



University of
Salford
MANCHESTER

Engaging the public in anticipating and mitigating the effects of flooding : international perspectives

Thurairajah, N, Amaratunga, RDG and Bichard, E

Title	Engaging the public in anticipating and mitigating the effects of flooding : international perspectives
Authors	Thurairajah, N, Amaratunga, RDG and Bichard, E
Type	Conference or Workshop Item
URL	This version is available at: http://usir.salford.ac.uk/id/eprint/9768/
Published Date	2010

USIR is a digital collection of the research output of the University of Salford. Where copyright permits, full text material held in the repository is made freely available online and can be read, downloaded and copied for non-commercial private study or research purposes. Please check the manuscript for any further copyright restrictions.

For more information, including our policy and submission procedure, please contact the Repository Team at: usir@salford.ac.uk.

Engaging the Public in Anticipating and Mitigating the Effects of Flooding: International Perspectives

Thurairajah, N.

School of the Built Environment, University of Salford
(email: N.Thurairajah1@pgr.salford.ac.uk)

Amaratunga, D.

School of the Built Environment, University of Salford
(email: R.D.G.Amaratunga@salford.ac.uk)

Bichard, E.

School of the Built Environment, University of Salford
(email: E.Bichard@salford.ac.uk)

Abstract

For many years flood stories are documented around the world as history or legend in almost every region on the planet. Flooding can turn even the most harmless looking watercourse into a raging torrent of large scale destruction where any structures may prove no obstacle to its power, it may ruin many crops which can lead to starvation and take away many people's lives. Many governments and international organisations have devised regulations and management structures to cope with flooding. Although, many nations carry out actions that are related to elimination or reduction of the probability of the occurrence or reduction of the effects from unavoidable disasters the lack of incorporation of the local conditions and vulnerabilities act as a hindrance to their success. This bespeaks the need to include local knowledge and skills from specific communities in disaster prevention activities. Hence, in order to gain an understanding on the international perspectives on flood prevention, this paper aims to examine the practices on community engagement in flood prevention within many countries and identify the challenges that local authorities face in this context.

Keywords: challenges, communication, flooding, mitigation, public engagement

1. Introduction

The advancement of technology has tremendously contributed to the development of world's security and economy. Although, huge amount of money and efforts are made for new applications and management approaches the occurrence and the effect of disasters are still threatening many parts of the world. Apart from the importance that is been given to the world's financial situation the world is forced to pay attention to the unprecedented scale of disasters as they appear to be increasing in both frequency and intensity. Kobe earthquake (1995), Bam earthquake (2003), Asian Tsunami (2004), Kashmir earthquake (2005), UK floods (2008), tropical cyclone in Myanmar (2008), Italy earthquake (2009), suicide attacks in World Trade Centre-America (2001), persistent civil wars in certain countries, regular explosions all over the world, are just a few out of the endless list of many disasters. Disasters have become a part of everyday life of humankind of the globe. Statistics indicates that the impact of natural disasters, such as flooding in particular, on life and livelihoods is also dramatically increasing.

Although, many governments and international organisations have devised regulations and management structures to cope with flooding the lack of inclusion of the local conditions and vulnerabilities act as impediments to their achievement. The local community is a major source for identifying the local conditions and vulnerabilities that exists within the affected area. This indicates the need to include local knowledge and skills from specific communities in disaster prevention activities. Hence, in order to gain an understanding on the international perspectives on flood prevention, this paper firstly outlines the challenges that local authorities face and describes the concept of public engagement which has gained its importance in recent past and its applicability. The paper further examines the ways of achieving effective communication between community and other agencies and encouraging the community to get involved in flood mitigation from different countries. This research has been based on a theoretical as well as practical ideas obtained through comprehensive literature review and a sample of interviews.

2. Challenges to authorities

Natural disasters such as floods are becoming more complex and climate change leading these to an increased adverse impact (Aalst and Burton, 2002). Natural disasters have their huge impact at local level, especially on the lives of people who are affected from a disaster. United Nations (2003) describes a disaster as a severe disruption of the functioning of a community or a society causing extensive human, material, economic or environmental losses which goes beyond the ability of the affected community or society to cope using its own resources. In order to address the impact of a disaster and to reduce the occurrence of future disasters, it is important to take corrective measures by managing disasters in an effective way. During recent past, the value of public and other stakeholders' participation has been increasingly recognised at policy level in disaster management (Tippett *et al.* 2005). However, many communities around the world rely on local or other authorities to take actions in preparing and responding to any flood event. Although, governments and related authorities devise many jurisdictions and management structures to deal with flooding they still face many difficulties in

managing it effectively. This section of the paper highlights the difficulties that authorities face in different countries.

2.1 Poor management of drainage systems

Due to improper management of water drainage especially within a city, communities and relevant authorities face a severe risk of flooding. This happens when a city's deep drainage piping is clogged with mud and waste or dams are filled with mud. As per The Herald (2007), experts warned the relevant authorities that Mexico City was at risk of flooding of the kind that devastated New Orleans in the wake of Hurricane Katrina if they don't take necessary steps to unclog the canals, reservoirs and lagoons that make up the municipal sewer system. The foul liquid moves through a more than 70 years old system of hillsides, slopes and gullies feeding the rivers of the Mexican capital. Further, it was highlighted that there is a possibility of flooding within the city if the hillsides are not recovered since the earthworks and reservoirs are not holding the water because of the mud that fills them. In addition, it was mentioned that a strong rainy season could put too much pressure on the dams and it may break the walls and release a monstrous wave of putrid wastewater down the hillsides into the lower neighbourhoods of the capital. This indicates the poor management of drainage systems and lack of co-ordination between different authorities during joint actions.

2.2 Inaccurate forecasting of potential risks

During the 2008 flood in Uttar Pradesh in India, more than 770,000 people faced the fury of floods as the Mahanadi in Orissa and the Yamuna were in spate of affecting more areas including the national capital. During this flood there were a total of 61 embankment breaches and, relief and rescue workers were facing trouble to reach many of the villages because water had huge current and they were not able to move on boats. This was a severe flood that affected many and thousands of other victims remained stranded in different places. This problem was heightened after a huge quantity of water entered the Hirakud reservoir forcing the authorities to open some 40 of its 64 gates. However, the release of water from the dam has caused devastation in the coastal districts of Cuttack, Puri, Jagatsinghpur and Kendrapada (Thaindian news, 2008).

2.3 Inflexible nature of flood management and political influence

Another problem which authorities face is the difficulty of providing community specific responses during an emergency state and also their lack of ability to take actions within the given power. During 1997 Red river flood, community members from certain flood prone areas felt that the government's mandatory evacuation order during the 1997 flood was inappropriate (Buckland and Rahman, 1999). As per the governmental policy on flood mitigation, they have encouraged rural households to flood-proof their houses by constructing permanent and temporary dikes around them. However, since sandbag dikes are vulnerable to leaks there was a need to monitor these preventive measures from a general collapse. In addition, due to water seepage in certain places there was a need for continuous

pumping of water from the basements. This too required a continuous monitoring in the event of equipment malfunction, clogging or electrical failure.

However, a government or a relevant local authority's evacuation order was commonly given for both towns and rural communities. In most of the circumstances, these orders are mandatory evacuation orders. This led to a dispute among people, because certain communities who had a need to monitor their flood preventive measures were also forcefully evacuated. In the case of Red river flood, the authorities failed to explore the community dynamics bound up in this issue as it generated much controversy in the communities. Although the order was just one of the actions taken by government, the level of sensitivity of the issue had a tremendous effect on public's perception on authorities' performance. According to a study on 1997 Red river flood (Buckland and Rahman, 1999), the respondents supported the essence of the mandatory evacuation order for certain parts of the flood prone areas where the risk of flooding is high and for young, old and disabled people. However, the tension and the perception created among community people from the process of implementation of the order resulted in further challenges to authorities for future flood management activities.

According to a study on 1997 Red river flood, it was found that the evacuation order was implemented with a little consultation with municipal officials (Buckland and Rahman, 1999). Further, the evacuation order was delivered to all municipalities, and was implemented by a combination of local authorities and the Royal Canadian Mounted Police and armed forces personnel. It was highlighted during the study (Buckland and Rahman, 1999) that municipal officials received an unsigned facsimile ordering the evacuation of all municipal residents, excepting emergency personnel. In addition, it was pointed out that the authority and municipal officials were in a very difficult position because, on one hand if they have to fully implement the evacuation order they would lose community support and on the other hand if they disobey the order they were feared about the reduction in government rehabilitation funds. This shows the lack of ability of the centralised system to consider the local situations which resulted in the failure of top down disaster risk measures to suit the different locations and different groups. Moreover, the consequences of bureaucratic and political nature in management of these events can be well noticed from these difficulties.

2.4 Unwillingness for change and, Lack of regular update of information and systems

According to a study by Osti and colleagues (2008) it was found that governments of some flood prone countries are still lagging in accepting flood mitigation agenda in their national development plan. Further, it was stated that flood mitigation policies in developing countries either do not exist or are not adequate and even if exist, these policies are ineffective or conflicting in their standpoints. Most importantly, due to legislative and administrative complexities, appropriate policy and programmes have difficulty in reaching all grass root levels. In certain situations, programmes are not effective due to overlapping and duplication which lead to people's ignorance. Furthermore, the lack of regular monitoring and evaluation of programmes by the authorities and weak social security systems act as other barriers. In certain places, introduction of completely new technologies for flood prevention without incorporating any local indigenous practices which are built within their

environment for many years, mislead the community on their perception on new developments by the authorities.

2.5 Ineffectiveness in communication and lack of inclusion of local knowledge

During March 2001, a low pressure system passed over the North Coast area of New South Wales which brought extensive torrential rain that caused serious flooding on several river systems. Local authorities faced difficulties in carrying out an effective warning and evacuation due to community's perception about the risk (Pfister, 2002). Since some people are not or less risk averse, they do not respond to evacuation order immediately. In addition, other priorities such as waiting for other family members, unwillingness to leave their livestock and other signals such as unwillingness or movement of other members from their neighbourhood may interfere with immediate response to warning messages. Another important aspect which authorities lack in their communication is their inappropriate use of method of communication to all community people. Due to lack of mental or physical capability, some people cannot respond to these general warnings. Further, due to different priorities, languages and levels of understanding these messages were not conveyed or understood by some groups of people. In short, the diversity in population was not considered by the authority. Some groups were largely excluded from most networks and they were not able to receive any warnings even where the system appears near perfect.

Lack of inclusion of local knowledge during these mitigation stage resulted in unnecessary evacuations of local people which ultimately became a widespread source of speculation. Due to a very different perception of some members of the community with regard to the probability and severity of the risk and the ability of some residents who can correctly predict the progress of the flow of flooding without any dramatic flow of water from their previous experience, authorities found that their messages to communities didn't have an effective response. This indicates the need to include local community's participation within the flood mitigation and prevention activities. In this context, the following section introduces the construct of public engagement and its importance for better development.

3. Public engagement

3.1 What is public engagement?

The term public engagement has been referred to as community participation, people's participation, civic engagement, etc. Participation is another term which is quite often referred to engagement. Burkey defines engagement (1993 cited Samaranayake, 1996) as a process which is an essential part of human growth, which is the development of self-confidence, pride, initiative, creativity, responsibility and co-operation. Many organisations and officials who deal with disaster management use the term public engagement as a tool of enhancing the capacity of the affected community in order

to create a resilient community. However, the term engagement is described with different meanings. The term is also viewed as a cosmic label to make any proposal to appear more attractive to the funding body or to describe a co-opting practice to mobilise local labour and which in turn will reduce the cost of execution. Further, the term is also used to describe an empowering process which enables the local people to do their analysis, to take command, to gain confidence and to make their own decisions (Samaranayake, 1996). According to Hajer and Kesselring (1999) public engagement is described and promoted with three rationales: normative, instrumental and substantive.

While explaining about engagement, Petts (2006) states that it is predicated on creating the necessary conditions to support a new relationship between expert and public and, lay understandings of an issue, one that promotes learning about different perspectives, views, and knowledge. Further, he states that public engagement is a process which can capitalise on local knowledge and lead to shared learning and understanding between experts and public. Petts (2006) refers to it as not only to be the right thing to do and a better way to achieve particular outcomes. However, Petts pointed out that this should ultimately also lead to better decisions as in many situations the interest of public is not taken up to decision making level. Although, the concept of public engagement has its different motives for different stakeholders of flood management, building a relationship with the public and agreeing on the importance of public participation as a solid first step towards engagement.

3.2 Importance of public engagement and its application

During early 1970s (Samaranayake, 1996) development interventions had two types of actors. On one side, those who engage in the development activity by involving in identifying the development need, planning development activities, mobilising resources for development, implementation, monitoring the implementation process to ensure that designs, plans and disbursement of resources were taking place as planned, and evaluating the success or failure of the development after the event. On the other side, the beneficiaries for whom and for whose development all these tasks were undertaken. Earlier days, although beneficiaries were marginally involved in the development process, they were called upon to operate and maintain structures such as minor irrigation reservoirs, well, etc. to share the cost of development activities. In these two categories those who carry out were empowered and they have knowledge, authority, access to resources and decision making power. However, the beneficiaries for whom things are been done are dependent, powerless, ignorant, lacking in authority and poor. Therefore, they are lacking in resources and basically voiceless in the decision making. This gap between these two actors has resulted in mutual mistrust, often leading to resentment and has serious implications on the development process. Numerous cases have been recorded on the failure of the development activity without community participation. Hence, there is a need to bridge this gap between these two actors.

Further, the local community is an important segment of the stakeholders for flood management as they are the first responders when a flood happens. Most often during small scale disasters the local community is left to deal with disaster management without any assistance from external parties. In addition, top-down disaster risk reduction programmes often fail to address specific vulnerabilities, needs and demands of at-risk communities (Haghebaert, 2007). These vulnerabilities and needs can

only be identified through a process of direct consultation and dialogue with the communities concerned, because those communities understand local realities and contexts better than outsiders (Haghebaert, 2007). Generally, vulnerable communities possess skills, knowledge, resources and capacities and these are often overlooked and underutilised (Aldunce and Leon, 2007) and, in some cases, even undermined by external actors. This indicates the need for involvement of affected populations when determining their needs and in the design and management of responses. Their lack of participation can limit the impact of both emergency and long-term interventions.

Four severe storms hit the Philippines during December 2004. However, before this catastrophe a project was carried out on flood control dam to hold up against the rush of water through community engagement (The World Bank, 2005). The community built a truly solid wall since the deluges were seasonal and devastating. When deciding on the construction of this installing a water system, communities had to decide between the importance of their access to water and its effect on flooding on them. Since the community decided that human lives are more critical than their access to water they prioritised their need towards flood control wall. Hence, community built their own 2.4 kilometres long wall which separates their village from the mountain. The project was very transparent where everything was recorded which encouraged the community to get involved in the activities and that didn't create any conflicts between people.

During the Yokohama World Conference on Natural Disaster Reduction (1994 cited Ariyabandu and Wickramasinghe, 2003), a mid-term review of the International Decade for Natural Disaster Reduction recognised the need to stimulate community involvement and the empowerment of women at all stages of disaster management programmes as an integral part of reducing community vulnerability to natural disasters. Empowerment has been defined in several ways by many authors for different contexts. While explaining about community empowerment Adams (2003) refers it as a process that enables them to analyse the sources of their problems, to explore their own needs and develop their own strategies. Even though the meaning of the terms delegation and empowerment may look similar they are different to each other. Shackleton (1995) states that in delegation a leader or manager decides to pass on a task or a specific part of his or her job to another individual for a specific reason. However, empowerment is a philosophy of management which widens the responsibility associated with the current task or role without necessarily changing the task or role itself. Handy (1993) simply explains empowerment as encouraging people to make decisions and initiate actions with less control and direction from their manager.

Through public engagement in flood prevention actions, authorities can provide accurate information to affected people about the assistance they can expect to receive, so that people can take other necessary actions to drive their own recovery plans in the overall process. Local authorities should not underestimate local communities' coping capacities but rather they should build upon them. There are a number of pre-conditions for reducing the spread of disease and preserving the quality of the environment during and after flooding. These include a good understanding of water and sanitation conditions, disease monitoring, speedy responses to warnings of disease outbreaks and the preparedness of health agencies to act. Further, public should be given an opportunity to get involved in post flooding reconstruction activities as it will provide them the chance to develop their ability to cope for future disasters. Although many agencies end their assistance after a period of time, the local

community do not cease their living instead they are the people who need to live and improve their living conditions and livelihood opportunities. Hence, local community needs to be given an opportunity to develop their knowledge and skills to maintain and develop their local conditions. Further, community's participation in these activities can provide them economic and social upliftment. Their participation can enable the aid programmes to be flexible enough to adapt to changing conditions and can facilitate the authorities to provide successful programmes to manage the emergence of new categories of people needing assistance. The highest form of participation appears to be self-organisation, self-responsibility and self-actualisation, which result in empowerment of people concerned (Samaranayake, 1996). This development allows a process whereby people learn to take charge of their own lives and find solutions to their own problems which guides towards sustainability.

4. Achieving public engagement in flood mitigation

The recognition of the importance of public participation in the process of flood mitigation has led to the development of a variety of methodologies in order to achieve its objectives. Osti and his colleagues (2008) emphasise that it is essential to build a community's capacity to understand their vulnerabilities, strategies, activities and the role they could play in managing flood risks without relying on external entities. In this context, with the view to highlight effective community participation this section draws some examples of the ways of achieving effective communication between community and other agencies and encouraging the community to get involved in flood mitigation from different countries.

4.1 Formation of decentralised units and formulation of local specific plans

According to Express India (2008), forming District Disaster Management Authority in each district can help the process of disaster mitigation as it will allow the authorities to consider the prevailing local conditions. Drawing specific plans for disaster mitigation by a district authority can make the process easier for communities to prepare for disasters instead of having a national plan for the whole country. It was stated that the District Disaster Management Authority will work in close coordination with the State Disaster Management Authority and will play an integral role in tackling different types of disasters at the district level. Further, it was decided that the funds can be divided into two sections that is, the mitigation fund and the response fund. While the mitigation fund will be for constructions and awareness programmes regarding the district specific disasters, the response fund will help the authority to manage rescue operations, rehabilitation programmes, etc. in the event of disaster. This will facilitate the District Disaster Management Authority to draw a disaster management plan by considering their individual risks and vulnerabilities. Delegating the appropriate power from district units to local units to decide upon the usage of funds for specific community developments can assist the local units to manage the events accordingly. Those districts, which suffer from two or more problems can form a comprehensive disaster management plan (Express India, 2008). This can not only encourage the community to get involved in constructing the disaster preventive measures but

also provide a confidence and interest to support their community specific disaster mitigation programmes.

4.2 Better networking between stakeholders

According to a study on 1997 Roseau river flood, many rural households found that due to mandatory universal evacuation order their flood mitigation measures were breached and damaged their homes that in many cases were not repaired or been compensated for a longer period. It was found that three communities within this area had unique experiences. This order catalysed conflict in at least one community that could have resulted in serious negative consequences. Hence, the study concluded that community effectiveness in disaster management would be greatly enhanced by a relationship with government agencies that is based on equal partnership, mutual respect and open, two-way communication (Buckland and Rahman, 1999).

Flooding is a significant natural hazard in New South Wales in eastern Australia. Within this region, flooding constitutes the most serious hazard faced by the community at large as it causes damages to infrastructure, property and production, and also in terms of deaths and injuries. The councils of local government in the Australian state of New South Wales were charged with making decisions about development on floodplains and applying measures to mitigate the impacts of floods. However, a volunteer agency is responsible for the coordination of community responses when flooding actually occurs (Keys, 2003). Many towns and villages in New South Wales have flood liable land, and many are built entirely on floodplains. It was estimated that the total expected damage from flooding in terms of all assets exposed in the state would amount to several tens of billions of dollars (Keys, 2003). In this place the actual flood management at the level of the flood prone community is delivered by the volunteers, who are local residents with the benefit of local community and local hazard knowledge. These residents receive considerable prior and real-time assistance from paid staff located in the organisation's regional and state headquarters. This indicates the assistance and the linkage between community and flood related authorities. There have been many improvements in terms of better networking the community's preparatory endeavours with relevant work in other organisations and in terms of training the volunteers before a disaster. In this participatory approach adequate measures are taken to ensure that volunteers are kept abreast of advances in flood management thinking and of technical studies about the nature of flooding in their own areas. Frequent briefings are held on floods and their management and purposeful exercises are conducted to update both community's and authorities' information. In addition, efforts are made to develop the local capacity to communicate effectively with the public, both directly and through the media.

4.3 Understanding the perceptions of community and effective dissemination of updated information

According to a study on 1995 flood in Norway it was found that the perception of flood hazard by the general public was not realistic and the flood risk messages was not communicated well (Krasovskaia *et al.*, 2001). This gap in the perception of flood risk among public and authorities can act as barrier

for effective communication. Further, the results showed that the transparency of the different decisions made during a flood situation and their effects on the degree of risk required further improvement. This indicates the need for better dissemination of information concerning flood issues and the organisation of flood mitigation activities with the decision makers and the community as the primary actors and the required transparency in the process of flood mitigation. The study (Krasovskaia *et al.*, 2001) recognised that the knowledge gained on these participatory approaches can be used for developing a flood assessment policy based on participatory principles. When the residents view the flood risk correctly, they are likely to support the allocation of the necessary funds for flood mitigation measures and cooperate with the authorities during a flood.

After the severe flood (1999) in Thua Thien Hue, a project was initiated in 2004 that focused on integrating GIS tools with local knowledge to develop flood risk maps in two communities. The communities' involvement in developing risk maps assisted them in establishing trust, respect and an exchange of information among local communities and, local authorities and planners. In addition, this facilitated them in developing a better community action plans which was appropriate to the local conditions than top-down disaster management plans. During this approach dialogues were held to encourage exchange of opinions, needs and wishes which helped to overcome the communication gap between stakeholders. The community meetings on flood management and the analysis of potential risks provided an opportunity to communities to empower them (Tran *et al.*, 2009).

Another important step in encouraging the community to participate in these approaches is to improve the accurate prediction of estimates of the risks associated with natural disasters. This can provide better data on the probabilities and consequences of these events to insurers which in turn can help them to set their premiums and tailor their portfolio to reduce the chances of insolvency. Successively this can assist the community to take corrective actions to mitigate their future loss with more confidence in the estimates of the risks and insurance companies (Kunreuther, 2001).

4.4 Motivating the community and developing their capacities

In achieving greater community participation, the authorities can create community based organisations and provide opportunities for community members to take leadership roles. This can motivate many members of the community to get involved in the process of flood mitigation. While community can gain knowledge and attain skills on flood mitigation measures they also would prefer to manage their problems by representatives from their places rather than external bodies. In addition, authorities can create a system to accommodate the community based organisations in the network of stakeholders. This will enable community based organisations to have contacts with relevant suppliers, authorities, and other bodies who are involved in flood mitigation and response. Although, initially this will require authorities' support later it may gain its power to sustain their organisation by the community itself.

During the process of encouraging the community to get involved in mitigation activities the use of visualisation tools and techniques, changes in the behavioural patterns and attitudes while focusing on the interaction and mitigation process can help the relevant institutions to promote community's

participation. The shift from verbal to visual can help even non-articulate members such as under privileged, children, and women to participate. The significance of visual communication can play a major role in achieving quick and effective communication between community and authorities.

5. Discussion

Community members are the first responders immediately after a disaster. Community's engagement can bring forward the genuine needs and difficulties and, satisfies them through self reliance and mass mobilisation. Within the literature on the practices of flood prevention and mitigation in many countries, it was clearly identifiable that many authorities or institutions at some point, do not give importance to pre-warnings that have been given by communities. It was highlighted among the reports or news that come after the disaster that if careful considerations would have been made to potential hazards the disaster would have been prevented or the impact would have been minimal. This shows the need for evaluating the potential hazards and consultations with communities in places especially where the probability of occurrence of disasters is high.

Although many recommendations are made for anticipation and prevention of flooding, mostly the lethargic nature of authorities and government structures do not facilitate the recommendations especially, when it comes to allocation of funds. Therefore, it is important that government devise a central framework and at the same time create a local framework too to cater the local needs. Further, it should not be forgotten that a system without adequate power will not function properly. Therefore, government should provide measures to manage the local system with required formal power and without many obstacles from other political intentions.

In addition to the above mentioned ways to accomplish effective communication and encouragement for community involvement, the authorities should also focus the methods and tools used; attitudes and behaviour and process and time. Although, nations have devised their regulations and new participatory measures the lack of awareness of those among public acts as a hindrance to effective community participation. Hence, it is important to conduct awareness programmes regarding the district specific disasters and examine flood mitigation measures in addressing the specific local community's conditions. Further, leaflets and brochures can be distributed to community to educate their knowledge on those. This will help the community to get them prepared for future flood events in addition to available external assistance. However, while providing information to public on flood mitigation and response the local authorities should give adequate attention to the usage of the right language and should consider the community perceptions on flood threat, resources availability, local threats, etc. The introduction of a new initiative to any problem mostly requires legislation or incentives for complying in order to achieve its success. This can be noted in the implementation of equality and gender policies, policies on employees, consumer benefits, etc. Similarly, the government and authorities should encourage and may bring in measures for adopting public engagement in flood prevention and mitigation activities in order to create sustaining long term disaster resilient communities.

6. Conclusions

Although some countries have made considerable progress in the recent past in removing obstacles for a full participation of community in their respective societies, there is tremendous work to be carried out. While many international and national regulations and management structures have been introduced over time for flood mitigation, authorities around the world face many challenges such as inflexible management structure, poor coordination between stakeholders, conflict of interest between parties, etc. in carrying these activities. However, the authorities can consider formulating a flexible management of flood mitigation that can allow for formulation of plan that fits the purpose of a community than a universal one. Further, they can facilitate a better networking between stakeholders and encourage them to understand the community and motivate them for a sustainable flood mitigation programme that can be run by the community in the long run. The authorities can foster greater co-operation through exploitation of pre-existing networks which can be identified through community engagement. This can provide opportunities to community to uplift their socio economic status which ultimately can empower them to take their own strategic decisions. However, in order to achieve effective community responses towards participatory flood mitigation programmes the government and other relevant institutions should take account of the complex causes of flooding, which include human vulnerabilities, inappropriate planning, increasingly climate variability and, most importantly the social capital of the community. Further, while planning for these flood mitigation programmes the authorities should consider the community's interest in the performance of flood warning systems as it will have an effect on community's trust towards the system and, human risk perception and behaviour.

References

- Aalst, M. and I. Burton (2002) The Last Straw: Integrating Natural Disaster Mitigation with Environmental Management. *Disaster Risk Management Working Paper No. 5*. The World Bank, Washington, DC.
- Adams, R. (2003). *Social Work and Empowerment*. 3rd ed. New York: Palgrave Macmillan.
- Aldunce, P. and Leon, A. (2007) Opportunities for improving disaster management in Chile: a case study. *Disaster prevention and Management*. 16 (1). Pp. 33-41.
- Ariyabandu, M.M. and Wickramasinghe, M. (2003) *Gender dimensions in disaster management*. Colombo: ITDG South Asia Publication.
- Buckland, J. and Rahman, M. (1999) Community-based Disaster Management during the 1997 Red River Flood in Canada. *Disasters*. 23 (2). Pp. 174- 191.
- Express India. (2008) Flood lesson: disaster management authority to come up in districts [Online]. *The Indian Express Limited*. 13th of September. Available from: <http://www.expressindia.com/latest->

news/flood-lesson-disaster-management-authority-to-come-up-in-districts/360746/ [23rd of March 2009].

Haghebaert, B. (2007) *Working with vulnerable communities to assess and reduce disaster risk. Humanitarian Exchange*. London: Overseas Development Institute. Pp. 15-18. Available from: <http://www.odihpn.org/report.asp?id=2888> [accessed on 25/03/2009].

Handy, M. (1993) Freeing the vacuums. *Total Quality Management*. June 1993. 11.

Hajer, M. and S. Kesselring. (1999) Democracy in the risk society? Learning from the new politics of mobility in Munich. *Environmental Politics*. 8(3). Pp. 1-23.

Keys, C. (2003). Managing Floods in a Volunteer Agency: some Considerations Relating to Training, Planning and Response Activities in New South Wales, Australia. *International Disaster and Emergency Readiness (IDER) Conference*. October 2003 London.

Krasovskaia, I., Gottschalk, L., Saelthun, N.R. and Berg, H. (2001). Perception of the risk of flooding: the case of the 1995 flood in Norway. *Hydrological Sciences-Journal-des Sciences Hydrologiques*. 46(6), Pp. 855-868.

Kunreuther, H. (2001). Incentives for mitigation investment and more effective risk management: the need for public-private partnerships. *Journal of Hazardous Materials*. 86. Pp. 171-185.

Loretta, D. and Polsky, W. (1991) Share the power. *Personnel Journal*. September 1991. 116.

Osti, R., Tanaka, S. and Tokioka, T. (2008) Flood hazard mapping in developing countries: problems and prospects. *Disaster Prevention and Management*. 17(1). Pp. 104-113.

Petts, J. (2006). Managing Public Engagement to Optimize Learning: Reflections from Urban River Restoration. *Human Ecology Review*. 13(2). Pp. 172-180.

Pfister, N. (2002). Community response to flood warnings: The case of an evacuation from Grafton, March 2001. *Australian Journal of Emergency Management*. Autumn 2002.

Thaindian News. (2008) Orissa flood toll 29; Uttar Pradesh, Delhi face Yamuna fury (Roundup) [Online]. *Thaindian News*. 22nd September. Thaindian.com Company Limited. Available from: http://www.thaindian.com/newsportal/uncategorized/orissa-flood-toll-29-uttar-pradesh-delhi-face-yamuna-fury-roundup_10098617.html [29th of March 2009].

The Herald. (2007) Mexico City might face Katrina-scale flooding. *The Herald*. 23rd of May. Available from: <http://www.eluniversal.com.mx/miami/24733.html> [23rd of March 2009].

The World Bank. (2005). *Empowering the poor - The KALAHY-CIDSS Community-Driven Development Project*. Manila: The World Bank.

Tippett, J., Searle, B., Pahl-Wostl C. and Rees, Y. (2005). Social learning in public participation in river basin management - early findings from HarmoniCOP European case studies. *Environmental Science & Policy*. 8. Pp. 287–299.

Tran, P., Shaw, R., Chantry, G. and Norton, J. (2009). GIS and local knowledge in disaster management: a case study of flood risk mapping in Viet Nam. *Disasters*. 33(1). Pp. 152–169.

Samaranayake, M. (1996) Significance of participatory approaches in empowering people for sustainable development. In: Bastian, S. and Bastian, N. *Assessing Participation*. Colombo: Konark Publishers private limited. Pp. 46-66.

Shackleton, V. (1995) *Business Leadership*. London: Routledge.