are empowered, it means reducing the vulnerability of affected community during disaster which in turn minimizes the consequences of catastrophes during disaster. This reinforces the argument that defines the vulnerability as the cornerstone of a holistic disaster risk management approach which conflates the sustainable development work. The participation of the community members is prerequisite for effective disaster risk management systems. the participation is not only that matters, but the degree of the participation, the capacity of the community and the readiness of the ordinary community to engage will determine the effectiveness of the DRM. The next section presents a community-based disaster management that focused on early warning systems.

3. A case study on Community Based Flood Early Warning System (CBFEWS) in Dumangas City in the Philippines

Contextualizing the case

“Flooding is the single most destructive type of natural disaster that strikes humans and their livelihoods around the world” (UNISDR, 2002, p.4 in Gabriel, 2013, p,3). The flooding is destructive disaster in Philippines which is one of the most storm-prone countries in Asia. The country experiences roughly five destructive typhoons each year and about three of these storms result in massive flooding (Porcil, 2009; Preventionweb, 2012 in Gabriel,2013,p,3). The paper is interested in the municipality of Dumangas which is located at the tail end of Jalaud River (also known as Jalaud River); one of the major river basins in the Philippines and the

biggest river in Iloilo Province with a drainage area of 1,503 square kilometers. Dumangas is located a coastal town, the area has active tidal flats and flooding is aggravated when the overflowing of the Jalaur River coincides with high tide (Subbiah, Bildan, Rafisura,2006 p,11). Four more rivers traverse the town a part from Jalaur which makes flooding in Dumangas to be overflowing the Jalaur River, most notably during tropical disturbances, such as cyclones, southwest monsoon, and the Inter-tropical Convergence Zone (Subbiah, Bildan, Rafisura,2006 p,11).

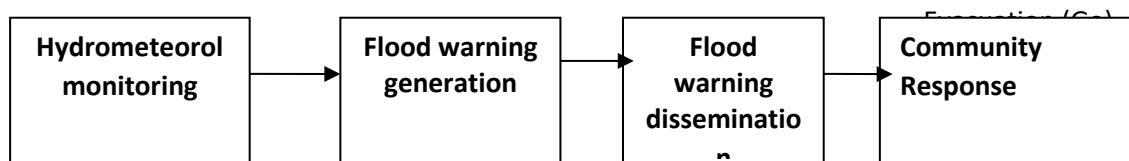
3.1 Community Based Early Warning Systems

The term ‘early warning system (EWS) refers “the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by hazards to take necessary preparedness measures and act appropriately in sufficient time to reduce the possibility of harms or losses” (Mercy Corps, 2010, p,23). The community based EWS is a system developed, managed and maintained by the community itself (Mercy Crops, p,23). The community-based early warning systems (CBEWS) is a “people-centered” system which empowers individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property, environment and loss of livelihood (Perez, Espinueva and Hernando,2007,p,1).

3.2 Community Based Flood Early Warning Systems in Dumangas

Prevention and preparedness mechanism was not in place in Dumangas to reduce the risks of the flood before the CBFEWS was developed and mainstreamed into the disaster risk management. The reason Dumangas lacked CBFEWS may be related to the expensiveness of establishing the flood forecasting equipment. The community based early warning system is considered to be inexpensive to develop and mainstream the disaster risk management. Despite this, CBFEWS in Dumangas was funded by external donors, while the Dumangas municipality implemented it in cooperation with the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA). The CBFEWS’ corner stone was the community’s participation in the monitoring, recording rain data and water level behavior of rivers or streams. Observations from monitoring stations coupled with meteorological forecasts were used to provide early warning to the community (Subbiah, Bildan and Rafisura, 2006 p,11).

The CBFEWS consists of four inextricably linked components namely 1) hydro-meteorological monitoring; 2) flood warning generation; 3) warning communication; and 4) community response (see figure 2).



3.2.1 Hydro-metrological monitoring

The hydrological monitoring system consists of network of rainfall and water level monitoring stations which are set up at strategic points in the Jalaur River basin. The four rivers, namely Balabag riverside, Dingle, Suage, and Linao Creek, that traverse Dumangas were being monitored. When there are tropical disturbances that are likely to affect the river basin, PAGASA sends advisories and regular updates directly to the local-agromet station via systematized data collection, phone and emails. Rainfall is observed and recorded using forms provided by PAGASA in normal conditions twice a day (8 AM & 5 PM). During the inclement weather, the observations are made in every three hours and hourly observations shall be made when the water elevation is at a particular reference point is 100% full, During the inclement weather, VHF is used to transmit information in real-time to local agro-met station (Subbiah, Bildan and Rafisura, 2006 p, 12).

3.2.2 Generation of flood warning

The terms of Alert, Alarm and Critical have been used as measurement of water height of the rivers. The hydrographic surveys standardized these measurements i.e. cross-sectioning of rivers and discharge measurement. These three levels correspond to different river heights which are based on the flood advisory warning (Ready for awareness, Get set for preparedness and Go for response. These three levels would also suggest actions the community should take including radio listening, secure moveable belonging and going to evacuation center (Subbiah, Bildan and Rafisura, 2006, p, 12).

3.2.3 Disseminating

Local Agro-met stations send alert message to Municipal Disaster Coordinating Council (MDCC), which is the sole agent authorized to issue a flood advisory to at risk-community in barangay (village), through the barangay tanods (village peace officers) via VHF radio. The primary means of communication are handheld VHF radios, emails and mobile phones, which serve as back up and support (Subbiah, Bildan and Rafisura, p, 13). The village peace officers disseminate different types of information other than flood warnings. the peace officers' repeated use of VHF radio would help them not to forget the communication protocols. In other terms, the community receives information through the village peace officers and by the radio stations (Subbiah, Bildan and Rafisura, p, 13).

3.2.4 Community Response

A considerable attention has been given to provide the target community with understandable and actionable warning. The alert messages indicate the stage at the rivers' water height which the community is able to conceive the meaning of the signal. The most important component is also actions that should be taken by the community and the evacuation places ready to receive the people. The evacuation area is a school building whose floors are elevated to make it impenetrable by flood water. There is a designated classroom for a cluster of households in each village so it would be easy to monitor if everybody was able to make it to the evacuation centre (Subbiah, Bildan and Rafisura, 2006,p, 13).

4. Discussion

4.1 Preparedness phase of CBFEWS

The creation of CBFEWS indicates that Dumangas was prepared to reduce the scale of flood's impact on the community, economies and infrastructure. The key actors of the development of the CBFEWS are both external such as UNDP that financed the project and internal such as the local government of Dumangas, community members, the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA). The operations of the CBFEWS take place mainly before and during the disaster occurs in Dumangas. The CBFEWS may partially be considered to be a people centred system, as the local people were able to act in sufficient time upon the alert signals and the representative of community members participate in CBFEWS by monitoring and recording rain data and water level behaviour. It is also questionable whether the community was involved in the design and finance of the CBFEWS which the initiative was drawn from the top with the external actors and local institutions.

The short coming of the system was that it was not integrated into the disaster risk management systems while the financial resource was deemed to be unsustainable. The warning messages are initiated by PAGASA, the municipal staff monitors and observes the climatic parameters, the peace officers represent the ordinary community delivers the messages to ordinary community members. Finally, the ordinary citizens receive the information through the peace officers leaving the ordinary communities to be passive unable to interact the message itself, particularly in the case of false alarm issued.

Despite the above shortcomings, the positive side of CBFEWS was astonishing; it reduced dramatically the economic and human loss. It was observed a decline in the expenditure on the rehabilitation and infrastructural repairs. The impact of the CBFEWS was it shifted the attention of the local government into the importance of investing in disaster risk management. The footprint of the intervention had been seen in the community that adopted to cope the disaster and deal with unforeseen risks. The structure of the CBFEWS was in line with the Hyogo framework's action priorities which call for the use of knowledge, innovation and education to build the culture of safety and resilience at all levels to reduce the underlying risk factors.

4.2 Disaster response phase of CBFEWS

The current form of the CBFEWS was established to protect the future capacity of the people, material and infrastructure through early messages along different levels of threats. Does CBFEWS really protected people, their capacity, material and infrastructure? When examined the case, the observation shows that there was a significant reduction of the loss of human, material and infrastructure. For example, the people in Dumangas were prepared to move into a safe evacuation place in which elevated floors were built to ensure the flood not enter into the place. The evacuation place has significantly reduced the loss of human when the flooding occurs in Dumangas. However, the awareness categories of the CBFEWS played significant role to reduce the loss of people by raising the awareness of the people regarding the perceived threat. It is especially worth mentioning the community's willingness to take action when they receive the "prepare and go alerts". There was no complains showing the people's reluctant to act upon the alert message provided to them. For example, at the level of the preparation, the

community gets prepared with their moveable belongings and when they receive “go alert” evacuation places were moved.. the only response from the supply side was to ensure the cluster of households had made to the designated classroom in the evacuation center.

The weak aspect of the CBFEWS is the response component is mainly placed at the community side or demand side during the disaster. During the case study, the data did not show that local government and the central government provided during and after emergency support to those who had been affected by the disaster.

4.3 Disaster recovery and development phase

The evidence did not show that the current form of CBFEWS was embedded with recovery intervention, in which the affected people are assisted to return to their proper level of functioning of livelihoods, rebuilding and repairing the physical structure and economies. One way to improve the current form of CBFEWS is to integrate fully it to the disaster risk management and sustainable development. The evidence does not support that CBFEWS was designed to deal with vulnerability and preconditions that existed before the flood overflow the city. it is also questionable whether the CBFEWS is development-oriented approach which reduces the hazards and vulnerability, but it is notable that CBFEWS is focused on emergency preparedness and response during the emergencies.

5. Conclusion

Disaster risk management is not considered to be linear, rather it is cyclical which the loop begins with the vulnerability, risks and hazards before even disaster occurs and the loop ends with these preconditions following after the development activities. The disaster preparedness is part of that cyclical which mainly comprises of early warning system and capacity building. The early warning system is set of capacities that generate meaningful warning information and disseminate timely target community to act upon in sufficient time. The Community-Based Flood Early Warning System (CBFEWS) was developed to reduce the negative effect of flood disaster in Dumangas in the Philippines.

CBFEWS in Dumangas was successful to raise the awareness of the community, let them prepare for the perceived risks and move them into the evacuation places when the threat is real. The elevated floors which the flood water impenetrable was one way to protect the people get negatively affected by the floods in Dumangas. The tools used to deliver the message to the community and the messages worked well which contributed to the decline of human and economic loss. The CBFEWS was effective system that changed the behaviour of the the community to deal with unforeseen risks. CBFEWS has also weak aspects that need to be improved including it should be integrated with the disaster risk management and development activities in Dumangas and the Philippines. The communication component of the system should be designed in two ways which allows the community to interact with the warning messages, particularly when false alert was sent to them

The flood disaster affects not only the people, but it affects development activities in so many different ways. The impact of the disaster is disproportionate within the affected communities, women, children and elder. It impacts differently even among the poor people. The uneven effect of disaster can be related to pre-existed conditions within the affected communities. The vulnerability in the affected communities can be tied with the under-development. Therefore, it is significant to integrate the disaster risk management to the development work to reduce the pre-existed vulnerability, hazard and risks that deteriorate the negative impact of floods.

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