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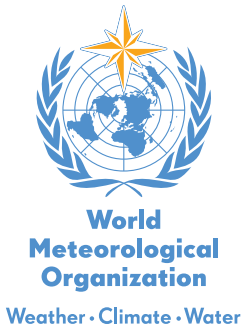

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To the reader

This publication is part of the *"Integrated Flood Management Tools Series"* being compiled by the Associated Programme on Flood Management. The *Communitiy-Based Flood Management* Tool is based on available literature and draws on the findings from relevant works wherever possible.

This Tool addresses the needs of practitioners and allows them to easily access relevant guidance materials. The Tool is considered as a resource guide/material for practitioners and not an academic paper. References used are mostly available on the Internet and hyperlinks are provided in the References section.

This Tool is a "living document" and will be updated based on sharing of experiences with its readers. APFM encourages flood managers and related experts engaged in community-based activities around the globe to participate in the enrichment of the Tool. For this purpose, comments and other inputs are cordially invited. Authorship and contributions will be appropriately acknowledged. Please kindly submit your inputs to the following email address: apfm@wmo.int under Subject: *"Communitiy-Based Flood Management"*.

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1 INTRODUCTION

1 Community participation has been – at least in principle – for more than 30 years at the core of any development policy and emergency intervention involving people, based on the assumption that a "top-down" approach is not adequate for its implementation. Both development policy and emergency intervention should be coupled by a grassroots or bottom-up approach (see **Chapter 2**). This is also true in any policy/intervention in flood management. It is an important step towards enabling communities to be recognized as active actors in this context and to help themselves in this regard and sustain those efforts. It is a process whereby the communities concerned function and contribute to perform a predetermined activity as a cohesive group, while recognizing and enhancing the differences within them.

2 Each year, there are 50–300 inland floods worldwide, impacting an estimated 520 million people and causing as many as 25 000 deaths (Gore, 2010). The worst natural floods in history, in terms of loss of life, have been those along Chinese rivers: the Yellow River has killed more people than any other natural phenomenon (between 2.5 and 3.7 million in 1931; between 0.9 and 2 million in 1887; and between 0.5 and 0.8 million in 1938). Over the past 4 000 years, it has flooded 1 593 times (Allin et al., 2010).

3 The worst recent natural floods were the Tamil Nadu floods in India in 2015 (more than 400 deaths); the Kashmir region floods in 2014, meaning 400–500 deaths in India and Pakistan (Burke et al.,2014); the Balkans floods in Serbia, Bosnia and Herzegovina and eastern Croatia in 2014 (almost 100 deaths); and the northern India floods in 2013 (5 700 deaths, while damage to bridges and roads left almost 73 000 people trapped in various places, according to UN-SPIDER (2013); the Greater La Plata floods (Argentina) in 2013 (almost 100 deaths); the Krymsk flood in the Russian Federation in 2012 (almost 200 deaths), the floods in the Democratic Republic of Korea in 2012 (more than 200 deaths), the Nigeria floods in 2012 (almost 100 deaths); the South-East Asian floods in 2011 (1 800 deaths); Tropical Storm Washy floods in the Philippines in 2011 (1 300 deaths); and the Rio de Janeiro floods in Brazil in 2011 (900 deaths).

4 There are two ways to protect lives and properties from flooding:

- Keep floodwater away from people (mainly through structural measures);
- Keep people away from floodwater (mainly through non-structural measures).

5 Structural measures are physical constructions to reduce or avoid possible impacts of floods or the application of engineering techniques to achieve hazard-resistance and resilience in structures or systems. Common structural measures for disaster risk reduction include dams, flood levies or ocean wave barriers. Non-structural measures are measures not involving physical construction that use knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness-raising, training and education. Common non-structural measures include building codes, land-use planning laws and their enforcement, research and assessment, information resources and public awareness programmes (UNISDR, 2009).

6 People can play a key role in the success of many non-structural measures such as awareness generation, popular knowledge valorisation, information dissemination, organizing people, warning and evacuation. These non-structural measures can also contribute to reducing the cost of structural measures (sometimes making them unnecessary or ensuring better monitoring of their impact), such as constructing local flood defences or contributing to design and maintenance of drainage systems.

7 People/communities are no longer seen as recipients; rather, they have become critical stakeholders who have a major role to play in the management of community flood-management programmes. Community involvement is more effective when people are fully conscious, empowered and trained. It is important, therefore, that people be provided with an opportunity to play a more active role and that the government or public officials facilitate and provide catalytic support for community-based flood-management programmes.

8 Integrated flood management **(IFM)** seeks practical approaches to maximize the net benefits from floods through related development activities within the river basin as a whole. At the same time, it aims to minimize loss of lives due to floods. Community activities provide essential opportunities for water resources development within the context of integrated water resources management **(IWRM)** and IFM. Benefits are derived at various levels of social and economic activities through agriculture activities and land-use planning[1]. Since a community is comprised of various sub-groups, these activities contribute to coordinating their interests and maximizing the benefits they derive by building consensus within the community.

9 In the frame of IFM, the sharing and exchange of data, information, knowledge and experience among experts and the general public, policymakers and managers, researchers and voluntary organizations, upstream and downstream users, all co-basin states and various institutions in a transparent manner is an essential ingredient for consensus-building and conflict management

1 Although living on a floodplain exposes its occupants to flooding, it also offers enormous advantages. The deep, fertile alluvial soil of floodplains – the result of aeons of flooding – is ideal for higher crop yields and the location provides good market access. Floodplains typically support high population densities, such as in the Netherlands and Bangladesh. Floods sustain ecosystems and the services that they provide. In Cambodia, the annual floods occurring on the floodplains of Tonle Sap Lake are of prime importance in keeping the lake one of the most productive freshwater ecosystems (in terms of fish catch) worldwide. This high productivity contributes significantly to regional food security (WMO, 2011b).

and for the implementation of a chosen strategy. Moreover, transboundary sharing and exchange of flood information is essential for implementation of flood-preparedness plans in downstream regions (Cap-Net UNDP, 2009).

10 Engaging the community throughout the project cycle of flood management (assessment, design, implementation, monitoring and evaluation) is also a prerequisite to ensuring that the measures undertaken are equitable and effective and that the needs and priorities of the entire affected population are met in the long term (Oluseyi et al., 2011). Hence, community participation becomes essential for each stage of flood management, i.e. prevention of, preparedness for, response to and recovery from, flood disasters.

11 The impact of floods on a community is based, among other things, on the historical experience and traditional backgrounds and features of communities. Communities are usually composed of many societal actors more or less firmly bonded to each other and which pursue interests more or less differentiated. We can find cohesive communities, but also cohesive groups inside non-cohesive communities (even with levels of conflict more or less high inside). In the absence of organized community participation (even at the level of specific groups), most of the activities are carried out at individual or household level, driven by individual necessity.

12 If we meet specific active groups in a non-cohesive community, most of the activities will be driven by groups' necessities (maybe in conflict). In both cases, such activities have limited effectiveness and are insufficient in the long run to protect individuals and the community at large from adverse impacts of floods. On the other hand, if activities based on individual/group initiatives are pooled together (seeking convergences and mitigating any conflicts) and carried out in an organized manner at community level, vulnerability and risks arising from floods can be substantially reduced (WMO, 2004).

13 Community activities to enhance participation are based on five factors:

- The community's features;
- The community's needs;
- Effectiveness and efficiency of activities;
- Practicability of implementation;
- Building local social capital.

14 Recognizing and improving organization or organizing directly effective community participation for flood management can occur in many ways. This Tool provides general and specific guidelines to organize/strengthen activities effectively to ensure community participation at various levels of decision-making within the framework of IFM. It is intended to address local leaders and disaster managers on how to organize/valorize people's participation/community activities and strengthen flood management at the local level. Several issues are also covered in order to facilitate the creation of the institutional frameworks necessary to enhance community participation (and/or to valorize existing networks). These are mostly related to the engagement of flood managers, non-governmental organizations (NGOs) and civil society in its broader sense, entrepreneurs, and policymakers in harmonizing community activities with other development and natural disaster policies.

15 The Tool is divided into three parts:

- People/community structure and participation;
- Organizing community participation;
- Conclusion and recommendations.

16 The Tool presents community participation in sequential order of the disaster risk reduction cycle, which includes prevention or mitigation as well as preparedness for, response to, and recovery from, flood disasters (see **Figure 1**).

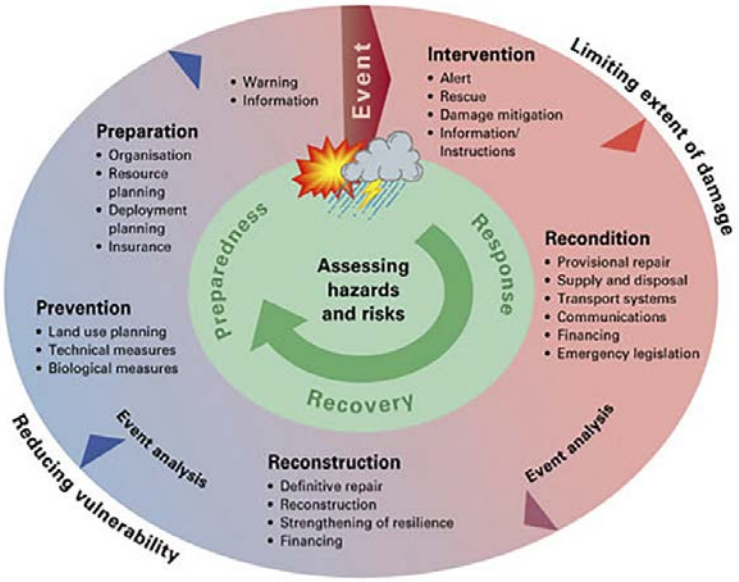

Figure 1 — Risk management stages (FOCP, 2003)

17 **Chapter 2** – People/community structure and participation – provides the background information required to valorize societal actors and organize effective community participation. Various natural, socioeconomic and institutional factors help to understand a community's vulnerability to flood and the basic needs involved, as well as the necessity for community activities and local-level institutions.

18 **Chapter 3** – Organizing/strengthening community participation – discusses the various steps to be taken towards the organization of community-based activities in flood management. Pragmatic approaches for resource maximization, participation and involvement, motivation for community participation, conflict mitigation, institutional linkages and adaptation to climate change are documented, together with the steps necessary for implementation.

19 **Chapter 4** – Conclusions and recommendations – documents issues related to sustainability and continuous improvement of community participation.

20 Additionally, case studies related to community participation are listed in **Annex IV** for further reference.

2 PEOPLE/COMMUNITY STRUCTURE AND PARTICIPATION

21 Several factors determine the actual participation of people and need to be considered before initiating any community activities (first of all, we need to understand who comprise the community and what their participation is). Strategies for involving communities in flood-management activities depend on the natural characteristics of the floods, socioeconomic conditions and institutional set-up. It is useful to understand these factors because they clarify the relationships between flood and communities.

22 According to the Oxford dictionary, a *"community"* is a group of people living in the same place or having a particular characteristic in common. From a territorial point of view, a community corresponds to people living in a given territorial area. From a societal point of view, however, the "community" leaving in a territorial area may probably correspond to many different communities with cultural and/or differences among them. Taking the example of New York, between its city boundaries we can find many different communities (Italians, Polish, Greeks, Chinese, Puerto Ricans, etc.). If we wish to involve and/or encourage people to participate/be active in social and environmental policies, we have, of course, to take into account a given territorial area, but we cannot adopt a "unitary" approach about people who live there. We have to involve not one community, but many (many societal groups/actors) with features that could be highly diversified and thus our approach should be diversified (at least in principle, taking into account also the level of social cohesion vs. conflicts among these groups).

23 Since the 1970s in the international/development community we have been dealing with participatory approaches (before, the approaches were almost all top-down, but, taking into account the limited impacts thereof, bilateral donors and international organizations began to couple top-down approaches and structural interventions with more or less actual participatory measures and non-structural actions). However, as stated in (FAO, 2003), *"the transformation from an authoritarian and technocratic approach of management style to a participatory and inclusive working style is*

not easy nor it is straightforward. In most cases there is good will on all sides to try to make this change work. However, what is often lacking is the necessary skills to make a change in attitudes and approaches possible".

24 Participatory approaches are a product of long-lasting interaction between researchers, development workers, government agents and local populations. The history of participatory methods in development co-operation began in the late 1970s with the introduction of a new research approach called rapid rural appraisal **(RRA)**, which immediately became popular with decision-makers in development agencies. Building on close collaboration with local populations, RRAs were designed to collect first-hand data from the local people about their perceptions of their local environment and living conditions in rural areas. RRAs were usually conducted as 1–3 day workshops with villagers in the field and facilitated by small teams of RRA specialists or researchers. The methods were specifically adapted to respond to local conditions. Thus, communication processes with illiterate persons not used to communication in abstract terms were carefully considered. Visualization, using locally comprehensible symbols and tools like mapping, diagramming and ranking, were introduced. A limitation of RRA, however, was that the role of the local people was limited to providing information, while the power of decision-making about the use of this information remained in the hands of others.

25 During the 1980s, NGOs operating at grassroots level used RRA to come up with further fine-tuned approaches known as participatory rural appraisals **(PRAs)**. PRAs use similar methods and tools as RRA, but the underlying philosophy and purpose changed. While RRAs aim at extracting information, often in a single event, PRAs were designed to follow more the concerns and interests of the people; PRA workshops were usually facilitated by a team of trained persons and could take several days (3–6). One of the most important PRA principles was the sharing of results of analysis, decisions and planning efforts among the community members by open and public presentation during meetings. PRAs strongly supported and facilitated the introduction of more demand-responsive ways of managing development interaction, and process-oriented thinking. The latter led to sequential applications of PRA events and assisted follow-up. Thus it built up rural people's capacities for analyzing their circumstances, their potential and their problems in order to actively decide on changes. PRA facilitators accepted more and more the role of learners. These shifts towards interactive mutual learning were then reflected in the new terminology of participatory learning and action **(PLA)** in the early 1990s.

26 Since the beginning of the 1990s, extended concepts of participatory processes and interaction have been developed, summarized under the name participatory and integrated development **(PID)**. In order to overcome the casual application of participatory methods here and there, PID seeks to include workshops and their results in a broader, long-term frame of institutionalized activities. PID means offering facilitation support to locals (such as villages, communities, interest groups, associations, etc.) on a demand-responsive basis, and assisting them in having their interests represented. One example is achieving the integration of grassroots-level planning and action into local and regional planning approaches. This leads to a more sustainable and better coordinated development process. In addition to this vertical integration, PID also tries to enhance horizontal integration – the collaboration of different agencies, sector organizations and different groups of stakeholders within a region (UNDP, 2012).

27 A real participatory approach starts from recognizing how people already participate or try to participate (it is rare that this phenomenon is completely absent while public officials and technicians sometimes "try" to teach people what "participation" is without recognizing

the societal participatory processes already underway) and understanding how facilitating, orienting, strengthening this process, adopting, in this way, a real bottom-up approach. Some features could be the following: sharing in decision-making and representation of all the community's groups, (especially women, the disabled, elderly, minorities, etc.), cross-disciplinary collaboration, regular consultations, public hearings, transparency of decisions and actions, getting to know the opinion of people before, during and after actions have been implemented, discarding coercion in human relations, sharing management of the project with beneficiaries (FAO, 2003; WMO, 2006).

2.1 Natural factors affecting people's participation

28 Natural factors that affect the ways that communities perceive and respond to flood risks can be described in terms of the mechanisms, hydraulic and hydrological characteristics of flood hazards, as well as magnitude (scale, duration, intensity) and frequency of flooding. Although floods are usually perceived as destructive natural events (loss of life and property, loss of livelihoods, decreased purchasing and production power, hindering economic growth and development, mass migration, psychosocial effects, etc.), they bring, in many cases, benefits to the communities living on a flood plain (WMO, 2006).

29 These benefits include recharging groundwater, making soil more fertile, creating a breeding ground for fish and flushing out contaminants and pollutants. In particular, freshwater floods play an important role in rejuvenating ecosystems in river basins and are a key factor in maintaining floodplain biodiversity, increasing biomass and improving fisheries and agriculture (WMO, 2006). Ancient communities flourished from periodic floods along the Tigris and Euphrates, the Nile, the Indus River, the Ganges and the Yellow River, among others.

30 An example is the Tonlé Sap River in Cambodia, which connects the Tonlé Sap Lake with the Mekong River. For most of the year, the Tonlé Sap Lake is fairly small, around one metre deep and with an area of 2 500 km^2. During the monsoon season, however, the flow reverses. Water is pushed up from the Mekong River into the lake, increasing its area to 13 000 km^2 and its depth to up to 10 m, flooding adjacent fields and forests. The floodplain provides a prolific breeding ground for fish (MRC, 2003). Communities in this basin benefit annually from these floodwaters, thanks to increased agricultural and fisheries' production.

31 Both the negative and positive impacts of floods influence the lifestyle of communities. In many flood-prone areas across the globe, people have adopted a lifestyle of *"living with floods"*. Communities experiencing regular flood risks are more sensitive to flood than those in areas with a lesser frequency. The understanding of such natural factors is thus essential for organizing community participation in flood-management activities.

2.1.1 Riverine floods

32 Riverine flooding occurs when the volume of water in a river exceeds the natural/normal riverbank level. The rising water level may be caused by prolonged seasonal precipitation of low to high intensity of rainfall, seasonal snow and glacial melt (WMO, 2012). Riverine flooding is normally the result of a combination of meteorological and hydrological factors. The scale,

frequency, intensity and duration of floods generally depend on hydrometeorological events, characteristics of the catchment and the capacity of natural drainage facilities.

33 Changes in river basin characteristics alter the magnitude of floods. Clearing forest or changing farmland to urban areas can cause runoff to increase and consequently increase the magnitude of flooding. On the contrary, constructing flood-control dams, levees and floodwalls along rivers can reduce the magnitude of floods downstream by storing storm runoff upstream and confining flow within a designated river channel. The communities living on the Kiso River basin in Japan have formulated community-based dykes (wa-ju) before developing major projects and dams along the river channel. Traditional lifestyle in the region is accustomed to frequent floods (see **Figure 2**).

Figure 2 — Wa-ju dikes and traditional lifestyle in the Kiso River basin (MLIT, 2006b)

2.1.2 Flash floods

34 Flash floods are associated with intense storms that release large volumes of rainwater into small drainage basins in a relatively short period of time, carrying deadly rocks, trees and other debris (ODLCD, 2000). The American Meteorological Society defines a flash flood as a *"flood that rises and falls quite rapidly with little or no advance warning, usually as the result of intense rainfall over a relatively small area"* (UCAR, 2010).

35 Flash floods are caused by a combination of natural (topography, geology, vegetation earthquake, volcanic activity) and man-made (groundwater depletion, deforestation, dam break) factors. Major factors in flash flooding are the intensity and duration of rainfall (caused by very intense rainstorms/cloudbursts), the steepness of watershed and high stream gradients. Other causes include the failure of dams and levees, poor management of hydraulic structures, rapid melting of snow and ice, and quick release of stored glacial water. The damage caused by flash floods can be more severe than riverine floods because of the speed and high hydraulic force and erosive power with which flooding occurs, the high sediment and debris load, and short time usually available for evacuation (WMO, 2012b).

36 There are several strategies for flash flood management. Structural measures (shaping retention, regulating rivers and streams, levees, etc.) can delay the speed of surface runoff, limit erosion and mitigate the impacts of flash flood. At the same time, non-structural measures, such as

flash flood forecasting and warning systems, can reduce the exposure of areas by providing real-time and accurate information, and enabling communities to take effective actions when warned. Spatial planning is crucial to reduce the exposure of flash flood prone areas by limiting potential flood damage. Details on flash flood management are provided in WMO (2012b).

37 The efficiency of warning and response actions, however, depend on the degree of awareness and preparedness at the local level (WMO, 2012b). Awareness and preparedness at the community and household levels are essential in the case of flash floods as those events are particularly rapid and intense and require an effective community response in a very short time. For example, community activities with respect to early warning and evacuation need to be coordinated with the weather-forecasting services. In the Philippines, in the municipalities of Dinalupihan and Hermosa in Bataan Province, a flood/flash flood warning scheme was developed to mitigate the impacts of flooding, mostly caused by typhoons. The system, which is monitored by the community itself, is based on a set of staff gauges that are installed in nine river stage monitoring sites and used as reference markers for the community. Staff gauges were installed by the personnel of the Bases Conversion and Development Authority in coordination with the local government units of the two municipalities. The system encompasses hydrological monitoring, information collection, flood warning and disaster preparedness and response action, all involving community participation.

38 During rainfall and/or after the forecast of an incoming weather disturbance by the Philippine Atmospheric, Geophysical and Astronomical Services Administration, community personnel (baranguay) or volunteers read the staff gauges and report the information through radiocommunication systems or phones. When the river section being monitored has reached the designated river stage, community personnel or volunteers alert the community through locally designed warning systems (alarm or bell) (UCAR, 2010). As it is very difficult to forecast flash floods, local information is highly valuable because, through its experience, a community may have great knowledge and understanding of the flash flood process in the area (prerequisites, flooding process, expected impacts, etc.).

2.1.3 Mudflow and landslides

39 A mudflow, also called mudslide, is a flow of dirt and debris that occurs after intense rainfall or snowmelt, volcanic eruptions, earthquakes and severe wildfires. The speed of the slide depends on the amount of precipitation, steepness of slope, vibration of the ground and alternate freezing and thawing of the ground. Typically, a flow may start after a heavy rainstorm and accelerate as it proceeds. As the slide accelerates, the liquid mud picks up everything in its path, including rocks, boulders, houses, trees and cars. The flow grows, accumulating more debris before reaching a plain and causing great damage to life and property (Tucci, 2007). Heavy rain in Southern California in October 2015 triggered flash flooding and mudslides, leaving motorists stranded and forcing closures of major roads **(Figure 3)**. The National Weather Service in Los Angeles reported heavy rain and life-threatening flooding in the Antelope Valley in the vicinity of Leona Valley, Quartz Hill and West Palmdale, California. Rainfall amounts of some 10–15 cm were reported near Fremont Dam and Leona Valley (Byrne, 2015).

Figure 3 — Heavy rain caused flash flooding and mudslides in southern California, USA (Byrne, 2015)

40 Areas that experience mudslides are often more likely to suffer from recurring slides. Those who live in hazardous locations should be aware of the dangers and be prepared at both community and family levels. At the community level, they should participate in activities such as the gauging of hydrological conditions, the preparation of disaster preparedness maps indicating hazardous locations (overflows, precipice failure, debris flows, etc.), evacuation roads, refuge shelters that are safe against sediment disaster, resident-related information (disaster-vulnerable individuals such as infants, the elderly, the handicapped, etc.) and housing conditions (houses in poor condition, vacant houses, etc.).

41 Other participatory activities include, among others: disaster awareness and training for capacity-building, design of early warning systems (EWS), selection of stakeholders responsible for the delivery of warnings of sediment disasters, and so forth (WMO, 2011c). At the family level, they should be aware of the potential danger of mudflow and create a family emergency plan, including deciding the role of each family member for preparedness actions (turn off gas, call family members to inform them about mudflow warning, etc.). In the case of a disaster, the family should meet to decide which relative should be called after the event if the family needs help or accommodation. These activities are particularly important to minimize impacts of sediment-related hazards, prevent collateral damage and execute disaster response activities without delay.

2.1.4 Coastal floods

42 Coastal flooding is the inundation of normally dry, low-lying land areas adjacent to the ocean, caused by sea-water above normal tidal conditions. Such flooding can originate from different hazards, such as storm surges (whose driving forces can be either tropical or extra-tropical storms), tropical storms, extra-tropical storms, tsunamis (triggered by earthquakes), tidal floods and erosion. The extent of coastal flooding depends on many factors, including the topography of the coastal land exposed to flooding, vegetation cover, land use, embankments, etc.

43 Because of their large depths, high flow velocities and powerful waves, coastal floods can cause many human losses and property damage. Tsunamis, for example, can cause considerable damage through floating debris that becomes dangerous projectiles for people, buildings, infrastructures, etc. (WMO, 2013b). The 2004 Indian Ocean tsunami was one of the deadliest of coastal floods, killing more than 230 000 people (MRC, 2003).

44 Coastal flooding extends from the shoreline to inland tidal waterways and to the tidal portions of river mouths. It leads to much agricultural damage, especially in low-lying areas (salinity intrusion, destruction of crops/seeds stocks/livestock and infrastructures, etc.), sanitary issues

(e.g. intrusion into freshwater aquifers), environmental damage (destruction of mangrove, dunes and seagrass beds) and coastal morphology changes (WMO, 2013b).

45 People living in low-lying areas are particularly vulnerable and should be prepared for coastal flooding. Strategies include flood-proofing, embankments and revegetation. In Guyana for example, where 90% of the population lives along the coast, which falls 1.04 m below sea level, the Guyana Mangrove Restoration Project (GMRP)[2] addresses the threat of storm surges, coastal flooding and erosion by involving communities in mangrove plantation. Women, who are at higher risk from the impacts of these hazards, were selected as project beneficiaries. They make up 80% of the community participation and organize Village Mangrove Action Committees, which provide training and resources for coastal women. Training includes subjects such as climate change and the role of mangrove, mangrove-seedling cultivation, restoration and management, tour guiding, and strategies for strengthening organization, and building the capacity of communities to restore the environment while increasing economic opportunities. Between 2010 and 2013, the project enabled the planting of 460 000 black mangrove seedlings, restoring 10 km of coastal mangrove forests, hence decreasing risks of coastal flooding and erosion (Aguilar et al., 2015). Other strategies include spatial planning and building codes, further structural and non-structural measures (see **Section 2.1.3**). Details of coastal flood-risk management are provided in WMO (2013b).

2.1.5 Urban floods

46 Urban floods cause inundation of, among other things, streets, basements and buildings. Urban floods typically stem from a complex combination of causes resulting from meteorological and hydrological extremes, such as extreme precipitation and flows, and changes in land-use patterns with a high rate of surface ceiling for infiltration. Most urban floods originate from riverine floods, flash floods, coastal floods, groundwater floods and structural failures. Urban floods are also caused by human activities within a floodplain, including unplanned growth and development, or the breach of a dam or an embankment that has failed to protect planned developments. The impacts of urban floods are often exacerbated by the limited capacity of the urban drainage system. In Bangladesh, Dhaka remains flooded for several days after each severe rainfall event, mainly due to drainage congestion (Huq et al., 2003). Causes of drainage problems are multiple: unplanned urbanization, increase of built-up areas and surfaced roads which accelerate land runoff, construction in low-lying areas surrounding the city with little or no provision for drainage, the main drainage systems blocked by unauthorized constructions, solid waste disposal in the storm sewer, insufficient capacity of storm sewers and lack of maintenance of the storm-drainage system, etc. (GWP, 2011).

47 Because urban areas concentrate economic and politic assets, together with high population densities, the consequences of urban flooding can be much higher than those of rural flooding of the same duration and intensity. Urban flooding has multiple effects on human beings: risk of death, risk of contamination due to the drainage of effluence into the water system, occurrence of waterborne epidemics, electrical and industrial accidents. In addition to the direct impacts of floods, many indirect impacts are caused by the complex interactions between the natural

2 This project was developed by the Government of Guyana, Guyana Women's Leadership Institute, Guyana Office for Climate Change, and National Centre for Education, Research and Development (NCERD) and funded by the European Union.

environment and the human use of resources in urban areas. These include prolonged disruption of business, loss of employment and increased costs of production (Tucci, 2007).

48 Due to high population density, wide variation in social groups and the dynamic nature of the population in urban areas, mobilizing community participation in such areas is a challenging task and needs extra effort to ensure true representation and participation of affected communities. The challenge is particularly high in informal settlements which are among the most vulnerable to flood-related risks, being often located on steep slopes prone to flash floods and erosion, in dwellings built of substandard materials, with poor water- and waste-disposal systems (WMO, 2012).

2.2 Social, economic and geographical factors affecting people participation

49 A flood event can cause the loss of millions of dollars' worth property and pose a significant threat to human life and safety. The flooding impacts on businesses, people, public sector and infrastructure (such as roads consistency and bridges) are usually significant. It also causes serious deterioration of the surrounding environment and ecosystem. Such impacts have a great influence on the social and economic welfare of people. Incidences of flood disaster further aggravate existing segregation in societies and vulnerabilities of individuals or groups and greatly influence community willingness and capacity to participate in flood-risk management.

50 The following four elements help to clarify the context in which floods could have an impact (Abarquez et al., 2004):

- Social structure (ethnic, class, religion, language, majority and minority groups);
- Cultural arrangements (family and cultural structure, hierarchy, common behaviour, cultural beliefs and practices);
- Socioeconomic well-being (sources of livelihood, seasonal and otherwise, employment and labour, the quality of public service facilities and housing, agricultural productivity, relevance of weak groups);
- Spatial characteristics (location of housing, public service facilities, agricultural land).

51 A real participation of communities is, of course, influenced by the social and economic features (often, as already mentioned, highly diversified) of their members. Poverty, education, access to social services, livelihood profile, cultural beliefs, status of weaker social groups and the rights of minority and ethnic groups are some of the influential socioeconomic factors in community participation. Understanding these factors is necessary to achieve true participation in flood-management activities (WMO, 2006).

52 These factors also define vulnerability to floods and coping capacities of the community, coupling negative aspects (constraints related to people's exposition and stress and to the weakness of their socioeconomic conditions); and positive aspects such as the strengths related to their capacity of adaptation) (IPCC, 2007; Quinti, 2015). Vulnerability can indeed be considered as a set of prevailing or consequential conditions which characterize the ability of the people/community to prevent, mitigate, prepare for, respond to and recover from, flood hazard events. These

long-term factors affect the ability (or inability) of communities or societies to absorb losses after disasters and recover from the resulting damage. The vulnerability of a community is characterized by two interacting forces: the external force, which is exposure to shock, stress and risk; and the internal force, which is defencelessness (a lack of means to cope with, or be resilient[3] to, flood disaster) and, on the contrary, strengths.

53 Several studies report that community connectedness (especially social capital) is a positive critical factor in the ability of a community (societal actors) to recover after a disaster (Colleta et al., 2000; Dufty, 2013). Social capital can be defined as the *"networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit"* (Putnam, 1995)[4]. Both the 2004 Indian Ocean tsunami and Hurricane Katrina demonstrated the usefulness of a high level of social capital in providing resources for a faster and more efficient recovery. Some recent post-flood evaluations conducted in Victoria, Australia, also indicated the importance of social capital in flood response and recovery. Research by the Victorian Department of Planning and Community Development has shown the need for social capital formation in building general community resilience (Buckland et al., 1999)[5].

54 Individuals' perception of the potential for future flooding is influenced by their previous experience of floods. In particular, elders have the longest historical memory and can remember, better than other members of the community (newcomers, young people, etc.), flood characteristics which struck the territory or which they experienced in the past. They have a higher perception and awareness than those with no such experience (WMO, 2017). While collective understanding of the risks is often inadequate in communities where harsh events are comparatively less frequent, much higher levels of awareness and understanding are evident where events are more frequent. Gaining experience is a lengthy process that also involves cultural adaptation.

55 The disparity in education, wealth, gender, age, culture or scientific/technical knowledge should be taken into account for the success of community activities in the prevention and management of natural hazards (such as flood), valorizing actors who could better contribute (thus increasing the community's resilience as much as possible with minor efforts), without

3 According to the United States Agency for International Development (USAID), *"resilience is the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth"*.

4 Social capital can be also defined as the ability to take social initiative (for generating economic growth too). Four relational dimensions should be considered: integration, linkages, organizational integrity and synergy. Various aspects can be considered, *"such as exchange, the presence of associations and groups, intermarriage and extended family relations, conflict-management mechanisms, trust and collective responsibility towards vulnerable groups (…) Both vertical and horizontal; defensive and offensive relations should be considered. The analysis of social capital allows, among others, to illustrate how civil society (and other societal actors) operate in conjunction with the state by either substituting for, or complementing government action"* (Colleta et al., 2000). This book was prepared on the basis of a large survey on social capital implemented by the World Bank with the Centre de Recherche et de Formation en Eco-éthologie (CERFE).

5 An important factor in resilient communities are strong networks and social capital. Social capital refers to the quality of relationships between members of a community. The benefits of social capital become evident when communities have to deal with adversity, conflict or change. Communities with high levels of social capital will be better able to manage difficulties than communities with low levels of social capital. This is most likely due to these communities having higher levels of trust, cooperation and tolerance. There is no single way to develop resilience and social capital. Each community needs to look at its particular issues, requirements and capacity and determine the best approach. Social capital can be built through a variety of groups in the community, including families, schools and other educational institutions, clubs and businesses. Communities also need to consider the impact that government policies may have on their community and programmes need to be sensitive to the needs and capabilities of the community or group they plan to support (Drug Info, 2007).

forgetting to build the capacity of less visible/active stakeholders (women, elders, remote people, handicapped, minorities, etc.), involving them also in community activities. Moreover, it should be considered that lack of cohesion/high level of conflict have adverse effects. It is not mere coincidence that successful outcomes from community activities are seen mostly in peaceful/cohesive societies.

56 The following social and economic factors are described below in the context of organizing community activities:

- Ethnicity (and religion)
- Poverty
- Marginal areas
- Gender
- Elders
- Migrants and refugees
- Disabled people and other disadvantaged groups
- Indigenous knowledge

2.2.1 Ethnicity (and religion)

57 Ethnic pluralism is a common phenomenon and ethnicity can be considered when organizing and empowering ethnic groups to make their own contributions and claims with respect to flood management. Perceptions of flood risk and community participation have a cultural dimension and hence differ broadly between communities. There is a distinct relationship between ethnic homogeneity and social capital, mainly in terms of trust and participation.

58 Ethnic minority groups are often perceived as difficult groups to engage with. Certainly, they deserve special attention as they have usually been marginalized and discriminated against (Alesina et al., 2000; Yasminah, 2006). Individuals living in areas segregated by race, caste or religion often participate less. Ethnically diverse localities are generally poor in networking among different groups and low in participation (Johnson, et. al., 2003; Knack et al., 1997).

59 Similar considerations are valid in societies characterized by religious minority groups and social tensions originated by differences in religious beliefs.

60 Research indicates that ethnically diverse societies have slower economic growth and are more prone to conflict and political instability than ethnically homogeneous societies, as a result of lack of cooperation across ethnic groups. In cross-country work, Mauro (1995) finds that ethnic diversity is significantly related to poor bureaucratic performance and political instability, and Knack et al. (1997) find that *"low social capital reduces growth"*. In this context, participation of communities may be hindered because of low socioeconomic conditions and political instability.

61 It is also critical to understand how other groups at risk (including women, the elderly, children and the disabled) are involved in community activities.

2.2.2 Poverty

62 There is a strong correlation between poverty, unequal distribution of resources and exposure to risks. People living in extreme poverty are less likely to join groups (the extremely poor, in addition to lack of resources, are characterized by a lack of identity and both imply a lack of agency (see Quaranta et al., 2004); but this is not usually true for those who are not extremely poor) and makes organizing community activities more difficult. This means that eradication/alleviation of extreme poverty as part of a flood management strategy is necessary for the successful community/people participation in flood-management activities. Generally, moreover, poorer sections of society are more vulnerable by virtue of their low coping capacities and because they live closer to vulnerable areas on hillsides and near riverbanks (IISD/IUCN/SEI-B, 2003).

63 The same situation can characterize people belonging to the lower castes, where a similar system remains significant.

64 Lack of skills, resources, literacy, knowledge, levels of empowerment and social exclusion are among the underlying inequalities that can present a barrier against the participation in decision-making for people living in poverty. This can result in an imbalance in participatory structures and processes. In addition, most poor people are renters (official or unofficial) and not owners. They pay generally less attention to flood risks as they prefer not to invest in resilience measures in a house/property of which they are not the owner, especially when they are threatened with expulsion. Owners tend to pay more attention to flood risks (WMO, 2017), but not when they don't live in the house/property at risk and they are not directly exposed to flooding. In that case, renters of the house at risk are particularly vulnerable and must be prepared for an emergency. Building the capacity of people experiencing poverty is key to overcoming some of the barriers to participation.

65 Poverty should be considered not only as a status but also as a dynamic process. In a territorial community, we can meet people who are not poor but suffer an impoverishment process (or social exclusion process) related to unemployment, lack of access of social services, lack of security, forms of institutional disorder, forms of discrimination, etc. On the other hand, we can meet people who, thanks to their agency (i.e. the orientation of individuals and organizations towards action, which is manifested in intentionality, plans, lifestyles or forms of social mobilization (Quaranta et al., 1996) and thanks to empowerment actions (through access to micro-credit, capacity-building, etc.) gradually emerge from a status of poverty (Quaranta et al., 2004).

2.2.3 Marginal areas

66 Marginal areas, such as informal settlements and remote locations, are often populated by economically disadvantaged groups and social vulnerable groups (minorities, ethnic groups, etc.). These groups may be particularly vulnerable to flood because of factors which might include: the spatial localization (e.g. near riverbanks), the underdevelopment of basic infrastructures and facilities, the degradation of the environment, the lack of hazard knowledge and/or fatalistic attitudes regarding flood. Development in marginal areas mostly occurs in an unorganized and dispersed manner, which disturbs community participation and social networks. Marginal areas sometimes also face the problem of emigrating populations, undermining the development of community activities. In addition, government authorities are often reluctant to support marginalized areas because of their limited political power and their inefficient yield of public

expenditure. Such conditions can disturb community organization and the development of preparedness/mitigation measures at the local level (WMO, 2011). Involving communities living in marginal areas in flood-management activities is therefore crucial to increase their resilience, strengthen their representation and participation in decision-making.

2.2.4 Gender

67 Even when men and women undergo the same disasters, the consequences they bear are not similar. Women are often disproportionately affected as a result of economic and social dislocation of the household, as well as cultural and physical/psychological differences. They deal not only with the economic devastation and disruption of livelihood systems but are also left to cope with the social and emotional disorders that come from dealing with death, disease and food shortages, problems in maintaining personal hygiene and sanitation, fear of gender-based violence while living in camps and so forth that often occur in the aftermath of floods (Hussein et al., 2006). Moreover, the gender disparity in decision-making authority in homes has a negative impact on the participation of women (the social, economic and cultural aspects within a society often limit their participation in decision-making, even within their homes). This has a negative impact on the participation of women in flood-management activities. Social prejudice impacts the way women and girls can survive disasters. When the tsunami of December 2004 hit Sri Lanka, men were more able to survive because they know how to swim and climb trees – activities which are mainly encouraged in boys (Oxfam International, 2005).

68 Women are also more sensitive to natural and human risks due to their higher capacity to understand the social and economic impacts and their deeper awareness of societal, micro-economic and environmental aspects of everyday life affecting them and their families. Women have skills that can make them "keys to hazard prevention". In many societies, they manage and use natural resources on a daily basis and can draw on survival in emergencies, such as food preservation. In addition, they are often important "risk communicators" as they have a central role in the family (looking after children, the elderly, etc.) and have strong social networks within the community. Those networks provide them with information about the people in the community who are in need or who can help in emergencies. Women are also more likely than men to pay attention to emergency warnings and are more safety-conscious. They have informal physical and mental health-care skills and experience and often formal/informal employment specialization that is important for disaster preparedness, response and recovery (health care, teaching, counselling, etc.) (ICIMOD, 2007). Women are often more resilient than men and this can have a positive impact on the participation of women in flood-management activities.

69 On the one hand, therefore, women are more affected by floods (as well as from other "disasters") and suffer from exclusion processes; on the other, they are more sensitive and more likely to participate. Wasting the potential of women, both as human resources and holders of knowledge, should not only be avoided but, on the contrary, enhanced.

70 Women's organizations involved in community networking can be of great help in addressing this issue. They are mostly successful in resolving gender-disparity issues with respect to safety and self-protection when working at the neighbourhood or family level (UNDESA, 2010). Women's voluntary work behind the scenes helps organize people for social change in many – especially flood-prone – communities (Enarson et al., 2003). Many women-led organizations around the world show the potential of women in flood preparedness, response and recovery.

In the Philippines, for example, in 2013, DAMPA **(Damayan ng Maralitang Philipinong Api)**, a network of 235 community-based organizations **(CBOs)** led by women, supplied water to informal settlements, monitored health service delivery in areas affected by Typhoon Haiyan and secured, in coordination with the local government, the resettlement housing of some 380 displaced families (World Bank, 2015).

71 Lastly, there is a need to remember that gender issues (such as those mentioned above) differ widely according to the different geographical contexts. Also, it has to be remembered that gender issues might also include LGBT **(Lesbian, Gay, Bisexual, and Transgender)** issues. This particularly reflects in social context where LGBT tend to have the least access to voice and representation in society.

2.2.5 Elders

72 The status of elders is ambiguous. On the one hand, elders are more affected by a natural disaster. After a disaster, many lose their homes because they lack the appropriate documentation for their property (either it has been lost during the disaster or it was not been required when their families settled on the land) (HelpAge, 2005). Like women, elders deal not only with the economic devastation and disruption of livelihood systems but are also left to cope with the social and emotional disorders that come from dealing with death, disease, food shortages and problems in maintaining personal hygiene and sanitation. This has a negative impact on the participation of elders in flood-management activities. Moreover, elders often live among people with a lower level of education and could represent a "burden" in any activity related to flood management.

73 On the other hand, elders often hold the better "historical memory" within a community, which may also include past floods, their consequences and management. Thus, their knowledge can be more than valuable and should be passed down to younger members of the community. Moreover, elders can hold a real decision-making power within a community and have a key role in restoring/maintaining the social network (HelpAge, 2005). Elders can therefore play a positive role in the active participation of citizens/actors for flood management: as with women, wasting their potential as both human resources and holders of knowledge should not only be avoided but, on the contrary, enhanced. As with women, also, the status of elders differs widely, according to the different geographical contexts.

74 Migrants and refugees

75 Migrants and refugees are often people who, on the one hand, lack access to land, housing and vital services and also suffer from livelihood pressure as they face the day-to-day insecurity of work and finances. More particularly, they can suffer from social exclusion processes, worsened by a minor knowledge of the territory where they now live. On the other hand, certain migrants and/or refugees can be the bearers of relevant knowledge and practices, useful in their present context if they came from areas more prone to floods and/or characterized by more advanced forms of citizens' participation in the prevention and management of floods and/or other natural hazards. Moreover, it should be underlined that an important percentage of migrant and refugees are either qualified or highly qualified (CERFE/OIM/FH2-MRE/CERED, 2009).

76 In dealing with community participation, special attention should be given to migrants and refugees to ensure they have equal conditions for realizing their full human rights and potential to contribute to national, political, economic, social and cultural development in general and flood management in particular, and to benefit from the results thereof (ILO, 2003). As noted with elders and women, wasting their potential as possible holders of knowledge should not only be avoided but, on the contrary, enhanced.

2.2.6 Disabled people and other disadvantaged groups

77 People who suffer disadvantages because of their disability, weakness related to their health status (e.g. infected with human immunodeficiency virus) tend to have the least access to voice and representation in society. Natural disasters like flood may further segregate these socially excluded actors from mainstream communities. These people are also likely to be least able to contribute to, and benefit from, flood-risk management and development activities, while they need specific support and face extra challenges during emergency times related to their disabilities or living environment (Handicap International, 2005).

78 In dealing with community participation, special attention should be given to socially excluded people (ILO, 2003). In particular, focus should be on their own safety in the case of flood (assessment of their particular needs for assistance and resources before, during and after the flood, including electricity-dependent and personal care equipment, transportation and evacuation means; awareness and training of rescue teams on disability issues, etc.) and their participation in community activities related to flood management (awareness and training, design of community EWS and community contingency planning, so they can help ensure methods are appropriate to meet their needs (Handicap International, 2005).

2.2.7 Indigenous knowledge

79 Indigenous knowledge is the set of traditionally practised coping strategies that have helped many communities survive natural calamities for centuries. People living in flood-prone areas have been utilizing indigenous knowledge to cope with flood disasters for hundreds of years. There are many examples of communities that have adapted their way of life to cope with floods whilst deriving economic and social gain.

80 There are many indigenous coping mechanisms practised in flood-prone areas. In Bangladesh, for example, communities raise the plinths of houses and cattle sheds and install toilets on raised ground in case of flooding during the wet season (see **Figure 4**). They also repair and strengthen houses by using strong bamboo or other wooden planks, make the thatched walls of their houses stronger, plant trees around their houses to protect from soil erosion and store emergency provisions for survival such as dry food, fodder, seeds, firewood and portable earthen stoves. Such local practices represent sound principles of interaction between humans and nature (Mallick et al., 2008). Other indigenous coping mechanisms include use of rafts. Indeed, it is quite common for people to use rafts made of banana-tree trunks for displacement, including over inundated roads **(Figure 5)** and floating cultivation for fast growing vegetables/agricultural produce **(Figure 6)**, with the whole cycle of planting and cropping linked to the rise and fall of rivers.

Figure 4 — Examples of a toilet and houses built on a platform raised above flood level in Bangladesh (Mallick et al., 2008)

Figure 5 — Banana-tree trunk raft for commuting (DH, 2016)

Figure 6 — Floating cultivation in floodwater (Practical Action, 2006)

81 Indigenous communities living in flood-prone areas extensively use their traditional knowledge for forecasting floods and other natural disasters. While many people were attracted to the shoreline because of the unusual retreat of the sea and fish flopping just before the 26 December 2004 tsunami struck Thailand, India and Indonesia, the Moken and Urok Lawai peoples of Thailand's coasts and islands, Ong of India's Andaman Islands and the Simeulue community of Indonesia, escaped unscathed. More than 80 000 Simeulue people evacuated

to beyond the reach of the tsunami. They recognized the signs and knew they had to escape rapidly inland and to higher ground (Elias et al., 2005).

82 In the same way, in Nigeria, the movement of *Sabutu or lagbaja* (a variety of crab) is taken as a signal of impending floods. When crabs migrate from brackish water towards the sea, it is a sign of a "rain flood" (warm flood) and, when the crabs move from the sea towards the creeks, it is taken as a sign of a "cold" flood (ocean flood) (Oluseyi et al., 2011). Similarly, in India, the unusual behaviour of animals, such as birds and hens climbing to higher places, ants, frogs and snakes coming out from their natural habitations and birds crawling in an unusual manner, is used as a sign of impending floods or other natural calamities (WMO, 2004).

83 This indigenous (or popular) knowledge is vital to flood management in many ways.

Box 1 — The value of popular knowledge: the Vajont disaster

Figure 7 — The Vajont Dam after the landslide occurred in October 1963 (CFBR, 2012)

One example to highlight the importance of popular knowledge dates back to the disaster of Vajont, a dam for hydroelectric energy production located in the Dolomites (Italy). *"At 22:39 GMT on 9 October 1963, a landslide dropped 260 million cubic metres of soil and rock into the reservoir, built three years previously, at a velocity in excess of 90 km/h. The landslide swept away electric power supply lines, plunging Longarone (a village located over a kilometre and a half downstream from the dam) into darkness. Two waves of 25 million cubic metres each overtopped the dam and rushed downstream. The mass of water destroyed the towns of Longarone, Pirago, Rivalta, Villanova and Faè and hit many other small villages nearby (Castellavazzo, Erto and Casso). It is estimated that the mega tsunami killed some 1 900 people. The dam was virtually unharmed."* (Aria, 2010)

Yet the local population knew full well that the area where the dam was built was prone to landslides: the mountain proved to be the source of the landslide was called "Toc" (onomatopoeic for the sound of a rock falling), which means "rotten" in the local dialect. Despite this element (and the fact that scientific studies of the site's geology confirmed what the inhabitants had known for generations), no attention was paid to popular knowledge and work proceeded with the development of the project called "Grande Vajont".

(WMO, 2017)

84 Increasing floods and flood-affected communities, despite the implementation of flood-management practices clearly indicates a gap between practice and policy. Using the information from the domain of indigenous knowledge and local coping capacities, this gap can be bridged, offering not only better flood management (reducing, among others, the costs), but also strengthened participation of the communities.

2.3 Institutional factors affecting community participation

2.3.1 The role of local-level institutions

85 In light of the socioeconomic factors explained earlier, the capacity of people to participate in activities related to flood preparedness, response and recovery varies widely within the community. Certain groups, because of poverty, ethnicity, religion, gender, age or disability issues, lack representation for their specific needs and are excluded from decision-making. Nevertheless, their participation remains crucial to ensure that planning and activities are appropriate enough with vulnerable groups' needs, to benefit from their knowledge and experience and more generally to strengthen their integration within the community. Local-level institutions act precisely as a significant means of expression and representation of those groups.

86 Community institutions are the main vehicles for carrying out community-based flood-management activities. The structure and territorial coverage of such institutions vary from one community to another. Mostly, they are comprised of multiple officers with a division of roles and responsibilities (chairperson, secretary and treasurer are among the common types of officers in a community-based flood risk management committee)[6]. Depending upon the needs and capabilities of the community, they coordinate the participation of community members and foster flood-preparedness. They also devise and implement flood responses, community trust-fund management (including common stockpiling of emergency response tools and supplies) and wider community resilience programmes or community-development initiatives (WMO, 2005).

87 Community institutions aim to facilitate dialogue and negotiations between various stakeholders (WMO, 2006). They act as intermediaries between communities and local, regional and national authorities, and between communities and external development agencies and implementing organizations (such as national or international NGOs). The following are prominent examples of institutions that may exist in a community (Haider, 2009):

- **Association:** a group of people, frequently from differing family groups, who work together for a common purpose and have a visible identity mainly through a specific sector (such as farmers', youth, widows' and parent-teacher associations). Associations facilitate self-help, mutual help, solidarity and cooperation. They usually have clearly delineated structures, roles and rules within which group members operate. For instance, the Karalee community association plays a vital role in helping flood-affected residents fill in the forms required to

6 A community-based flood risk management committee helps to increase the effectiveness of community-based flood early warning system (FEWS – see **Chapter 3**). In 2013, these committees were installed in five community-based flood early warning systems in the Singora and Jiadhal rivers (India). The system installed in the Singora River sends flood-warning signals to 20 flood-vulnerable villages downstream; more than 25 villages receive warnings from the system installed in the Jiadhal River (ICIMOD, 2014)

apply for assistance after surveying homes and property completely flooded in the area of Queensland, Australia (floods are frequent in that area according to QT, 2016). Associations are established to operate and maintain a facility constructed with public and/or private funds, with resources mobilized from members of the Association.

- **Cooperative:** an autonomous, voluntary association of people who work together for mutual economic, social or cultural benefits through a jointly owned and democratically controlled enterprise.
- **Civic organization:** a type of organization whose official goal is to improve neighbourhoods through volunteer work by its members (such as the community-based flood-risk management committees mentioned above). Among civic organizations, common interest groups comprise members of the community that come together to achieve a common purpose.
- **River basin organization (RBO):** an organization that aims at ensuring coordination among various government institutions at the national, state, district and local levels. It provides an interface between different stakeholders to share the benefits and concerns related to the basin; ensures enhanced stakeholder participation in planning, implementation and evaluation of activities; and facilitates sharing of information and knowledge and capacity-building of key stakeholders, without overlapping administrative and community governance structures (WMO, 2006). There are many types: basin commissions, basin directorates, basin associations or councils and corporations. Within transboundary watercourses, RBOs are established to promote cooperation and resolve conflict. Many were originally set up to deal with specific technical issues but, once the benefits of cooperation become apparent to stakeholders, their mandates are often expanded. RBOs can also be inter-State, such as the Orange-Senku grouping Botswana, Namibia, Lesotho and South Africa (ORASECOM, 2016).
- **Disaster management committees (DMCs):** deal (also) with floods, not only at the national level (e.g. Myanmar, where the DMC is installed in the Department of Meteorology and Hydrology) but also at the local level (village level, e.g. community-based FEWS in the Singora and Jiadhal rivers, India (as mentioned above); city level, e.g. Madras, India; and district level, e.g. Upazila, Bangladesh.
- **NGOs:** local or referred to their community-based partners (WMO, 2006). In Pakistan, NGOs struggle to respond to – among others – the scale of the floods (Pakistan has a sizeable NGO sector; 39 among the largest NGOs are organized in the Pakistan Humanitarian Forum; the NGO community also reports to this Forum according to House of Commons (2011).
- **Community-based organizations (CBO):** organizations that should ideally be representative of the community (membership-based) but consequently tending to vary dramatically in size and focus. CBOs may focus on a specific sector or multiple sectors. They can also comprise the local arm of one or more NGOs. Among CBOs, village development committees (or district development committees in the urban areas) are organizations of collective governance of a village with responsibility for development. Some of the above-mentioned entities (some committees) can also be considered as CBOs. Collective governance of a community implies a set of accepted endogenous rules (the institutions of the community) and an organization responsible for the application of the rules (the institutions of the community) and an organization responsible for the application of the rules and for organizing collective action of interest to all the members of the community.
- **Village leadership:** an official, traditional or informal leader at the local level. Official leaders include the communal chief and the local government administration. Traditional leaders are usually persons who are revered for their religious or spiritual attributes. Informal leaders carry influence due to wealth, special skills or charisma. Official and traditional leaders play key roles in local political, social, religious and welfare activities.

- **Specialized groups:** CBOs operating on a specific issue, such as the Flood Management Committees developed in the framework of the pilot projects carried out by APFM and the Asian Disaster Preparedness Centre **(ADPC)** in the Bihar region, India, in 2004 (WMO, 2005).
- **Micro-finance institutions (MFIs):** community-level common interest groups specialized in savings and lending. In Bangladesh, the critical role of MFIs in addressing vulnerability was evident after the 2005 floods, when a majority of member families took loans to meet their different requirements, including repairing damaged assets, purchasing new income-generating assets, and house repairing. Moreover, none of the control-group families had access to credit after the disaster. The study found the MFIs to be the single largest stakeholder, followed by the government, NGOs and the local community to provide different short-term support to the disaster victims. The short-term support services included donations for health treatment, purchase of essential household commodities, and humanitarian services. On the other hand, most of the respondents told the researchers that the money that came out of their own savings was the most important component in addressing disaster loss in the long term. They said that, among the external sources, MFIs were important in terms of providing credit for reconstruction and rehabilitation after a disaster (ACEDRR, 2005).
- **Other local community institutions**, such as:
  - Professional learning organizations;
  - Senior citizen groups;
  - Community colleges
  - Youth groups such as boy scouts;
  - Religious groups;
  - etc.

88 Local-level institutions, of course, influence people's participation.

89 From a quantitative point of view, as many people (in absolute and percentage terms) are involved in these institutions, the greater the participation, the easier it will be to involve people (or to strengthen their involvement) in flood management at the different stages (prevention, preparation, preparedness, response, recovery).

90 It would also be useful to benefit from the presence of organizations that could enrich the participation. However, too many organizations/groups would have a negative impact owing to conflicts of interest, overlapping of action, institutional disorder, etc.

91 From a qualitative point of view, of course, we have to consider the quality of these institutions. Some may exist only "on paper" and play, in fact, no role; others may be characterized by a lack of effectiveness; others may be "individual" with only an ostensibly large number of members; other may be characterized by corruption/lack of transparency, conflicting and/or discriminatory approaches, so it is better not to benefit from their contribution, etc.

92 Many others, of course, can be high-quality and effective groups. The quality of individual involvement in these organizations should be taken into account in order to valorise each contribution albeit modest and limited in time.

93 Community institutions play a pivotal role in undertaking many kinds of activities in flood management, which contributes through (Abarquez et al., 2004):

- Coordinating and facilitating individual efforts;
- Building synergy effects and reducing costs of programme operation;
- Strengthening solidarity and enhancing effectiveness of cooperation within communities;
- Providing a platform for consensus-building and conflict avoidance, thereby building local social capital;
- Supplementing national and local government efforts;
- Harmonizing flood-management efforts with other development activities.

94 People generally have to perform – and already perform – different activities at different stages of flood development and risk reduction. Furthermore, understanding the role of community participation in each and every phase of disaster risk reduction (prevention, preparedness, response and recovery) is equally important for the success and sustainability of flood-management activities. Likely phase-wise community activities drawn from experience of community-based flood management programmes in South Asia, for instance, are presented in **Annex II**. A detailed elaboration of these activities can be found in WMO, 2004.

3 ORGANIZING/STRENGTHENING COMMUNITY PARTICIPATION

95 Communities' mobilization for local flood-mitigation initiatives should, first of all, be recognized in each specific context. There could be many – and strong – differences, depending on the factors/issues discussed in **Chapter 2**. Prior to any other action, information needs to be assembled and analysed in order to map natural, social and economic factors, community institutions concerned, etc.

96 A second step could be the formation of community-based flood management committees (CFMCs). A CFMC (as mentioned in **Chapter 2**) helps to increase the effectiveness of community-based FEWS. It is an integrated system of tools and plans to detect and respond to flood emergencies that are prepared and managed by the communities. The objectives of community-based FEWS are to manage flood or flash flood risk by providing early warnings to downstream communities and to enhance cooperation between upstream and downstream communities in the sharing of flood information. Community-based FEWS are implemented in communities under flood risk to enhance the capacity of local people to withstand the adverse effects of floods or flash floods. A properly designed and implemented system can save lives and property by providing time for downstream communities to prepare, and respond to, the threat of flood. While implementing the community-based FEWS, four key elements must be considered (ICIMOD, 2014): *(a)* risk knowledge; *(b)* monitoring and warning service; *(c)* dissemination and communication; and (d) response capability.

97 Information needs to be assembled and analysed to in order to identify the role and responsibilities of the CFMC, the CFMC formation process and the mobilization of community members, as well as the resources. The added benefits of the community-based approach should be identified and disseminated to the stakeholders concerned (including local-level authorities and political leaders, teachers and community leaders).

98 Initially, an ad hoc committee may be formed to facilitate and carry forward the formation process of the fully fledged CFMC. The ad hoc committee works with the organization(s) assisting the community in flood management to achieve clarity before the formation of the CFMC and prepares a draft constitution of the CFMC. As part of the preparatory process, and with the assistance of the facilitating organization(s), the ad hoc committee must conduct wider awareness-building discussions and interact with the affected communities, local leaders, youth, veterans, teachers, women and different ethnic groups.

99 The CFMC that is eventually formed should include local leaders, women, representatives of ethnic groups, representatives of local elite groups, agriculture/health-care officials, teachers, youth and representatives of local NGOs and CBOs. It should be inclusive of all stakeholders in a representative manner. There may be an advisory committee with local-level representatives of concerned ministries, local government, senior citizens, etc., who may provide guidance and facilitate linkages with technical and funding sources as and when required. In many CFMCs, taskforces/committees are formed to facilitate the accomplishment of specific community activities.

100 CMFCs perform various functions such as:

- Identification of risks to communities;
- Assessment of needs and capabilities of the community;
- Provision of equipment and supplies for emergency situations;
- Awareness-raising;
- Information dissemination and capacity-building;
- Networking, monitoring and reporting;
- Establishment of institutional building and linkages;
- Planning and interface with government institutions for rescue and evacuation, flood-proofing and flood moderation;
- Conducting simulation exercise/drills to facilitate effective evacuation;
- Development of linkages with other communities and with government and external development partners (including the private sector);
- Monitoring, evaluation and record-keeping;
- Management of information for future reference;
- Resource mobilization.

101 Experience from flood-prone regions in South Asia indicates that the existence of CFMCs with clearly defined institutional structures, roles and responsibilities before, during and after a flood (i.e. in the various phases of flood management: prevention, preparedness, response, recovery), can be an effective platform for strengthening the participation of those most affected (WMO, 2005). Even though the experience deals with community participation mostly in rural areas, the model can also be adapted to communities in urban areas.

102 For better understanding of the effectiveness of CFMCs (and, more generally, for identifying what could be done to strengthen people's participation in flood management), what has already happened in this regard in these four phases should be highlighted.

3.1 Communities' participation in the various phases of flood management

3.1.1 Prevention

103 Prevention and mitigation are the actions/steps/measures used to prevent an emergency from happening and, if it does, to reduce the impact. This includes structural (building reinforcement, infrastructure renewal) and non-structural (legislation, by-laws, codes, risk-sharing) measures. There is international consensus that investment in risk reduction or prevention and mitigation before an emergency will reduce the cost of recovery afterwards (Victorian Government, 2012):

- Australia has estimated that every dollar spent on disaster mitigation saves at least three dollars in economic and social recovery;
- The International Federation of Red Cross and Red Crescent Societies (IFRC, 2001) has estimated that, if US$ 40 billion had been invested in mitigation measures in the 1990s, worldwide economic losses of US$ 280 billion resulting from natural disasters could have been avoided;
- The World Bank has estimated that, spending 1% of a structure's value on vulnerability-reduction measures can reduce probable maximum loss from hurricanes on average by one-third.

104 Basin-management planning, land-use planning, flood-zoning and risk-sharing are the main activities at the prevention stage of flood management. Participation contributes to capitalizing knowledge, building consensus among stakeholders and creating linkages with other activities. A basin-management plan requires participation of all stakeholders from the agriculture, fishery, forestry, industry, urban development and environmental management sectors, as well as the local inhabitants themselves. Participation can provide a common solution to overcoming differences by reducing losses and maximizing benefits from floods. Such an interest-based problem-solving approach can create amicable options, avoiding conflicts in many cases (Creighton et al., 1998).

105 In the context of IFM, community participation is sought for advocating that government and concerned authorities formulate legal and operational instruments for linking flood management to other development processes. IFM aims to improve the quality of life and the natural environment by addressing the root causes of floods through enhancing coping capacities, promoting sound land-use planning and raising awareness of risk. This requires wider coordination among many development activities, such as flood-proofing, land-use planning, building codes, education, socioeconomic welfare activities and water-use management. Furthermore, a community needs to build its coping capacity through developing a culture of living with flooding. Similarly, the residual risk of a flood can be minimized through the promotion of insurance and diversification of livelihood options. Details on the process of risk-sharing are described in WMO (2013).

3.1.2 Preparedness

106 Flood-emergency planning is a core activity at the preparedness stage. It is important to draft a shared vision reflecting relevant stakeholders' needs, aspirations and concerns right from the beginning. A flood-emergency plan requires that disaster-management institutions actively participate in the process. Each community has different perceptions of risk, underlying vulnerabilities and capacities, which are determined by the socioeconomic conditions of the communities and their physical location.

107 Flood preparedness generally starts with vulnerability and risk assessments, development of risk-response options, risk awareness and emergency contingency planning (including stockpiling of life-saving equipment and supplies). Additionally, building and strengthening institutional and social capital at the community level is equally important, along with links to government and local bodies to sustain the flood-management process.

A | Flood vulnerability and risk assessment

108 It is important that people in a community arrive at a collective understanding of their own vulnerability, capacity and the underlying risks. Flood hazard and vulnerability mapping is an effective tool for accumulating and sharing information for the purposes of preparedness and raising awareness. Based on the probable flood or historical flood data (thus valorizing popular knowledge, such as that of elders or, more generally, indigenous knowledge as a whole), people can identify (remember) flooded areas, effective evacuation routes and the actions necessary to prepare for floods with the help of the risk assessment. Flood vulnerability and risk assessments consist of several actions, including the following:

- Mapping risks and resources to identify hazards, vulnerability of locations and capacities to cope with them;
- Discussing and brainstorming in groups to learn, and foster ownership of, the community response plan;
- Identifying the poorest and most vulnerable people/areas;
- Identifying all stakeholders for planning coordination and sharing responsibilities;
- Preparing a seasonal calendar, including likely natural disasters, their frequency of occurrence and some variables: economic activities, cultivation types, diseases, level of safety, etc.

109 Participatory capability and vulnerability analysis **(PCVA)** is used to assist field workers and communities in analysing people's vulnerabilities and capacities at the local level, to combine community knowledge and scientific information to gain understanding about local risks, drawing up action plans, mobilizing resources and enacting appropriate initiatives and strategies to reduce vulnerability to flood disaster. It is based on a set of tools, including Venn diagram, seasonal calendar, transect walks, direct observations, hazard map/resource map, historical timeline and problem/solution tree. Different tools can be used, depending on the context. PCVA involves several stages, which could be for example (Oxfam Australia, 2012):

- **Stage 1:** Preparing for PCVA (terms of reference of the process, training of the facilitation team, allocating necessary resources and logistics, etc.);

- **Stage 2:** Collecting secondary information (local demographic aspects; community structure, including male-female ratio, age groups, ethnicity and religion, behaviour patterns; livelihood; environment; disaster profile; climate projections; development plans, policies and strategies; organizations working on disaster risk reduction/climate change adaptation (DRR/CCA), etc.);
- **Stage 3:** Generating a community overview (gender and generational roles in the community; community power structures and hierarchies; which groups and organizations exist in the community, especially with regard to DRR/CCA; which governments, NGOs, private sector institutions exist within the community, etc.);
- **Stage 4:** Analysis of hazards and stresses, vulnerability and capacity (history of disasters in the area; observations on other changes to climate conditions; impacts of such events and changes; how communities have managed these events and changes; social, environmental or economic assets within/outside the community that have been relied on; groups living in poverty and the reasons, etc.);
- **Stage 5:** Analysis of livelihoods (main livelihood groups within the community and what cycles they follow; which livelihood groups are more vulnerable to disasters; positive and negative coping strategies; key constraints and opportunities faced by each vulnerable livelihood group, etc.);
- **Stage 6:** Analysis of future uncertainty (long-term trends, including climate change affecting the community; how changes may affect women and men differently; how people access relevant and timely information to enable them to reduce risk, etc.);
- **Stage 7:** Governance analysis (what organizations, agencies and governance structures exist within the community; what governance structures have responsibilities for supporting communities in DRR/CCA activities, etc.);
- **Stage 8:** Prioritization and action plan (which hazards and stresses present the highest risks to the community; how the community would like to address the prioritized hazards and stresses; how they would like to address risks and uncertainty; direct/indirect actions and who is/are responsible; when these actions will take place; what resources they require, etc.);
- **Stage 9:** Finalizing the PCVA process (establishing a liaison group within the community and a system for communication; agreeing on a process to compile the PCVA outputs; arranging follow-up meetings with the community, etc.).

B | Awareness-building

110 Sustaining people's awareness of floods is a critical aspect of organizing community activities. The ubiquitous flood sign in town centres or on floodplains is a tool for raising awareness of floods. Flood signs mostly indicate possibility of flooding, levels of flooding, evacuation routes and destination camps. **Figure 8** shows flood signs used in Japan. These marks are registered under Japan Industrial Standards and can possibly be applied on a global scale. This standardization effort is challenging but can contribute to enhancing community participation. The more a community acknowledges these signs, the more it is motivated to participate in preparedness activities. Many people do not always have an incentive to participate in such activities, but watching and identifying flood risks in their daily lives can facilitate their participation. Unfortunately, even though people are aware of flood risks just after major floods, this awareness diminishes as time passes.

Figure 8 — Standardized marks for flooding in Japan (MLIT, 2006)

C | Flood-risk contingency planning

111 Flood-risk contingency planning is a management tool used to analyse the impact of potential flood risk and to ensure adequate arrangements are made in advance. This is achieved primarily through stakeholder participation in the contingency planning process, as well as through follow-up actions and regular review of critical planning elements.

112 Experience clearly indicates that an effective emergency response at the onset of a flood depends on the level of preparedness and planning of responding organizations, as well as the capacities and resources available to them.

113 Contingency planning is an important step within the broader framework of emergency preparedness, which includes early warning mechanisms, capacity-building, creation and maintenance of stand-by capacities and stockpiling. Contingency planning is a process that includes four broad components (IASC, 2007):

- Preparation;
- Analysis;
- Response planning;
- Follow up and continuation of the process.

114 Flood-risk contingency plans must be drawn up from the individual/family to the community and higher levels (municipal, district, province and national). They include the following activities **(Box 2)**:

Box 2 — Flood emergency preparedness activities at various levels (WMO, 2006)

1 Individual, family and household level

- Know the risks: drowning, waterborne diseases, electrocution, poisonous animals
- Prepare for the specific needs of each family member (for example, install protective railings around house to protect children from falling into the water and to provide support for the elderly)
- Scout for safe areas and know how to get there
- Know what to do and who is responsible for what when a warning is received
- Know whom to contact in case of emergency
- Know where the family members are most of the time, how to contact them and where they should evacuate to in case of emergency
- Keep life-jackets, buoys or tyres ready for use
- Keep first aid kit ready for use
- Store clean water and food in a safe place
- Disconnect gas and electrical supply
- Listen to daily flood forecasts
- Move valuable items to higher ground
- Get ready for evacuation
- Protect livestock

2 Community or village level

- Identify and maintain safe havens, safe areas and temporary shelters
- Put up signs on routes or alternate routes leading to safe shelters
- Inform the public of the location of safe areas and the shortest routes leading to them
- Have all important contacts ready: district or provincial and national emergency lines; and have a focal point in the village
- Make arrangements for the set-up of teams in charge of health issues, damage and needs assessment
- Set up community volunteer teams for a 24-hour flood watch
- Improve or keep communication channels open to disseminate warnings
- Distribute information throughout the community

3 Municipality, district, province and national levels

- Determine roles and responsibilities of each agency during response, relief and recovery phases
- Prepare maps (flood risk/inundation/vulnerability maps, resource maps) to provide essential information and data on current situation and to plan for assistance in those areas
- Make sure that critical roads are built up to a certain height – to enable access to safe areas for flood-affected communities and to ensure continuous transportation critical for flood relief
- Identify new safe areas and maintain existing shelters, making sure they have sanitary and other basic necessities that meet the needs of everyone, including the most vulnerable
- Implement public awareness activities to create a pro-active and prepared society, which can cope effectively with hazards and their aftermath
- Educate the public on what to do and what not to do to prevent harmful activities in the floodplain
- Educate the public on environmental management, water resource use and land-use planning
- Stockpile relief goods in safe areas
- Prepare resource inventories – how much is available locally and how much is needed from the outside
- Plan resource mobilization
- Set up emergency teams (for example, health, search and rescue teams)
- Plan to assist in emergency response at the local level
- Conduct drills for emergency teams and population living in flood-prone areas (including schools)
- Make sure that communication channels to the community are functioning well
- Issue orders for various agencies and organizations to get prepared
- Inspect flood mitigation infrastructure (for example, dykes, levees and floodwalls)
- Disseminate public safety information through the establishment of early warning systems
- Specify the source and actions to be taken immediately after receiving warnings.

115 **At the family/individual level:** the family contingency plan must be developed by families/households who are living in flood-prone areas. It is different from the community contingency plan in the sense that it spells out actions, responsibilities (listen for flood forecasts, check things that could cause danger for the family) and key information specific to each family (those who have specific needs, important contacts in case of emergency). In Haiti, the Directorate of Civil Defence, with the support of Handicap International, Oxfam and UNDP, developed a standard form of a family contingency plan **(Figure 9)**.

Figure 9 — Family Emergency Plan developed by the Directorate of Civil Defence in Haiti

116 **At the community level:** the community contingency plan is a useful tool in supporting the organization of local disaster response, defining actions and responsibilities of various players before, during and after flood episodes. The CFMC can be a key stakeholder in formulating this plan, together with other actors such as RBOs, CBO and NGOs. As communities can provide a great deal of information regarding their own risks and capacities, and because they are the first to react during an emergency, their participation in the planning is vital. To ensure full effectiveness, coordination is required among all emergency response agencies (such as government agencies, CFMC, NGOs, etc.).

117 Such plans must be coordinated with other existing plans, such as river-basin and national contingency plans. For more details, see WMO, 2011d. Along with contingency plans, awareness tools are also important to improve dissemination of disaster preparedness information and the understanding thereof by a broad public (including children, the illiterate, etc.

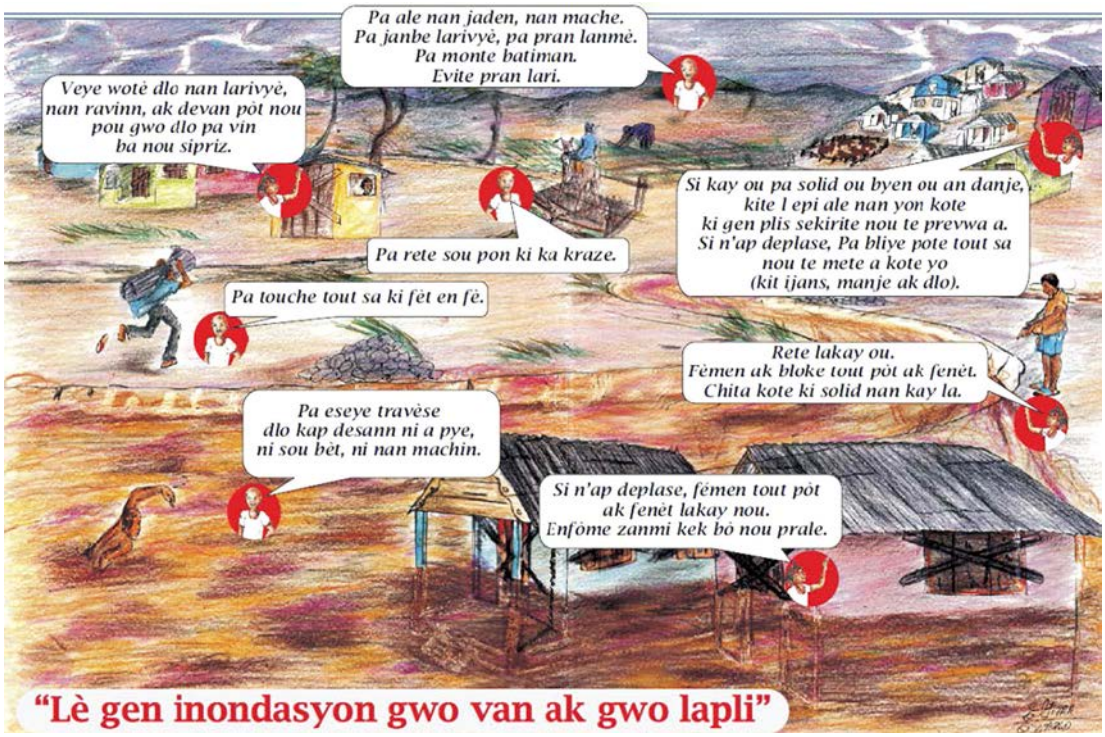

Figure 10 — Awareness posters used in 2008 by the French Red Cross (Dipecho VI Project) to make the community of Bas-Artibonite (Haiti) aware of what to do during a flood or a cyclone

D | Drills/simulation exercises

118 One of the major tasks in capacity-building for flood-prone communities is to organize periodic (for example, once a year, preferably early in the monsoon) evacuation drills/simulation exercises based on the prepared flood-risk contingency plan. This simulation exercise usually visualizes roles and responsibilities to be played during an actual flooding situation. These include systematic evacuation of people and movable property, valuation documents, escape routes to safe ground, cooperation and living together in shelters. Community participation in such drills enables local people to understand the warning information and the necessary actions at each alert level, why they need to do something, who are the main stakeholders involved during an emergency and how the community can work in a coordinated fashion for the best possible results. Drills also strengthen the coordination mechanisms at the horizontal scale (e.g. between community response teams and the local committee of a Red Cross national society) and vertical scale (e.g. between local civil protection committees and communal civil protection committees). Additionally, such simulations help identify the shortcomings in the contingency plan and provide lessons for improving the prepared flood-risk contingency plan.

E | Flood observation and early warning systems

119 Flood build-ups are easily observed and warning notices can be issued with a great degree of certainty. Measuring water level at different points along a river can indicate when a flood will arrive at a certain point and how high it will rise. More details are available in WMO (2013c) and in WMO (2011). Threshold river level and lead time can be calculated or ascertained using the available historical information obtained from the communities' memory, National Meteorological and Hydrological Service offices and computer model simulations. More information is provided

in WMO (2013d; 2017). Flood-warning threshold levels such as alert, alarm and critical levels are related to the water level that can be read from a staff gauge or simply by using landmarks related to the community's past flood experiences. The statue *"Le Zouave du Pont de l'Alma"* in Paris is a landmark for residents for flooding events of the Seine **(Figure 10)**. When the Seine's level reaches the feet of the Zouave, access to the footpaths by the river embankments is usually closed. When the water reaches his thighs, the river is unnavigable. During the great flood of the Seine in 1910, the water reached his shoulders.

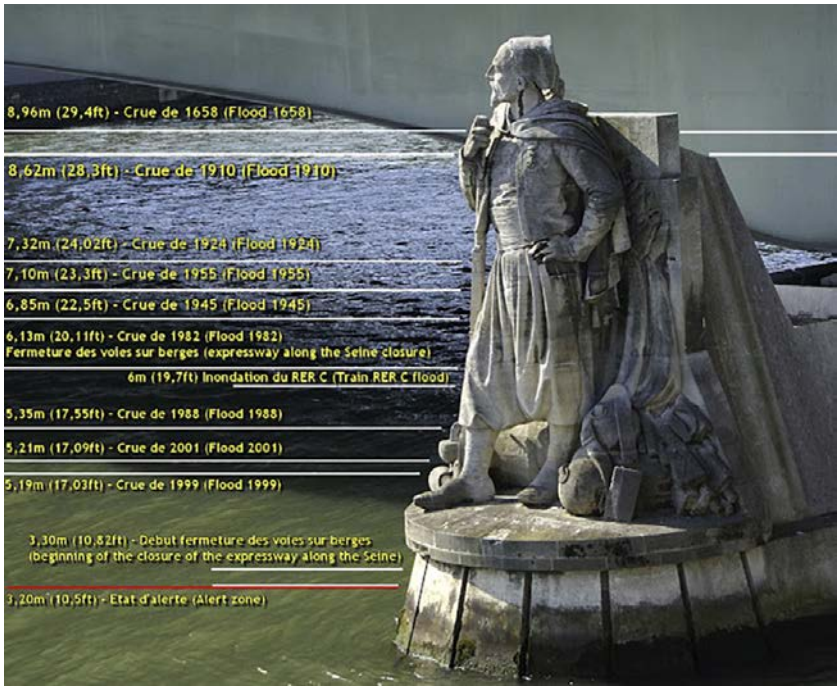

Figure 11 — Le Zouave du Pont de l'Alma: a landmark for flooding events of the Seine (Paris Running Tours, 2010).

120 Water-level measuring can be done through a Flood Citizen Observatory (see Castro Degrossi et al., 2014): a crowdsourcing-based approach that enables the collection of volunteer information. Its main objective is to obtain useful volunteer information related to flood-risk management, especially about flooded areas and water level in the riverbed, for decision-making. FCO is based on the Ushahidi crowdsourcing platform[7], which is used worldwide by activists, emergency agencies and citizens to map extreme events. Volunteers are considered "human sensors" since they can observe important parameters of flood-risk management in a local environment. In order to facilitate the provision of information about flood risk, the interpretation mechanisms are represented by different categories and subcategories. The volunteer can thus identify more easily the category that best represents the observed scenario. To send a report, volunteers can use both a mobile application and a website. More information is provided in WMO (2017).

121 In Nepal, community-based flood forecasting systems use the usual three colour codes to define different alert levels: green, yellow and red (the same as used in emergency departments in hospitals). **Table 1** illustrates the flood warning/alert levels and the levels of response required

7 The most utilized platform for crowdsourcing is Ushahidi, a non-profit software company that develops free general public license software for information collection, visualization and interactive mapping. After the earthquake in Haiti, it was largely used as a source of information for those affected, including medical care, shelter, food, and a mobile platform to create accurate maps that were used by NGOs and other humanitarian actors, as well as search and rescue teams. See MIT Technology Review (2016)

(Mercy Corps and Practical Action, 2010). People play a core role in continuously observing river level and sending water-level information to concerned district and national agencies during the rainy season. This system has greatly helped in issuing warnings to affected populations through district disaster-management committees. As already stated at the beginning of this chapter, CFMCs also play a core role in flood-warning systems.

Table 1 — Flood water level and warning in Nepal

Warning/alert level	Level 1, Alert: Standby "Ready"	Level 2, Alarm: "Get set"	Level 3, Critical: "Go"
Precondition	Heavy upstream rainfall (threshold value may vary as per location and watershed).	Water level in river increased by X (according to calculated threshold)	Water level in river increased by XX (according to calculated threshold)
Warning messages	High possibility of flood	Flood is inevitable within X hours (according to calculated lead time).	Flood coming any time
TO-DO LIST	— Upstream observer will inform EWS management committee, who will then inform the community. — Upstream observer will inform concerned organizations/persons through agreed-upon communication channels.	— Upstream observer will inform the EWS management committee, who will then inform the community. — Upstream observer will inform concerned organizations/persons through agreed-upon communication channels.	— Upstream observer will inform the EWS management committee, who will then inform the community. — Search and rescue and first aid teams will be activated for immediate evacuation as per the contingency plan. — Nearest police station, Red Cross chapter and others wll be informed for external assistance.

123 **Community early warning system:** a CFMC may organize constant flood vigilance activities to check on how the flood is developing. It should keep a record of indicators observed (for example, water level in relation to a landmark such as an electricity pole or a tree), the corresponding warnings issued and the actual effects in terms of mobilization of people and resources in response to the evolving situation. The databank thereby created over time can provide useful background material when dealing with future floods.

124 Communities with local warning systems have greatly benefited from early information on flood disasters. Warnings are generally issued by the authorities, but there are many examples of local community warning systems. Communities are organized, trained and empowered to operate and issue warning messages. In the event of a disaster, designated communication channels such as local sirens, hoisting coloured flags, announcements and local FM radio and television stations, provide warning information.

125 Warning information includes the expected time of flood arrival, evacuation routes, location of temporary shelters and other emergency procedures. Depending on the circumstances,

any one of three protective actions (shelter-in-place[8], prepare to evacuate or evacuate) may be appropriate. The community warning system in not only cost effective, but the dissemination of warnings is also much faster. An example would be the Bangladesh story on community radio stations **(Box 3)**.

Box 3 — Community radio cuts disaster risk in flood-prone Bangladesh

There are several examples of new local-dialect community radio stations in coastal districts which warn residents about tsunamis and cyclones and help farmers cope with erratic weather patterns. The new radio stations are part of an initiative to reduce loss of life and damage to livelihoods from natural disasters and unpredictable weather.

In April 2010, approval was given for 14 community radio stations in coastal and inland areas, and six are now broadcasting from coastal districts. A further 22 applications have been filed with the government. The stations are mostly funded by NGOs and individuals. The radio programmes focus primarily on disaster risk reduction and climate variability and their growing popularity is in part attributed to their being broadcast in local languages, since people in the countryside, most of whom are illiterate, can thus easily understand weather bulletins and other instructions. During a tsunami watch in early April 2012, in countries bordering the Indian Ocean, including Bangladesh, the new radio stations transmitted national weather forecasts in local dialects. Lokobetar community radio, based in Barguna district in the south of the country, advised people what they needed to do for their safety during the emergency. Although no tsunami took place, heavy rainstorms struck Bangladesh as the rainy summer season began, claiming at least 20 lives in different parts of the country. Lokobetar radio station suggested that fishermen carry a radio set with them so that they could hear weather bulletins and start returning in time to avoid any danger. Lokobetar also broadcasts plays, songs and talk shows to raise awareness about impacts of climate change and issues such as education and health services. The station strives to ensure that programming is relevant and approachable (Islam, 2012).

In 2013, as part of addressing the risk of Cyclone Mahasen, six community radio stations in the coastal regions of Bangladesh broadcast for five days continuously from 11 May to 16 May. A total of 391 staff members and volunteers and more than 20 000 listeners were involved constantly in disseminating disaster preparedness message and information to the local community. They regularly and frequently updated and reported on the cyclone situation. They provided information on cyclone shelter to the community according to the disaster situation that was continuously updated by the Meteorological Department and other Bangladesh government agencies. Broadcasting continued, despite power failure/load shedding, by using a generator to supply power. Since the stormy weather caused power disruption everywhere, community radio became the only source of information for the local people. The local community was thus enabled to know all the details related to the cyclone and how to take precautionary measures. This saved lives and assets and again proved the essential role of community radio at grassroots level in the coastal region (BNNRC, 2013).

126 **Neighbourhood directory:** The community should have a directory of updated household information that includes contact persons, phone numbers and e-mail addresses (if applicable) for all community members. This directory should be available on the web and hard copies should be available in busy places (public offices, schools, hospitals and health facilities, places of worship, etc.). Neighbourhood inventory is also needed/required to list special information, such as the number of children, seniors and persons requiring special attention who may be home alone during an emergency, and storage of hazardous materials. It is suggested that

8 *"Shelter-in-place"* means to take immediate shelter wherever you are – at home, work, school or in between. It may also mean "seal the room", in other words, take steps to prevent outside air from coming in (See CDC, 2016).

important phone numbers, such as the local emergency management offices, the police department, civil protection/defence offices and medical care services be included in this directory.

3.1.3 Response

127 An effective emergency response depends on the effectiveness of the preparatory work conducted during the pre-flood season as it reduces some of the suffering and loss that occurred during and after a disaster. It is particularly important because local communities are, in many cases, the first responders and have the greatest chance to save lives and provide support in the hours and days in the immediate aftermath of a disaster. Local residents and groups are in a position to best identify their immediate needs, coordinate preparations, supplement official response efforts, implement emergency response programmes and contribute to local decision-making for future events.

128 Similarly, communities can provide a sense of connection and decrease the sense of isolation and separation that is often felt among flood victims. This capacity for providing community services does not always exist, but it can be cultivated and should be encouraged and empowered. Generally, the response activities that a community needs to undertake at the time of a disaster are flood monitoring, implementation of contingency plans and providing the foundation for recovery activities.

A | Flood monitoring

129 During the duration of a crisis, continuous watch is required at the local level. An efficient flood-monitoring system must be created to provide up-to-the-minute information (such as the latest water level at a particular point in the river, blocked drains and ditches, inaccessible areas, etc.) for the disaster-management practitioners. This system is essential to ensure an efficient execution of real-time emergency operations, such as flood warning, evacuation of vulnerable inhabitants to safe areas and the deployment of search and rescue teams.

130 Flood-hazard monitoring is usually carried out by the same agency that is responsible for flood forecasting and warning. If continuous watch is beyond the capacity of the agency during the crisis, local flood watch committees can be formed for a 24-hour watch in villages, with an appropriate method of information dissemination to warn the public (ADPC, 2010). Citizens/volunteers who already played an important role in this regard in previous phases may be used to advantage (see FCO in *Flood observation and early warning systems*, **Section 3.1.2**).

B | Operationalizing flood-risk contingency plan

131 Every plan should have a small section outlining how, when and by whom the plan is to be activated. The standard operating procedures **(SOPs)** that "operationalize" the contingency plan are a way to make sure that tasks specified in the contingency plan are carried out quickly and according to pre-agreed criteria. This will help in organizing emergency operations in a coordinated manner, providing communities with a clear understanding of who will do what, where and when.

132 SOPs (used in Florida, USA (FRWA, 2012) or in Haryana, Chandigarh, India (HIPA, n.d.)) are the link between plans and the actual operational response. They specify the way in which individuals or units are to carry out their functions as outlined in the plan, setting out what should be done, how it should be done, who is responsible for implementing what, and specifies available resources. Such contingency-planning approaches not only make communities clear about their roles and responsibilities and optimize the limited available resources but also enable emergency operations to be conducted in a transparent manner with reduced conflict. Once the flood response operation is over, an evaluation of the contingency plan must be performed in order to assess what went right and what went wrong. Based on this evaluation and the lessons learned, the contingency plan must be amended and updated for the next cycle of flooding.

C | Protection of critical infrastructure

133 Personnel and machinery – where available – must be mobilized within the community to protect infrastructure (as in Bangladesh (ADB, 2011), such as dykes, levees and retention basins; remove individuals from facilities at risk, such as hospitals, schools, industrial sites, bridges or individual houses; and prevent flood-related risks such as landslides and disastrous river-bank erosion. This includes emergency strengthening and rehabilitation of existing structures and flood-proofing measures, such as sandbagging or establishing temporary earth, wooden or other flood barriers, including mobile flood barriers. (For more information, see WMO (2011d)).

D | Evacuation operations

134 Safe routes and areas should be identified within the flood-contingency plans developed at the individual/family, community and municipality/district/province/national levels. Evacuation routes must be discussed with family members and with the community. This ensures that all members of the community are aware of the evacuation plan in case of sudden floods. A CFMC may help in coordinating evacuation and transportation effort. (For more information, see WMO (2011d)).

E | Shelter

135 Safe shelters should be identified in advance, and evacuation routes leading to designated shelters clearly marked. Organization of shelters and distribution of aid among the affected population should be mainly in the hands of local community organizations/committees (such as CFMCs), which should be identified and trained in advance. Priorities should be established to prepare exclusive response programmes to meet the special needs of infants, the elderly, pregnant women and the disabled. One area that requires attention, particularly in flood-prone locations, is the lack of evacuation routes in relief operations. Lack of a strategy that results in poor planning may force a community to become dependent on relief handouts for their survival, rather than addressing their vulnerabilities pro-actively. (For more information, see WMO (2011d)).

F | Rapid assessment of damage and needs

136 Local committees/teams must be identified within the community and trained in advance to assess the damage and emergency needs, including medical assistance, shelter, provision of

short-term food, safe drinking water and other essential items, search and rescue, sanitation and waste disposal, epidemiological surveillance and psychological support. The assessed damage and needs must be regularly communicated through a standardized reporting method/format to the appropriate authorities, especially when government and external development parties' support are required. (For more information, see WMO (2011d)).

G | Emergency relief assistance

137 It is necessary to mobilize resources (trained personnel within the community with appropriate local technical knowledge and language skills; relief items and other necessities) before, during and after floods in the local area. A CFMC may help in organizing and distributing these resources. Moreover, a strong network is required between communities, humanitarian organizations and the responsible government agencies to ensure coordinated relief assistance. (For more information, see WMO (2011d)).

3.1.4 Recovery

138 Communities' participation can represent a way to bridge cooperation between individuals and external agencies for flood management, especially at the recovery stage. Nobody can understand the local situation and needs better than the local communities themselves. Such needs should be supplemented by developing linkages among communities, government, national disaster management agencies and donors focusing on recovery from floods. The overall focus of the recovery approach, as defined by the United Nations Development Programme (UNDP, 2008), is to restore the capacity of national institutions and communities to recover from a natural disaster, enter a transition phase or *"build back better"* (BBB) and avoid relapses. There are three main categories of activity under the recovery phase:

- **Restoration:** Measures to re-establish essential services (power, communication and transportation) disrupted by the flood.
- **Rehabilitation:** Any activity whose object is to restore normality in conditions caused by a flood disaster; for example, measures to assist the physical and psychological rehabilitation of affected individuals or communities.
- **Reconstruction:** The repair and construction of a property undertaken after a flood disaster: one example of a reconstruction measure is the replacement of buildings and infrastructure which have been destroyed in the flood.

A | Early recovery

139 Early recovery aims to generate locally owned processes for post-disaster recovery that are resilient and sustainable. It encompasses the restoration of basic services, livelihood systems, transitional shelter, governance, security and rule of law, environment and other socioeconomic dimensions, including the reintegration of displaced populations. It strengthens human security and aims to begin addressing the underlying causes of the flood (UNDP, 2008).

140 The early recovery process starts immediately after the onset of a flood disaster. The priorities are to produce immediate results for vulnerable populations and to promote opportunities for recovery, a response that will evolve over time into longer-term recovery. People affected by disaster often require life-saving support to restore basic social services, infrastructure,

livelihood opportunities and governance capacity. While early recovery is guided by long-term development principles, it begins within the time frame of emergency intervention and must be integrated with humanitarian aid mechanisms. At the same time, in order to facilitate a smooth transition into longer-term development, early recovery also needs to be situated in the context of development actors and processes.

B | Reconstruction

141 Reconstruction is a post-disaster process to restore damaged infrastructure and livelihood systems in a given area. It always begins with individual households salvaging the remnants of damaged property. Involvement of the individual is therefore important for a better reconstruction process, otherwise, the community may suffer from recurrent floods of equal or greater magnitude. It is thus important to introduce the BBB concept to reconstruction and recovery activities. The concept refers to the need to take the opportunity present during the post-disaster phase, along with reconstruction and recovery efforts, to improve a community's physical, social and economic resilience.

142 Improvement of structural design, land-use planning, social and economic recovery, and community consultation are the main thrusts of BBB, while empowering communities to take ownership of recovery activities is one of its fundamental elements (Mannakkara et al., 2014). The concept was first introduced during the 2004 Indian Ocean Tsunami disaster response and recovery. Since then, the BBB concept has been driving key elements of the design of disaster-recovery activities around the globe. It improves the lives of the people affected by disaster, while also allowing large-scale investment for future generations.

3.2 Building resilient communities

143 Drawn from decades of experience of providing humanitarian relief and development assistance, the concept of resilience has evolved to reduce chronic vulnerability and promote more inclusive growth in areas of recurrent crisis. Building community resilience aims to save and improve lives and decrease the need for repeated infusions of humanitarian assistance in these areas. As already mentioned (UN-SPIDER, 2013), according to the United States Agency for International Development (USAID), *"resilience is the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from, shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth"*. This definition is drawn from decades of experience of providing humanitarian and development assistance to disaster countries (USAID, 2012).

144 Each community already has a certain level of resilience that could be more or less low/high (related also to their level of vulnerability) and can change over time. Strengthening community resilience requires individual and collective actions. Individuals must determine how to help themselves and each other in ways that best suit their circumstances. They must therefore be able to adapt so that they can maintain/increase resilience. To do this, communities need the skills (fund-raising, mobilizing people, communication, etc.) to access all available resources when necessary. A community which is highly resilient to disaster has the inherent capacity to deal with shock and thus, generally, responds more effectively to floods.

145 In Nepal, nine characteristics of disaster-resilient communities have been identified and included as a minimum component of community-based disaster risk management (CBDRM) programmes (see **Figure 12**). These agreed indicators have been designed in consultation with Government of Nepal, international and national NGOs, the United Nations, donors and IFRC (WMO, 2005; NRRC, 2012).

Figure 12 — Nine minimum characteristics of community-based disaster risk management programmes in Nepal (NRRC, 2012).

3.3 General principles for strengthening communities' participation

146 Over the last three decades, it has become apparent that top-down approaches to disaster risk management that ignore local capacities and resources fail to address the specific needs of vulnerable communities. People-based disaster risk management as an alternative approach emerged in the 1980s and 1990s in response to the limitations of this top-down methodology (ADPC, 2007).

147 This approach is adopted to foster and institutionalize elements of good governance to empower the community. In this situation, inclusive participation and representation, transparency, accountability and capacity to be resilient to natural disasters are seen not simply as a means to fulfil immediate needs but also to sustain livelihood systems in the face of recurrent floods. The links between community-based interventions and progress in governance are apparent in many successful community-based activities (Haider, 2009). Community-based processes ensure that voices are heard and local communities equipped with the skills and tools to cope with disaster through flood-management initiatives.

148 Community participation in flood-management activities can be strengthened effectively by adhering to four principles: they are needs-based, effective and efficient, build social capital, and are practical to implement:

- Community participation has to match a community's needs in terms of:
  - People/community factors;
  - Vulnerability and risk reduction (and resilience enhancement);
  - Sustainability in activities for infrequent and recurrent events;
  - Establishing public–private partnerships, involving NGOs, private actors and other relevant actors.
- Community participation retains its effectiveness and efficiency by:
  - Understanding societal actors and their actions;
  - Synergizing effects of limited financial and human resources;
  - Providing the best mix of community experience and technological knowledge;
  - Connecting individual requirements and government preparedness.
- Community participation promotes building social capital through:
  - Equitable access – a commitment to ensuring equal opportunity for all community members to participate in decisions;
  - Inclusiveness – a commitment to the development of participation strategies for all community members, especially those who, characteristically, do not participate;
  - Responsiveness – a commitment to listening and taking action in relation to the views, concerns and experiences of community members;
  - Integrity – a commitment to open, transparent and accountable participation practices that enhance trust and confidence in the community.
- Community participation ensures practicability for implementation through:
  - Undertaking flood management at each stage (prevention, preparedness, response and recovery);
  - Capacity-building and coordination through dialogue and participation;
  - Creating opportunities for training and drills as realistically as possible.

3.4 Strategy for effective participation

149 A strategic approach to organizing/strengthening community participation in flood-management activities must address four perspectives (Haider, 2009):

- Participatory process
- Resource maximization
- Motivation
- Institutional linkages

3.4.1 Participatory process

150 The participatory process has been recognized as an essential element of community-based risk management that builds a culture of safety and ensures sustainable development. It addresses specific local needs of vulnerable communities by realizing the full potential of local resources and capacities. It seeks active engagement of locals in all stages of flood-risk management activities (identification, analysis, planning, preparedness, response, recovery,

monitoring and evaluation). Community-based activities for flood management should be organized strategically, based on necessary actions for each target group: policymakers, disaster managers, trainers and community workers.

Box 4 — The benefits of public participation process in flood management

The following points attempt to summarize the key potential benefits that can result from public participation in flood-risk management. We can distinguish two different directions of benefit: one is more related to the individuals involved in the process and the second is more correlated to the benefit for the general process or output.

Benefits to individuals

- More transparent and basic decision-making
- Better control of decisions and their implementation and chance to control expert information and administration and strengthen the ability to make judgments on water issues
- Reduction of the media's monopoly on persuasion and influence
- Empowerment of the public – participants can learn to express their interests, thus gaining influence
- Participants can enhance their capacity for coping with floods through a learning process

Benefits to the process

- Extension of stakeholders' (and citizens') room of action through learning processes, reflection and putting issues in a broader context
- Social learning and experience – if participation results in constructive dialogue with all relevant parties involved, then the public, government and experts can learn from each other's awareness of flood risk
- Support of a common discourse as a basis for long-term perspectives;
- Less litigation, misunderstandings, fewer delays and more effective implementation and monitoring (network of delegates, experts, gossips…) can eventually lead to most cost-effective solutions
- Increasing public awareness of environmental issues, as well as the environmental situation in the related river-basin and local catchment area
- Making use of different kinds of knowledge (regional, local, historical, social events), experience and projects of the different stakeholders, thus improving the quality of plans, measures and river-basin management
- Legitimizing decisions, public acceptance, commitment and support with regard to decision-making processes
- Citizens taking over responsibility not only for decisions but also for implementation and realization of measures (unsalaried engagement can also be a financial aspect)

Risks and potential disadvantages of public participation

- Potential costs
- Time-consuming
- Risk of losing control of the process of authorities
- Domination by certain persons or institutions
- Non-implementable solutions/results
- Exclusiveness of processes (exclusion of important stakeholders)
- Potential conflicts which could lead to "dead ends".

(Evers, 2012)

151 No matter how sophisticated the assessment/planning done by technicians (engineers, meteorologists, flood managers, etc.), it will not work effectively without the participation of local people. Losses and casualties are relatively small in a community with a high level of participation as compared to a community with lesser participation or motivation to cope with

flood. Furthermore, communities that practise indigenous techniques to cope require less time to recover from disaster shocks than those who are solely dependent on external support.

152 Communities have their own perceptions of vulnerability and capacity that are dependent on local conditions and exposure to flood incidences. Communities exposed to frequent floods are more sensitive and responsive to flood risk than those that experience fewer incidences of flooding. Local people have a great amount of experience and insight into what works well and what does not and why. Community participation concerns the engagement of individuals and communities in decisions about what affects their lives.

153 It is important to clarify the role and degree of involvement expected from each stakeholder. The specific roles and responsibilities of a particular stakeholder must be identified according to their understanding and abilities. A monitoring system is required to check the stability of roles for each person and also the performance of the person in charge.

A | Community participation is both a process and an outcome.

154 The level of involvement differs from one stakeholder or social actor to the next. For the purpose of IFM, stakeholders are categorized as decision-makers, creators, advisers, reviewers, observers and the unsurprised apathetic (people that neither want nor need to be involved – thus "apathetic" – but should be kept informed – thus "unsurprised") (Creighton et al., 1998b). All these stakeholders have their own specific role to play in IFM. Their orbit of influence in relation to the IFM process is outlined in **Figure 13**.

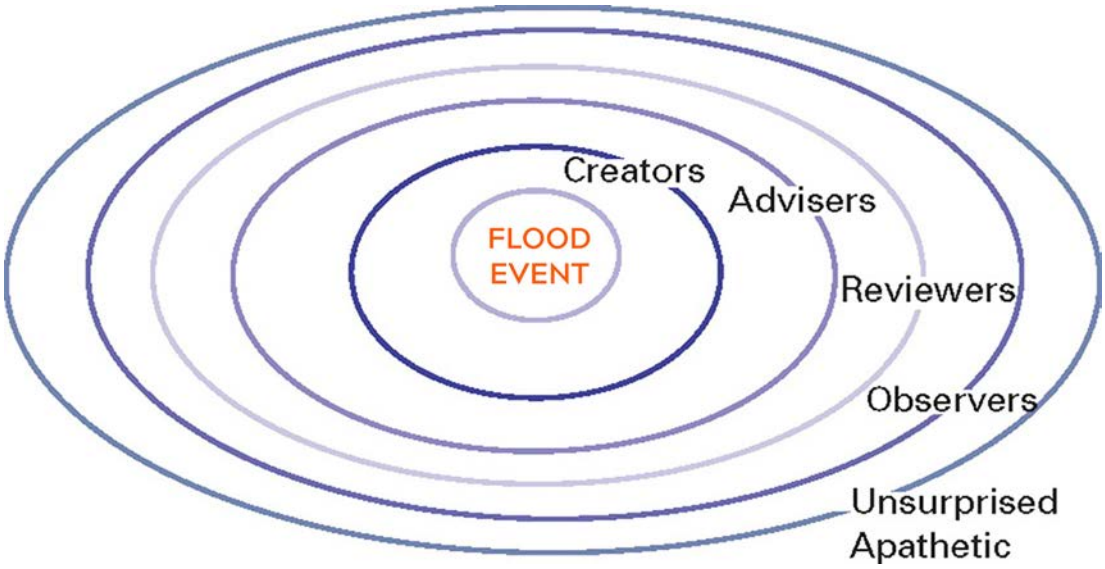

Figure 13 — Orbits of stakeholder influence in integrated flood management (WMO, 2006).

B | Levels of stakeholder participation

155 The level of stakeholder/social actor participation also varies with the varying degrees of stakeholder/social actor involvement, as illustrated in **Figure 13**. These include provision of information, public hearings, consultations, collaboration in decision-making, delegation of responsibilities and self-management. Details on the orbits of stakeholder influence and levels of stakeholder participation can be found in WMO, 2006.

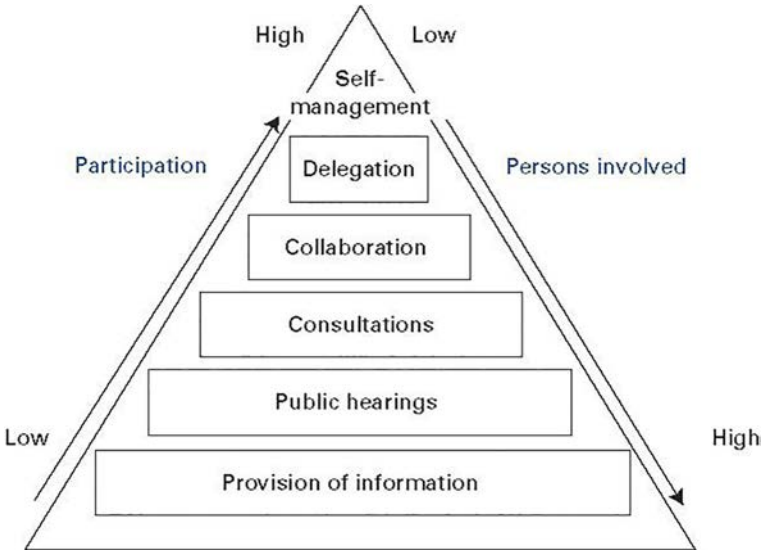

Figure 14 — Levels of stakeholder participation (WMO, 2006)

156 **Table 2** presents the stakeholders' role as mentioned in **Figure 13** and their level of participation **(Figure 14)** as represented by community activities at four phases of flood management. Details of the activities in each phase of IFM have been described in the first part of this chapter.

Table 2 — Example of community activity and participation (Defra/Environment Agency, 2005).

IFM phase: Community activity	Stakeholder's role	Level of participation
Prevention: Land-use planning		
— Residents	— Reviewers	— Public hearings
— Community leaders	— Creators	— Delegation
— Water users	— Advisers	— Collaboration
— Private sector	— Reviewer	— Consultation
Preparedness: Emergency preparedness		
— Residents	— Reviewers	— Public hearings
— Community leaders	— Creators	— Delegation
— Water users	— Advisers	— Collaboration
— Voluntary organizations	— Observers	— Consultation
— Private sector	— Reviewer	— Consultation
Response		
— Residents	— Creators	— Collaboration
— Community leaders	— Decision-makers	— Self-management
— Water users	— Advisers	— Collaboration
— Voluntary organizations	— Advisers	— Collaboration
— Private sector	— Advisers	— Collaboration

IFM phase: Community activity	Stakeholder's role	Level of participation
Recovery		
— Residents	— Reviewers	Public hearings
— Community leaders	— Creators	Delegation
— Water users	— Advisers	Collaboration
— Voluntary organizations	— Advisers	Collaboration
— Private sector	— Reviewer	Public hearings

C | Inclusiveness in participation

157 Adopting a bottom-up, community-level approach does not necessarily translate into greater participation and inclusion. In many contexts, community participatory approaches reflect social dynamics and reinforce pre-existing cultural or social divisions, such as the dominance of a particular group (ethnic, religious, politic, economic, etc.) or of the male gender. Often, women do not attend community forums – or, if they do, remain silent – and decisions are made without their input. In addition, many studies have found that weak groups may find it difficult to respond to the opportunities created by flood management activities.

158 In such cases, traditionally dominant groups could control community institutions, resulting in continued marginalization of excluded groups and potentially renewing the underlying causes of conflict. If perceived to be inequitable and to favour one group over another or to have been "captured" by special interest groups, community-based programmes may exacerbate divisions (ILO, 2003).

159 The reverse can also happen. An environmental disaster/damage as well as any other (deep) crisis in a community can also represent a discontinuity that undermines traditional societal relations (at least partially). New leaders can emerge, new functions can be appropriated by marginalized groups, etc. It is fundamental to exercise caution about any social dynamics generated by flood events.

160 In this frame, inclusive processes having the potential to contribute to community solidarity and social capital and to rectify exclusionary practices and poor governance that may have been factors in the outbreak of violence should be promoted/strengthened. In Nepal, for example, particular attention was paid to addressing the root social causes of conflict in participatory flood-management projects by including not only disadvantaged groups, such as women, lower castes and ethnic groups, but also by having elite groups compensate marginalized groups (Haider, 2009).

3.4.2 Resource maximization

161 In most cases, local people are aware of flood events and have their own culture of coping. Such indigenous knowledge inherent to the community is an important existing resource. Community-based flood-management strategies need to adopt, build upon and strengthen this local knowledge. Further promotion of indigenous knowledge and skill is important in IFM.

162 The Bicol region in the eastern part of the Philippines is an example of such a culture of coping and preparedness. This is due to the community's exposure to multiple, frequent, violent and devastating natural hazards such as super-typhoons and volcanic eruptions. Natives of the area are well prepared to face typhoon hazards five to six times a year, along with the consequences of living in the presence of an active volcano, Mount Mayon. The local authorities, in cooperation with communities, have achieved a remarkable "zero casualty" rate through three volcanic eruptions (UNCRD, 2004).

163 On the other hand, some communities experience severe floods with very long intervals between them. In such cases, local coping mechanisms may lose their momentum. Keeping a community's coping capacity constant requires continuous investment in public awareness, based on scientific understanding of the phenomena.

164 In the case of exceptional floods, external support is generally expected to compensate for overwhelmed community coping capacities. In such cases, external assistance should focus on enhancing the inherent coping mechanism made up of local resources and capacities. Moreover, the provision of complementary resources to deprived communities should emphasize the development of a culture of vulnerability/risk reduction on the one hand and a culture of water on the other. Poorer communities with limited resources have a tendency to invest only in immediate coping mechanisms rather than in a long-term risk-reduction culture. **Table 3** provides a framework for assessing existing community practices.

Table 3 — Check sheet for community practices

Items to be checked	Rating of practices		
	Regularly	Seldom	Not practiced
Explanation of causes and effects of disasters; geographical, scientific and physical considerations			
Explanations of environment and human interaction and its relationship to disasters; social, economic, cultural and political considerations			
Discussion of sources and applications of disaster information, particularly the elements of risk-mapping EWSs			
Exercises on disaster scenario-estimation of potential effects of disasters and what to do in relation to this scenario			
Discussion of lessons learned from previous disasters and what improvements may be necessary			

3.4.3 Motivation for initiating community participation

165 In many vulnerable communities, experience shows that flood issues are not always a high priority compared to daily necessities such as employment, water supply, sanitation facilities and security. This can make the community passive about flood risks, since floods could be seen as remote occurrences, thus making it more vulnerable to floods. To avoid such conditions, communities need to be motivated to maintain their resilience. Socioeconomic incentives,

systematic awareness and capacity-building, social dialogue and higher active involvement (i.e. not only as "beneficiaries" but also as overall active protagonists, as through a crowdsourcing approach) are the best ways to motivate community participation. Better understanding begets higher aspirations among people, which is essential for motivation and sustainable ownership of activities. Regular information on important structures and locations, such as dykes and lifelines, make the community aware of the risks and enhance its interest in participating in flood-management activities. In a broader way, it could be important to promote participatory vulnerability/risk mapping exercises and their periodical update.

A | Shared vision for participation

166 It is important for every stakeholder and community member to have a common vision, leading to a sense of shared ownership and motivating community action. A case study in Bangladesh examined community-based activities primarily motivated by regional development (WMO, 2004). The raising of yards or homesteads through landfill not only safeguards them against flooding but also results in long-term livelihood benefits. Improvement of economic status and accumulation of assets from activities related to floods creates additional development opportunities for a community. This synergy effect is a good example of IFM, in which the objective is not only to reduce losses from floods but also to maximize the efficient use of floodplains (WMO, 2004).

B | Sense of ownership

167 A sense of ownership in community development is described as a concept to assess whose voice is heard, who has influence over decisions and who is affected by the process and outcome. Applying an ownership approach can help to understand how the strategic interests and actions of individuals or organizations at local level contribute to community flood-risk management efforts. In addition, the potential for ownership can be understood in part by examining the capacity for, and quality of, trust. Whether or not an ownership approach advances the field, especially regarding community flood-risk management planning and practice, is still under debate. (WMO, 2004; Lachapelle, 2008)

168 Involving a community in mapping and planning gives them a sense of ownership, making them willing to participate in operation, maintenance and execution of flood-management programmes. Community-managed schemes, accompanied by an appropriate devolution process which clearly defines the transfer of responsibilities from the central government to local agencies, are more sustainable than centrally managed schemes. Lessons learned from FAO projects in Afghanistan, Pakistan and Zambia are presented in WMO, 2006.

C | Motivation through economic incentives

169 One of the policy schemes using economic incentives to motivate community-based activities is flood insurance with a community-based rating system (FEMA, 2015). In the USA, in 1968, the National Flood Insurance Program (NFIP, 2015) is a federal programme enabling property owners in participating communities to purchase insurance as protection against flood losses. This is in exchange for state and community floodplain-management regulations that reduce flood impacts. NFIP requires communities to maintain a minimum level of floodplain management

for its residence to be eligible to purchase flood insurance. It established the Community Rating System **(CRS)** to encourage communities to exceed these minimum requirements.

170 For CRS-participating communities, flood-insurance premium rates are discounted in increments of 5% from classes 10 to 1. For example, a *Class 1* community will receive a maximum discount of 45% on premium, while a *Class 9* community will receive a minimum discount of 5% and a *Class 10* community does not participate in CRS. CRS classifies local communities based on 18 creditable activities, organized under four categories: public information; mapping and regulations; flood damage reduction; and flood preparedness (NFIP, 2015; MSD, 2012) Participation in this programme is voluntary, and only 20–30% of those eligible participate (WMO, 2004b). Even so, economic incentives to enhance motivation remain an option worth considering.

D | Systematic training

171 Training enhances the capacity of individuals or groups to achieve their full potential and contribute to a specific cause (UNCRD, 2004). Achieving full potential for flood management includes:

- Clear knowledge about the floods
- Initiative to put the knowledge into practice
- Enhanced capacity to respond to, and recover from, floods
- Learning through trial and error for further improvement

172 Training is an essential component in enhancing the sustainability of community-based flood management. Case studies have found that there is no general approach to be taken; training approaches vary in accordance with the objectives of the project and the needs of a community. In Bangladesh, the Community Based Disaster Management Project (Oxfam, 2007) arranges extensive training for capacity-building of Local Project Society **(LPS)** members and links LPS with other development agencies and local government in order to achieve sustainability of interventions (UNCRD, 2004).

173 The six steps of a training cycle may be tailored to community activities **(Annex III)**. Training is effective when the conceptual design, objectives, methodology and language are planned and adjusted in response to the demand and needs of local communities.

3.4.4 Institutional linkages

174 Communities face their own limitations when coping with shocks from floods or other disasters and meeting needs through an isolated community-based approach. Combatting flood risk demands cooperation between State and regional authorities and communities due to the scale of the threat and levels of investment required for flood defence. The nature of the duties assumed by public agencies at the village/municipal, regional and national levels, and the manner in which they discharge those duties for public benefit, play a major part in determining communities' and households' protection from, or exposure to, floods. Self-reliance can play its part, but it is not self-sufficient; external support is required.

175 Community-based approaches often build up expectations of continued resources and on-going opportunities for investment in communities. In the absence of local and national government resources, the end of donor funding can signal the end of community activities. This can result in disillusionment with community-based approaches and dissatisfaction with local and national authorities. It is thus important that community initiatives are linked to government structures and that some system of handover is established in advance, with governments assuming responsibility for donor funding and launching community-driven programmes.

176 Mechanisms linking communities together may thus be required in order to determine design and implement common flood-management projects. For resilient and sustained flood management, local communities should be linked both horizontally with other communities and vertically with local, regional and national governments and external development partners (Haider, 2009).

A | Horizontal linking – other communities

177 Community-based approaches can be extended to build horizontal linkages across communities enhancing the social capital of their members. This can be done through the sharing of experiences and peer-to-peer learning and knowledge transfer that also help to promote capacity-building. Study tours, for example, bring together community members by rotating host communities for ongoing discussions, sharing of issues and celebration of achievements.

178 They have been shown to be effective in improving programming through shared learning and fostering relationships between diverse societal groups. This also applies to mentoring, whereby weaker communities and community institutions are matched with those which have achieved stronger results. Such exchanges have been shown to be effective in transferring skills, replicating good practices and building horizontal linkages between previously isolated communities (Haider, 2009).

B | Vertical linkages – local and national government

179 Long-term integration of a community-based approach into government structures, planning and budgeting cycles helps gain government support. In addition, seeking a strong sponsor within national leadership for community-based approaches make a significant difference in strengthening the approach by articulating its importance to national recovery.

180 Extending community-based initiatives across the country requires the support of local and national government and also establishes linkages and partnerships between communities and government. A gradual process of scaling up provides time and space for government to become more familiar with, involved in, and supportive of, community-based approaches. This is the case even where government institutions are weak and do not have the capacity or financial resources to provide tangible support.

181 In some cases, local and national authorities may feel threatened by participatory structures, community empowerment and the prospect of well-financed parallel structures. In the absence of efforts to include local and national authorities, they may resist, and seek to block, the implementation of community-based programmes. In order to avoid mistrust and non-

transparency, both government and community activities need to be linked and to acknowledge each other's roles and responsibilities in creating flood-resilient communities (Haider, 2009).

182 Similar situations are applicable with respect to some private funding mechanisms. There are many private charity organizations and individual philanthropies that usually provide funds for emergency response. Linking community-based approaches to these private funding mechanisms is a mechanism for obtaining reliable support to sustain the community system in the long run.

3.5 Flood management in a changing climate

183 A variety of climatic and non-climatic processes influence flood processes and result in riverine floods, flash floods, urban floods, glacial lake outburst floods and coastal floods. Flood magnitudes depend on precipitation intensity, volume, timing and phase. Antecedent conditions of rivers and drainage basins (frozen or unfrozen, saturated soil moisture or unsaturated soil moisture, for example) and their status also contributes to the occurrence of floods.

184 The climatological parameters that are likely to be affected by climate change include precipitation, windstorms, storm surges and sea-level rise. Climate change can result in an increase in intensity and frequency of precipitation, causing greater peak runoffs but less groundwater recharge and the occurrence of extreme climate events. Receding glaciers, melting permafrost and a change in precipitation from snow to rain are also likely to affect seasonal flows.

185 Communities are often already partially aware of water-related hazards that accompany climate change but they need to better know the full range of possible changes. These hazards can result from too much water (causing floods, erosion, landslides, mudslides, etc. in land-degraded areas) or too little water (causing droughts, forest fires, loss of wetlands or other habitats, saline encroachment, etc.) and biological and chemical pollution of water quality and in-stream ecosystems. The participation and consultation of communities are essential to build their resilience and capacity to adapt to long-term climate trends and unpredictable climate shocks and their impacts on individuals, community assets and livelihoods.

186 Planning for climate change adaptation requires the development of clear strategies, as well as the mobilization of communities to build resilience to extreme weather events. Communities must become aware not only that they could be facing problems from climate change in their daily lives, but also that, by participating in the development of adaptation strategies, they can play a part in the solution to these problems[9].

187 The challenge is to involve people in long-term developments and policy goals and to connect the actions needed to deal with climate change to people's everyday needs and priorities.

9 International workshops on community-based adaptation to climate change have been held in Dhaka, Bangladesh, in 2005, 2007, and 2008, and in Dar es Salaam, United Republic of Tanzania, in 2010.

Box 5 — Community-based adaptation and advocacy in coastal Pakistan

The coastal area of Pakistan is one of the largest tomato-producing regions in Asia but is now waterlogged and can barely sustain agriculture. Extreme weather events have persistently affected the coastal areas of Badin, often provoking humanitarian disaster. The prospect of global warming in delta regions brings added problems, including saltwater intrusion of crops and the increased risk of extreme climatic events.

In 2008, Oxfam GB in Pakistan undertook a community-based project to better understand the implications of climate change for communities living in the Badin coastal area. It covers two villages: Mohammad Ali Chandio and Khamoon Mullah, in the Union Council of Bhugra Memon in Badin District. This area is home to some of the poorest people in Pakistan. Communities here have seen profound and bewildering changes to their environment. Mismanagement of natural resources has contributed to their plight. Large swathes of what was productive land are waterlogged, salinized or parched. Seawater intrusion is now a fact of life and coastal habitats, essential for the well-being of marine resources and livelihoods, are under enormous stress.

The Project has been divided into two components: adaptation measures and advocacy activities. The community adaptation component provides benefits directly to the most vulnerable communities. Advocacy activities consist in initiating dialogue for policy change to help coastal communities adapt to climatic changes.

The Project aims to improve the capacity and sustainability of existing resources, empowering affected communities with their own adaptive capacity for the foreseeable future. It mobilizes human resources more effectively and ensures that communities are better prepared to deal with both extreme and unpredictable events and stresses that are set to increase over time. Despite a lack of technical knowledge and information, the communities know their areas well and, if provided with the required technical assistance, will be able to recognize problem areas and act accordingly. Knowledge of their land and climatic patterns, combined with technical know-how, will enable communities to be better prepared for the future and to fight prevailing poverty through adaptation to climatic changes.

(Oxfam International, 2009)

188 Community participation programmes should provide facilitation processes that will help participants increase their own awareness of climate change adaptation, understand possible responses and design and implement their own responses. An IFM approach that is robust and adaptive is the best way to tackle flood hazards induced by climate change. Flood-risk assessments, which form an essential element of such approaches, should incorporate climate change effects on the variability and magnitude of floods and the populations at risk. The APFM tool Flood Management in a Changing Climate (WMO, 2012) provides adaptation options for flood management in changing climate scenarios.

3.6 Suggested steps

189 Required and appropriate community participation varies according to the situation. For the purpose of this Tool, steps quoted in case studies have been reproduced in this section. Steps followed for the flood management/mitigation are patterned after the basic methodology in organizing communities for flood resilience. Organizing communities is just the first step towards effective participation in these activities. The goal of community participation is to strengthen communities and transform vulnerable or communities at risk into flood-resilient communities or strengthen this change. Based on the community contexts and organizational mandates, the

process and requisites for organizing community participation in flood management are shown below (with reference to the six steps of IFM basin planning) (WMO, 2006).

- Process design
  - Identify the stakeholders/social actors related to a given area (a territorial community), their activities, their knowledge and resources
  - Draft, through a participatory process, a shared vision that reflects both the community's needs and concerns and the context
  - Launch a two-way public awareness campaign to keep the community informed and to ensure community participation in decision-making, implementation and review
  - Identify information required and develop a data-collection methodology
- Vulnerability and risk assessment (to be presented in the form of maps, tables and graphs)
  - Understand floods through historical records or from the stories of those who experienced them (existing local knowledge)
  - Create a database inventory of:
    - Current land-use practices
    - Potential future land-use patterns
    - Patterns of human settlement
    - Location of resources (natural and man-made)
    - Map the natural courses of the river
  - Undertake hazard assessment from a multi-hazard perspective
  - Undertake a vulnerability assessment (in relation to floods) in the same area
  - Check to ensure that the risks identified are the same as those perceived by stakeholders (or fill the gap)
  - Facilitate risk assessment at the community level and determine the communities at risk
- Problem analysis
  - Conduct a capacity assessment
  - Identify the human factors that contribute to flooding (both in a positive and a negative way)
  - Identify floodplain areas in terms of their risk level with respect to different magnitudes of floods
- Setting goals
  - Determine objectives based on risk assessment results and vision
  - Decide scope of community activities. Goals are largely set by regional development objectives (WMO, 2013e) and driven by the need to reduce flood risks and vulnerability, secure livelihoods, sustain economic development and preserve environmental quality (ADPC, 2002)
- Draft an action plan
  - Evaluate various possible measures to address flood risks within the given scope, such as land-use planning, building codes, zoning, conservation, protection, drainage improvement, risk-sharing and flood-risk contingency plans
  - Develop an action plan listing specific activities, roles and responsibilities of key stakeholders

- Set the timeline and the expected results
- Carry out economic analysis and financing arrangements
- Set monitoring, evaluation and review procedures
- Widely disseminate the draft plan, particularly to all those who are directly affected

— Implementation at the different stages (prevention, preparedness, response, recovery) (ADPC, 2002b)

- Conduct simulation/mock drills with the participation of all stakeholders to identify flaws, and correct the draft plan accordingly;
- Approve the plan through community consultation and involvement;
- Form/strengthen community institutions (for example, grassroots flood management/ response organizations, CBOs, groups or volunteers) to mobilize the community at large;
- Implement short-, medium-, and long-term community activities as agreed;
- Perform social audit/participatory monitoring and evaluation: continuous improvement of participation, documentation and dissemination of good practices for replication.
- Update vulnerability, hazard and risk assessments, whilst maintaining a participatory process.

4 CONCLUSIONS AND RECOMMENDATIONS

190 The general objective of community participation in flood management is to save lives and reduce damage to property while also striving to increase the benefits derived from flooding. This is achieved through helping communities decrease their vulnerability and increase their resilience and, in this context, their capacity to reduce the negative impacts of floods and provide awareness of how to improve positive effects of flooding. Participation of community members and related stakeholders in flood management is essential in sustaining the flood risk-reduction process and for the community to meet intended aims and targets. Organizing community participation does not seek perfect implementation at the outset.

191 It is expected that communities will gradually build up flood-resilient activities through continual efforts. To develop and establish general plans and measures, sustained efforts, such as business continuity, are required. Continual effort is a flood-risk management technique that is used to prepare for, respond to, and recover from, flood disaster.

192 Developing and implementing participatory community-based activities for sustainability in IFM requires addressing the following issues:

- Community participation is fundamental and essential for each stage of flood management, i.e. prevention of, preparedness for, response to, and recovery from, floods. It seeks to maximize benefits through integration with related development activities within the river basin as a whole;
- Natural factors that affect the way a community perceives and responds to flood risks can be described in terms of the magnitude (scale, duration, and intensity), frequency and variability of flood hazards;
- Socioeconomic factors, such as poverty, livelihood profile, cultural beliefs, status of weaker social groups and the rights of minority and ethnic groups, influence a community's willingness to participate;

- Community participation at all phases of flood management (flood risk assessment, planning, implementation and evaluation of risk management measures) is key to success.
- Community activities can be successfully valorised at every step in flood management (as exemplified in **Chapter 3**):
  - Prevention: work for building consensus and collaborating with other development activities;
  - Preparedness: building capacity and contingency planning to cope with possible flood disasters;
  - Response: generating synergy effects of coordinated and consolidated action to overcome the negative effects of flood disasters;
  - Recovery: creating flood-resilient communities through enhanced cooperation and participation.
- Community participation in flood management should be organized according to a community's needs and social cohesion, as well as the effectiveness, efficiency and practicality (for implementation) of possible measures;
- Strategic approaches to organizing community participation integrate four perspectives: resource maximization through integrated use of local knowledge; an effective participatory process with clear understanding of each stakeholder's expected role and degree of involvement; motivation through a shared vision; sense of ownership development and socioeconomic incentives; and institutionalization of community approaches to link the community horizontally to other communities and vertically to government and private funding mechanisms;
- Organizing community participation can be adapted from the six steps of IFM basin planning: process design; risk assessment; problem analysis; setting goals; drafting an action plan and implementation;
- Organizing community participation is a gradual process seeking to build flood-resilient communities through continuous efforts. Continuous and sustainable efforts are required to develop and establish general flood-risk plans and measures;
- There is no single approach that should be used when organizing/strengthening community participation in flood management; an approach must be formed in the light of a community's specific needs and context;
- Incorporation of the minimum characteristics of a CBDRM programme in designing a community-based flood management programme and projects is necessary to sustain community-based flood management activities in the long run.

ANNEX I — ACRONYMS

ADPC	Asian Disaster Preparedness Centre
BBB	Build Back Better
Cap-Net UNDP	Capacity Development in Sustainable Water Management
CBDRM	Community-based disaster risk management
CBO	Community Based Organization
CCA	Climate Change Adaptation
CFMC	Community Based Flood Management Committees
CRS	Community Rating System
DAMPA	Damayan ng Maralitang Philipinong Api
DMC	Disaster Management Committee
DRR	Disaster Risk Reduction
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FCO	Flood Citizen Observatory
FEWS	Famine Early Warning System
GMRP	Guyana Mangrove Restoration Project
IFM	Integrated Flood Management
IFRC	International Federation of Red Cross and Red Crescent Societies
IWRM	Integrated Water Resources Management
LPS	Local Project Society
MFI	Micro Finance Institution
NFIP	National Flood Insurance Program

NGO	Non-Governmental Organization
PCVA	Participatory Capability and Vulnerability Analysis
PID	Participatory Integrated Development
PRA	Participatory Rural Appraisal
RBO	River Basin Organization
RRA	Rapid Rural Appraisal
SOP	Standard Operating Procedures
UNISDR	United Nations office for Disaster Risk Reduction
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response

ANNEX II — PHASE-WISE COMMUNITY ACTIVITIES FOR FLOOD RISK REDUCTION

Flood risk reduction phases	Community activities
Flood prevention	— Advocate formulation of legal instruments — Promote land-use planning and integrated river basin management — Enforce building codes and flood zoning — Share risk through insurance and livelihood diversification — Strengthen flood defence structures
Flood preparedness	— Form Community Flood Management Committee (CFMC) — Assess flood risk — Organize training for capacity-building at community and individual levels — Prepare flood-risk contingency plans for rescue and evacuation, as well as flood-proofing and flood moderation — Organize simulation exercises/drills to facilitate effective response — Make provisions for addressing unforeseen eventualities — Monitor and report community activities — Manage information for future reference
Flood response	**Pre-flood responses** CFMC-level responses — Prepare cultivation of fish and vegetables — Prepare security and public order — Household-level responses — Shift valuable and movable possessions to higher ground — Stock emergency supplies and equipment and prepare evacuation **During flood responses** Surviving floods — Improve housing conditions (build makeshift platforms, protect from erosion) — Secure safe food and drinking water (storage, handling and water purification) — Maintain nutrition supply, healthcare and hygiene — Safeguard agricultural production (early harvesting, floating cultivation, cage fishery, shifting livestock to higher ground) — Maintain mobility (temporary bridges, rafts and boats) — Establish liaisons (local authority, aid organizations, family members and relatives, neighbouring communities) Escaping floods — Operationalize the CFMC flood-risk contingency plans

Flood risk reduction phases	Community activities
Flood response *(cont'd)*	— Prepare temporary makeshift flood shelters — Manage day-to-day flood shelter/camp management activities — Promote community welfare services (through psycho-social counselling, law and order, income generation, health-care facilities, education)
Flood recovery	— Return home — Assess and prepare an inventory of damage/losses — Conduct needs assessment and identify the most needy households for rehabilitation — Prioritize rehabilitation of infrastructure, including school and health service buildings, roads, communications and electricity — Run compensatory classes for loss of teaching time — Restore health care, hygiene and sanitation — Rehabilitate flood shelters/camps — Coordinate and manage reconstruction and rehabilitation programmes — Adopt flood-resilient agricultural production and technologies — Revive local economic activities to enable flood resilience
Note: *Details of flood preparedness, response and recovery activities are illustrated in* WMO (2004)	

ANNEX III — STEPS FOR COMMUNITY TRAINING

1. Know the situation	— Hydrological and hydraulic conditions — Demographic and social background of the community — Type of major floods facing the community and their frequency — Extent damage due to past floods — Government and other stakeholders' roles in early warning, disaster preparedness and disaster emergency response — Community's survival techniques and coping mechanisms — Kinds of initiatives for flood mitigation, if any
2. Identify the local resources	— Practice of culture of coping with floods — Structural and non-structural resources (dam, dyke, warning system) — Participation and support of people in the community — Experienced local people — Support from local government authorities and external organizations — Stakeholders who can be or are ready to be involved — Educational background (literacy, etc.), training materials
3. Design the training course	— Ensuring full and equal participation, especially of the most vulnerable (women, elderly, disabled, minorities, etc.) — A broader development effort for reducing causes of vulnerability — Defining the roles and relationships of identified stakeholders — Underlining importance of developing community assets for socioeconomic conditions of the community, especially diversification of livelihood systems — Set-ups for training, such as the number of participants, duration of training, available methods, contents with main points
4. Conduct the training	— Significant role and responsibility of vulnerability reduction — Identifying potential stakeholders and encouraging relationships with them — Assessment of the benefits of accumulating tangible and intangible assets for vulnerability reduction — Encouraging the integration of activities into regular development planning and budgeting — Facilitating problem identification through participation — Effective methodology, such as group exercises and role-playing
5. Assess the impact of the training	— Attitude change in building up capacity to take initiative in the community and reducing dependence on external help — Active involvement in decision-making and empowerment in accessing potential resources according to requirements — Formal institutional arrangements among stakeholders to improve accountability and transparency — Motivating communities to initiate activities on their own for flood preparedness and response

6. Learn the lessons	— Behaviour changes to minimize vulnerability to floods — Methods and materials to motivate participants that are user-friendly and accepted by participants — Each stakeholder's degree of involvement and effective role in future activities — Suggestions for a sustainable approach to cope with floods at the grassroot level — Achievement in terms of continuing activities

ANNEX IV — FURTHER REFERENCE FOR ORGANIZING COMMUNITY PARTICIPATION FOR FLOOD MANAGEMENT

Country and region(s)	Brief description and reference information
— Africa (Madagascar, Sierra Leone, South Africa, Zambia, Zimbabwe, East Africa, Ghana, Mozambique, Rwanda) — Asia (Bangladesh, Cambodia, India, Lao PDR, Pakistan, Philippines, Sri Lanka, Turkey) — Latin America (Belize, El Salvador, Guatemala, Peru, Venezuela, Belize, Bolivia, Columbia, Costa Rica, Dominican Republic, Honduras, Panama) — SIDS (Cuba, Jamaica, Solomon Islands, Vanuatu)	IFRC (2016) shows case studies for community risk assessment (CRA) that place communities in the lead role for the assessment, active planning, implementation and evaluation of activities aimed at reducing the community's risk in the face of disasters.
Bangladesh — Melandaha Upazila — Nawabganj UpazilaIndia — Assam- Bihar — West BengalNepal — Saptari District — Rautahat District	WMO (2005) describes the regional pilot project "Community Approaches to Flood Management" developed by APFM. This pilot project was initiated in November 2002 jointly with the Global Water Partnership South Asia (GWP SAS). Community Flood Management Committees were established in selected communities – three in India and two each in Bangladesh and Nepal. Manuals describing the specific activities carried out on community-based flood management were prepared and translated into local languages. During the 2004 monsoon season, the manual guidelines were tested in the field and consequently, they became useful in reducing loss of lives and property. In parallel, a draft strategy for community-based flood management was developed.
Bangladesh	WMO (2003) is a case study on flood management in Bangladesh. In addition to the improvement of the flood forecasting and warning system in the study area, more emphasis was placed on other non-structural means for flood mitigation, in particular the adoption of a policy of involving communities in flood management.

Country and region(s)	Brief description and reference information
Bangladesh — Tongi- Gaibandha	The project *"Bangladesh Urban Disaster Risk Reduction"* (BDRCS, 2015) builds on existing indigenous techniques and uses collective social organizations to develop community-based flood-mitigation strategies.
Cambodia — Kampong Cham — Kandal — Prey Veng	Case study *"Community-based Flood Mitigation and Preparedness Project"* (World Bank, n.d.) This project aimed to establish sustainable, replicable non-government mechanisms for disaster mitigation and preparedness with a focus on flooding. This was accomplished through: — empowering communities to develop solutions to flooding; — providing communities with a higher degree of security from natural disasters; — training local village volunteers in disaster preparedness concepts and techniques; — establishing village disaster committees to implement participatory processes for solutions to reduce the impact of natural hazards on their communities; and — mobilizing funds to create or refurbish disaster preparedness infrastructure.
Canada	Case study (WMO, 2004d) After the flood in 1997, this project, which is located in Canada, demonstrated that a comprehensive approach that included structural and non-structural methods should be favoured, along with participatory approaches.
Central and Eastern Europe	WMO 2005b is a regional project that aims at increase community resilience to cope with the effects of flash floods, especially in circumstances where early warnings are not readily available.
Cuba	Case study: Prevention activities, preparedness, response and recovery to protect the population, the economy and the environment from the destructive effects of disasters (Pedroso Herrera, 2015).
Ethiopia	The case study WMO, 2003b was based on the principles of the Ethiopia Water Resources Management Policy and prepared with input from regional representatives. Communities had decisive roles during the planning and implementation phases, especially regarding drinking-water supply. This is particularly important in the Awash Valley, where the population are mostly pastoralists and where controlling floods to avoid the damage of grazing areas is not appreciated.
Fiji	Case study (WMO, 2004c) The National Disaster Management Act of 1998 gives authority to, and provides institutional arrangements for, all actions related to disaster management and related activities and defines the functions and duties of government and relevant agencies. Community cooperation and participation are recognized as important in the success of flood mitigation programmes.
Italy — Piemonte region	Case study (WMO, 2003c) — Local communities were strongly involved in flood mitigation in three different activities: — design of the emergency plan at local scale; — elaboration of such plans, and — involvement in local groups of civil protection volunteers in emergency actions during critical events as defined in the emergency plans.
Japan	Case study (WMO, 2004f) After the heavy rains in Tokai in 2000, comprehensive flood-control measures were formulated, adopted and implemented in consultation with communities.

Country and region(s)	Brief description and reference information
Kenya	Regional project (WMO, 2004e) The National Flood Management Strategy For Flood Management in the Lake Victoria Basin (Kenya) was developed by local experts in close collaboration with WMO and APFM.
Mali — Niger River Inland Delta	Case study (WMO, 2004g) In 2002, as part of the Water Code, problems related to flood management were considered and the responsibilities of the government and of decentralized units such as communes, district councils and regional councils were defined. The process of decentralization (with the creation of communes) modified some of the responsibilities related to water resources management, which subsequently needed to be reflected in the laws and regulations.
Mauritania — Lower delta of the Senegal River	Case study (WMO, 2004h) The management plan for the Diawling National Park, located in the lower delta of the Senegal River, was created following a community based approach. It demonstrated that involving local communities in the management of protected wetlands is feasible and beneficial in environmental terms.
Nepal	Pilot project (NRRC, 2012) The Nepal Risk Reduction Consortium (NRRC) is a unique arrangement that joins humanitarian and development partners with financial institutions in partnership with the Government of Nepal in order to reduce Nepal's vulnerability to natural disasters. Based on the Hyogo Framework and Nepal's National Strategy for Disaster Risk Management, the NRRC has identified five flagship priorities for sustainable disaster-risk management. Flagship priority 4 is dedicated to integrated community-based disaster risk reduction (CBDRR). It aims to build a common understanding and approach among the many organizations contributing to CBDRR activities, track progress against national targets and encourage greater investment for scaling up CBDRR across the country.
Pakistan	Case studies (WMO, 2004i; WMO, 2003d) The Third National Flood Protection Plan (1998–2012) demonstrated the applicability of an IFM approach at both the national and local level and clearly spelled out the concept of community activities in all aspects of flood.
Philippines — Pinagbayanan — Calauag in Quezon province — Catalina — Minalin — Pampanga — ObandoBulacan	Pilot project (UNCDR, 2004) Research and field testing for tools and guidelines on sustaining community-based disaster management (CBDM).
South America — Brazil — Uruguay	Regional project (WMO, 2004j) The project activities include an evaluation of the possible approaches to flood management and duly assess both structural as well as non-structural measures with active involvement of the local communities.
Turkey — North-western Black Sea region	Case study (WMO, 2004k) Local communities needed to be involved in effective solutions based on land-use control, zoning, building ordinance, modifications in building codes, flood information programmes with major restructuring of legal systems and institutions.

Country and region(s)	Brief description and reference information
United Kingdom — Parrett River Basin	Case study Following a severe summer flood in 1997 and a 1999-2000 winter flood, a wide range of stakeholders participated in decision-making in the Parrette Catchment Project. www.floodmanagement.info/publications/casestudies/cs_uk_syn.pdf
USA	Case study (WMO, 2004l) Comprehensive historical review of flood management in the Mississippi and review of 30 years of the National Flood Insurance Program (NFIP), in which participating communities regulate land use in the floodplain.
Vietnam	Pilot project (UNCRD, 2004) Field testing for CBDM guidelines and tools implemented by the United Nations Centre for Regional Development jointly with the Canadian Centre for International Studies and Cooperation, which has a large experience in managing projects on CBDM, adaptation to climate change and emergency response.
Zambia	Regional project (WMO, 2007) The IFM strategy for the Kafue basin could be used as a model for developing a flood-management strategy for the whole of Zambia.
Zimbabwe — Zambezi basin	Case study (WMO, 2004m) The involvement of a broad spectrum of the population in the management of floods, with particular emphasis on management at the local level, made flood management much easier in comparison with the traditional centralized approach.
Note: Non-exclusive, in alphabetical order.	

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