

Day 2

Session/Activity	Activity time (minutes)	Cumulative time of session
Session 5: Vulnerability and Flash Flood Risk Assessment		
5.1 Methods of vulnerability assessment	60	60
5.2 Flash flood risk assessment	30	90
Session 6: Local Knowledge on Disaster Management		
6.1 Concept of local knowledge and its role in disaster management	35	35
6.2 How to identify and document local knowledge related to disaster management	15	50
6.3 Advantages and limitations of local knowledge in disaster management	15	65
6.4 Methods of transferring scientific knowledge to the community	10	75
Session 7: Community-Based Flash Flood Risk Management		
7.1 Importance of community level flash flood risk management	10	10
7.2 Process of community participation in flash flood risk management	20	30
7.3 Structure, responsibilities, and empowerment of the CFFRMC	15	45
7.4 Characteristics of good community governance	05	50
7.5 Role of government in community flash flood risk management	10	60
Session 8: Gender Perspectives in Disaster Management		
8.1 Concept of gender and gender differences	10	10
8.2 Gender and flash flood risk management	15	25
8.3 Gender-sensitive flash flood risk management	20	45
Session 9: Social Hazard Mapping and Risk Assessment		
9.1 Concept and importance of social hazard mapping	10	10
9.2 Process of social hazard mapping	35	45
9.3 Process of participatory GIS mapping (PGIS) of hazards	15	60

Session 5 Vulnerability and Flash Flood Risk Assessment

Time: 90 minutes

Objective

To understand vulnerability and risk assessment by:

- ▶ Understanding the concept of vulnerability
- ▶ Becoming familiar with the methods of vulnerability assessment
- ▶ Learning about risk levels and risk assessment

Activities

Activity 5.1: Methods of vulnerability assessment

Time: 60 minutes

- Step 1** Engage the participants in a short interactive question and answer session asking 'what is vulnerability?' in the context of flash floods.
- Step 2** Clarify the concept of vulnerability and the levels of vulnerability. Present the different schools of thought on vulnerability analysis.
- Step 3** Present both the physical and social aspects of vulnerability assessment and discuss the assessment methods.
- Step 4** Clarify the concepts of susceptibility and exposure. Explain the process of deriving vulnerability levels.
- Step 5** Clarify the concept of exposure and discuss how exposure indicators are derived and expressed, e.g., high, medium, and low.
- Step 6** Discuss socioeconomic vulnerability. Highlight adaptive capacity and its indicators.
- Step 7** Discuss how quantitative adaptive indicators are converted to qualitative categories.
- Step 8** Explain how physical and socioeconomic adaptive indicators are combined to assess vulnerability levels.

Note to the trainer

Analysis of vulnerability is the third step in risk assessment. Remind the participants that collecting the essential data and analysing hazard are the first and second steps and that these were covered in the previous sessions. Discuss the different schools of thoughts on vulnerability and mention that current scientific thought favours using a combination of biophysical and socioeconomic indicators to get the best overall estimate of vulnerability.

Activity 5.2: Flash flood risk assessment

Time: 30 minutes

The aim of this activity is to bring together the concepts presented in the previous sessions and to show how all of these contribute to the final assessment of risk.

- Step 1** Before beginning with the formal presentation engage the class in a short question and answer session on 'what is risk assessment'? Clarify the concept and clear up any misconceptions.
- Step 2** Review the four levels of hazard and the four levels of total vulnerability (RM 5.1 and Figure 7); review how these are graded (i.e., high, moderate, moderately low, and low).

Note to the trainer

Risk assessment involves quantification of risk through understanding hazard, vulnerabilities, and exposure patterns. Reiterate that it is essential both to understand these aspects and to know how to grade them in order to be able to plan and to conceive strategies for risk management.

- Step 3** Present the method of determining risk levels for risk assessment.

Session 5 Resource Materials

RM 5.1: Vulnerability and methods of assessment

In the context of flash floods, vulnerability refers to the capacity (or lack of capacity) of people to resist or cope with flash flood events. The extent of vulnerability, is expressed in terms of the vulnerability index which has four levels i.e., high, moderate, moderately low, and low.

There are three schools of thought on vulnerability analysis. The first focuses on exposure to biophysical hazards (Heyman et al. 1991; Alexander 1993; Messner and Meyer 2005). The second looks at the social context of hazards and relates social vulnerability to the coping responses of communities, including societal resistance and resilience to hazards (Blaikie et al. 1994; Watts and Bohle 1993; Messner and Meyer 2005). The third combines the two approaches and defines vulnerability as a hazard of place, which encompasses biophysical risk as well as social response and action (Cutter 1996; Weichselgartner 2001; Messner and Meyer 2005). The third school of thought has become increasingly significant in the scientific community in recent years.

Vulnerability has two dimensions – physical and social. Physical vulnerability is a function of susceptibility and exposure.

Susceptibility is the state of being easily influenced by flash flood hazards. The elements most susceptible to flash flood hazards are the elements most at risk to flash floods. The most susceptible i.e., settlements very close to flood plains have a high vulnerability level. Susceptibility can be expressed in terms of a vulnerability index, which can be expressed in either monetary or non-monetary units. The vulnerability index is based on qualitative categories since many elements (such as human lives, ecological species, and landscapes) are difficult to quantify.

Exposure refers to the type, extent, and magnitude of susceptible elements likely to be affected when a flash flood occurs. The exposure indicator depends on the proximity of the susceptible element to the river, river morphology, geology of the location, elevation, return period of the flood, flow velocity, and so on. It is evaluated similarly to susceptibility and it is also expressed in qualitative categories.

Figure 7: Classification of risk level

		Vulnerability level				Risk level	
		High	Moderate	Moderately low	Low		
Hazard level	High					Very high	
	Moderate					High	
	Moderately low					Moderate	
	Low					Moderately low	
						Low	

In a physically vulnerable zone, the extent of socioeconomic vulnerability depends to a large extent on the society's capacity to adapt. Adaptive capacity is both a social and economic in nature. Settlements along riverbanks are vulnerable to flash floods debris fans. Poverty as well as limited access and control over various resources contribute to vulnerability. Adaptive capacity can be expressed either quantitatively or qualitatively. A few quantitative indicators of adaptive capacity include accessibility, availability of health facilities, availability of communication facilities, and income level. Those indicators have to be converted to qualitative categories so that they can be combined with qualitative indicators to estimate the socioeconomic vulnerability of the area in question. The qualitative indicators are those that encompass different risk management measures such as warning systems, loss reduction measures, social awareness, and attitude.

Physical and socioeconomic vulnerability are converted into qualitative categories and combined to obtain the overall total vulnerability, which can also be reported in qualitative categories (e.g., high, moderate, moderately low, low).

RM 5.2: Flash flood risk assessment

A risk-level scale is the product of hazard level assessment and an estimation of total vulnerability. Four levels of hazard and four levels of total vulnerability (high, moderate, moderately low, and low) are used to estimate the risk level.

The scale is derived by making informed but subjective judgments, and in this regard it is similar to the hazard-level scale. Figure 7 shows the risk-levels: very high, high, moderate, moderately low, and low.

Session 6 Local Knowledge on Disaster Management

Time: 75 minutes

Objective

To understand what local knowledge is and what role it can play in disaster management by

- ▶ Introducing the concept of local knowledge
- ▶ Learning the methods needed to identify and document local knowledge on disaster management
- ▶ Identifying the strengths and weaknesses of local knowledge on disaster management
- ▶ Learning how scientific knowledge can be transferred to the community level

Activities

Activity 6.1: Concept of local knowledge and its role in disaster management

Time: 35 minutes

- Step 1** Clarify the concept of local knowledge and then engage class in a short question and answer session where the participants are encouraged to compare and contrast 'scientific knowledge' with 'local knowledge' in the context of disaster management.

Note to the trainer

Clarify how the scientific knowledge approach is top down while local knowledge is bottom up. Local knowledge is subjective; it comprises the beliefs and values of people in a specific place and time. Scientific knowledge is objective and it valid regardless of the context.

What people know is influenced both by what they experience and by the beliefs, worldviews, and values of their community. Indigenous knowledge is part of local knowledge. Local knowledge is a complex adaptive response to internal and external changes. All people have local knowledge, but indigenous people who still live in close harmony with nature have a deep understanding that comes from fine-tuning their understanding about nature and adjusting their practices over time. Their knowledge has been created, recreated, and transferred from one generation to the next. Specific practices based on local knowledge can vary depending on the practitioner's ethnicity, clan, gender, age, wealth, educational status, and personal experiences.

Step 2 Show the short video on local knowledge and flood preparedness in the Eastern Terai of Nepal.

**Note to the
trainer**

About the video

The video shows how the people of the Eastern Terai of Nepal use local knowledge in flash flood and riverine flood preparedness. It also shows how these people live surrounded by numerous different stresses. Practitioners working in the field of flash flood management need to be aware that while communities exist in a given environmental context that this needs to be considered against the backdrop of their own particular socio-cultural, economic and political situation. The hazards of flash floods need to be seen as one of the many natural hazards and other stresses that the community faces.

Step 3 Distribute Handout 6.1 and ask the participants to write down what they understand by 'local knowledge'?

Based on the video presentation and on their own experience, ask the class to write the answer of the following questions:

- What areas are covered by the term 'local knowledge'? How does it cover both environmental knowledge and social and cultural aspects?
- Where is local knowledge located?
- Who in the community has local knowledge?
- How and when is local knowledge produced, transmitted and/or lost?

Step 4 Ask the participants what role they think local knowledge plays in flash flood management.

Step 5 Clarify the importance of local knowledge in disaster management. Specifically mention how local knowledge can be used in flash flood management.

Activity 6.2: How to identify and document local knowledge related to disaster management

Time: 15 minutes

Step 1 Discuss why it is important to document local knowledge.

Step 2 Discuss the four pillars of local knowledge on disaster preparedness.

Step 3 Discuss the process of documenting local knowledge.

**Note to the
trainer**

Reiterate that local knowledge is context specific and that it is not easy to generalise it and apply it to other areas. Clarify that the purpose of documenting local knowledge is not to conserve it, but rather to learn from it in order to create new concepts, methods, or strategies for improved flash flood and disaster management. Local knowledge is documented in the hope of being able to use indigenous methods to strengthen the coping mechanisms that communities use to deal with disasters.

Activity 6.3: Advantages and limitations of local knowledge in disaster management

Time: 15 minutes

- Step 1** Engage the class in a short question and answer session asking them what they perceive to be the links between local knowledge and disaster management. Discuss what can be learned from local knowledge for disaster management.
- Step 2** Discuss the advantages of using local knowledge in disaster preparedness and management.
- Step 3** Discuss the limitations of using local knowledge alone in disaster preparedness and management.

Note to the trainer

When presenting the advantages and limitations of using local knowledge in disaster preparedness and management, try to link the discussion with the video presentation and compare and contrast local activities with external, top-down strategies of disaster preparedness and management.

Activity 6.4: Methods of transferring scientific information to the community

Time: 10 minutes

In addition to local knowledge, it is important to understand the extent to which the community knows about the various scientific methods and information that may be available on flash flood management.

- Step 1** Discuss why it is important to transfer scientific knowledge to the local level. Explain what different means can be used to disseminate information and that it is important to keep in mind that not all means of communication are available or applicable to the same extent in different places or situations.
- Step 2** Discuss with the participants what kind of information it is necessary to disseminate and why. Emphasise that it is necessary to choose an avenue of communication that local people can rely on.
- Step 3** Describe how information creates awareness and leads to changes in behaviour at the local level.
- Step 4** Describe the process of communicating scientific information to the local level and describe the different methods that can be used.

Session 6 Handouts

Handout 6.1: What is local knowledge?

	Key characteristics
What are the different types of local knowledge that are relevant for the implementation of disaster management activities?	
Where is local knowledge located?	
Who has local knowledge within the community?	
How is local knowledge produced, transmitted, disseminated and/or lost?	
How does this knowledge change and why?	
When is local knowledge produced, transmitted, disseminated, and/or lost?	

Session 6 Resource Materials

RM 6.1: Local knowledge and its role in flash flood management

What is local knowledge?

The term 'local knowledge' is used here in its broadest sense; it refers to what the people living with risk know about natural hazards, what they believe, and how they cope with different risk situations. Peoples' practices, their lifestyles, and what they believe, all influence their knowledge on natural hazards. Local knowledge is unique to a given culture and it holistically comprises all of the complex diversity of how that society understands both the visible and invisible. Local knowledge and practices are place specific and can and do evolve; they are complex adaptive responses to change. In many cases, communities have been living with natural hazards for generations and have been able to cope and to adapt in order to minimise, reduce, or avoid the negative effects that natural hazards can have on their livelihoods, properties, and lives.

Flash flood management is a major challenge for both government and non-governmental organisations (NGOs) mainly because of the difficulties associated with accurate forecasting and the short lead-times for issuing warnings. When dealing with flood preparedness and management activities, most agencies tend to favour scientific and specialised knowledge, a great deal of which cannot be assimilated in local contexts and realities. On the other hand, local knowledge can provide information related to the local context, local environmental variability, and specificities; local perceptions of natural hazards; community-valued tradeoffs with respect to risk in the context of multiple stresses; local information on who are the vulnerable groups and individuals. Local knowledge can contribute by giving local advice on safe locations for construction sites (buildings and roads) and by being used together with conventional knowledge for hazard mapping. Local knowledge can also be used to inform: early warning systems, surveys, and other inventories to verify information, as well as to help adapt communication strategies to local understanding and perceptions, and to integrate local values into the decision-making processes. The incorporation of local knowledge in disaster preparedness and management activities can be made cost-effective, efficient, and sustainable. In the HKH, local knowledge is even more pertinent than elsewhere because, since many communities are isolated and remote, local knowledge is often all that is available.

Where can local knowledge be found?

Local knowledge is everywhere: in people's heads, their beliefs, cultural and religious ceremonies, practices, taboos, local rules, songs, and proverbs. Local knowledge resides at the individual and household level as well as at the collective level, gathered and transmitted by community stewards and other key social actors. We all have local knowledge, but it may differ by ethnicity, clan, gender, age, sex, socio-economic group, and educational level.

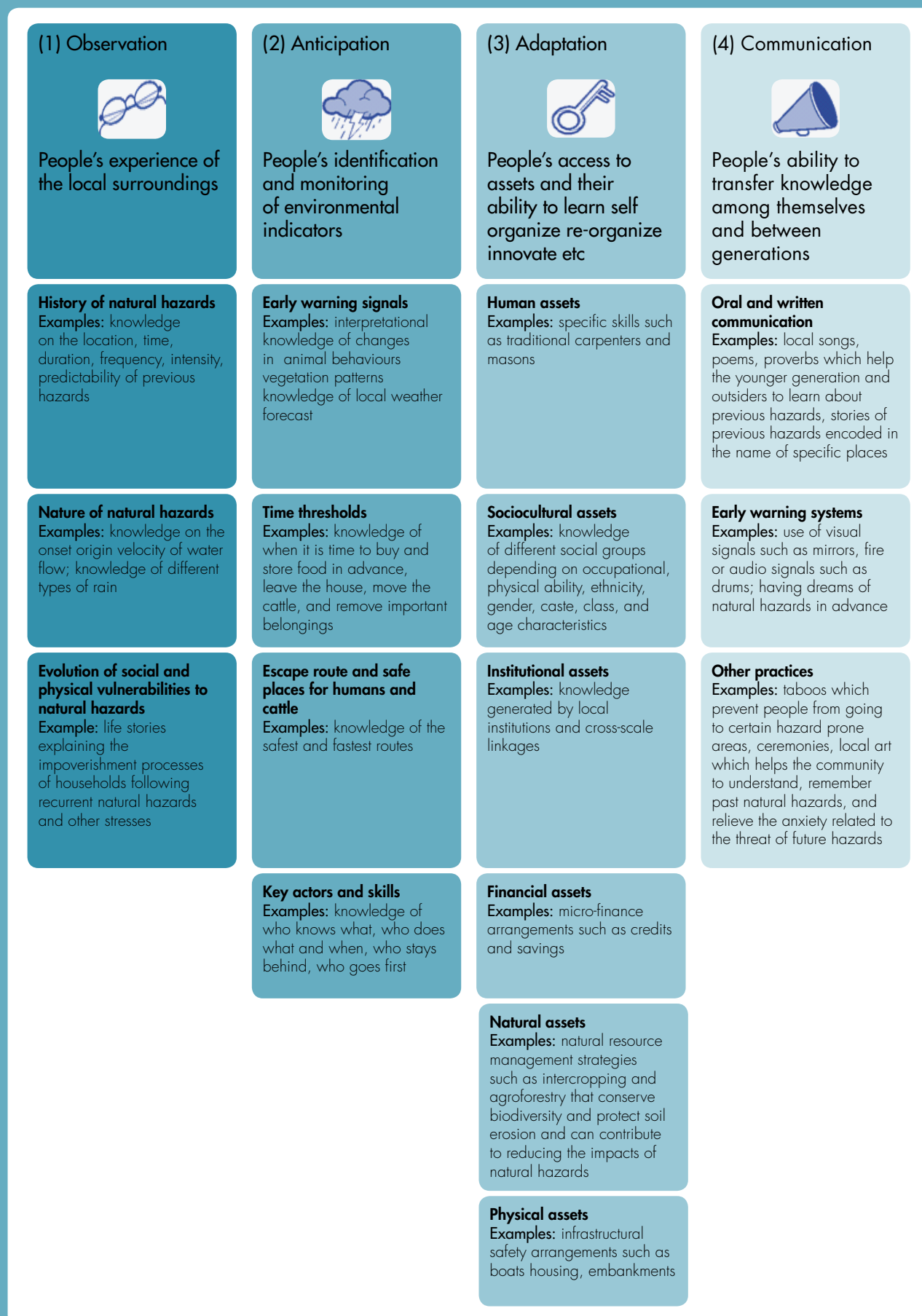
When and how is local knowledge created and transformed?

Local knowledge is dynamic; it is both created and lost over time. Unlike conventional or scientific knowledge, local knowledge depends more on memory, intuition, and the senses than on the intellect. Local knowledge is always gained through experience and is transferred from one generation to the next.

RM 6.2: Identifying and documenting local knowledge

Local knowledge is not instantly available and cannot always be easily documented. To document local knowledge it is first necessary to spend some time with the community to understand everyday livelihood practices and to observe practices, events, and activities that are part of their local knowledge. Figure 8 provides a simple framework describing how local knowledge on disaster preparedness is related to:

Figure 8: The four pillars of local knowledge on disaster preparedness



Source: Dekens (2007)

- people's ability to observe their local surroundings;
- people's capacity to identify and monitor environmental indicators (of an upcoming flood);
- people's ability to develop adaptation strategies for recurrent floods;
- people's ability to communicate understanding of past and present floods.

As a general procedure, practitioners working in the area of disaster management should remember to ask questions related to these four key dimensions to try to understand both what people know about natural hazards in their locality and what they do for disaster preparedness.

In trying to identify and document local knowledge, one should always be open to observing local customs, events, and activities. Documenting local knowledge is a discovery process that takes place by observing people in their day-to-day lives in their own context; it should take place by observation and by using one's own senses much more than by interrogating the community. It is important to observe how people categorise their observations and give meaning to them. The observer/researcher needs to be keenly aware that the act of discovery can be affected by the power relation that he or she has in the community. Research should be reflexive. The researcher needs to be able to put aside his own preconceptions when he observes and interprets what local people do. The researcher also needs to be able to question what he perceives to ensure that he is not filtering the information according to his own socio-cultural bias.

Documentation not only helps to preserve local knowledge; it also helps to inform those wishing to work with communities to strengthen sustainable and equitable local coping mechanisms. Well documented local knowledge also helps to create new concepts, methods, or strategies for improved disaster management.

RM 6.3: Advantages and limitations of local knowledge in disaster management

Local knowledge and practices have several advantages when compared to most external, top-down strategies. When the local knowledge is not taken into consideration and used fully, it is highly likely that the following will result.

- Community dependence on external help can be increased and unsustainable disaster management activities promoted.
- When the situation is not considered holistically and when there is no profound understanding and analysis of the vulnerability context, new vulnerabilities and disasters can be created.
- Projects intended to benefit the entire community may not reach the most vulnerable and disadvantaged.
- Valuable opportunities that could strengthen good local practices and attenuate unsustainable ones for creative and innovative solutions can be missed.
- Misunderstandings, resentments, and lack of trust can develop between the community members and those trying to help them.
- Inappropriate technologies, ideas, or communication strategies can be promoted owing to a misunderstanding of local contexts – the result of which is often a negative impact on the environment and/or the economy.
- Community involvement and ownership may be lacking, and resistance to change may result.
- Monitoring and other disaster management activities can be diminished or totally neglected.
- Possible future relationships on development projects can be irreparably damaged or compromised.

The following are the major limitations or barriers to the use of local knowledge in disaster management and disaster preparedness.

- Local knowledge may be perceived as unscientific and inferior to conventional knowledge.
- People can be fatalistic and often live at risk because of lack of knowledge.
- Local knowledge is difficult to identify, use, assess, validate, generalise, and replicate.
- Local knowledge is often monopolised by dominant groups in the community.
- Some local practices, beliefs, and adaptation strategies are unsustainable and/or not socially equitable.

- As a result of rapid changes in society, local knowledge and practices are increasingly considered inappropriate, irrelevant, or inaccessible.
- Local knowledge lacks credibility within the communities themselves, especially with the younger generations.
- The focus on local knowledge may be a threat to national interests and political structures, especially in authoritarian regimes.
- Some people worry that documentation of local knowledge can make it available to outsiders who can then use it to gain control over communities and their resources.

RM 6.4: Methods and process of information dissemination

Communication is a process whereby information is transmitted by a sender to a receiver via some medium. The receiver then decodes the message and gives the sender feedback. All forms of communication require a sender, a message, and an intended recipient; however, communication does not require the receiver to be present or aware of the sender's intent to establish communication. Communication requires that all parties have an area of communicative commonality. It can take place through verbal means such as speech and tone of voice, or non-verbal means such as pictures, graphics, sound, and writing.

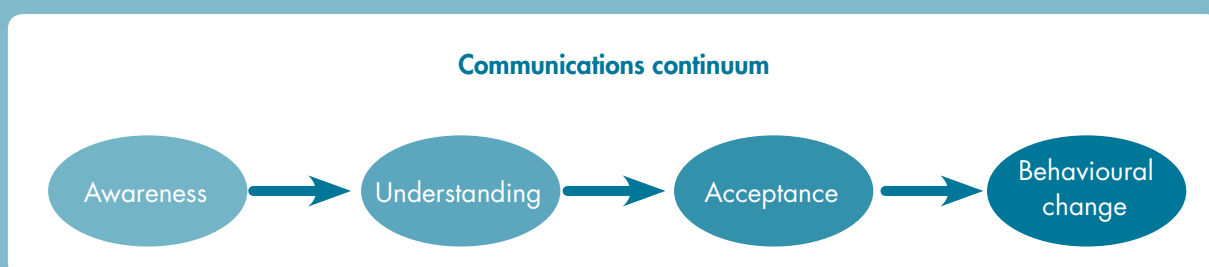
In simple terms, the term 'dissemination of information' can be defined as the process of making information available. The dissemination of information is a one-way process. The disseminated information flows from the source to the target audience (the public). There may or may not be any feedback on the part of the public. It is usually initiated or organised by government, non-governmental organisations, and academic or private organisations. An organisation not only regulates the quality and quantity of information reaching the local level, but also disseminates it systematically to a select group of people.

Communication continuum mode

The main goal of transferring scientific information to local people is to make them aware of the various means of flash flood risk management. A more scientific approach can include using more precise ways of estimating hazard levels, degrees of vulnerability, and risk levels as well as adding various other means of disaster management (e.g., early warning systems, policy interventions, improving social resilience) to existing practices.

People who have no access to other information usually depend on local knowledge, but this can change. The dissemination of scientific knowledge can lead communities to enhance their efforts. Exposure to scientific knowledge first raises people's awareness. Next come understanding and acceptance, and then people can help bring about changes in how their community deals with disaster and flash flood risk management. Figure 9 shows the key stages in the continuum of persuasive communication that leads to changes in behaviour. It is important to emphasise that those bringing scientific knowledge to communities that have not been previously exposed to it must be aware of the local knowledge systems and must work with the communities to design and implement effective communication.

Figure 9: Stages of persuasive communication



Means of disseminating information

There are many means of disseminating information to local people. However, it may be that not all are available or applicable to the same extent in all situations. The following are a few effective means of disseminating information at the local level to consider.

- Workshops at the local level
- Community meetings and discussions
- Local newspaper and radio programmes
- Publication and distribution of reference materials
- Publication and distribution of reports
- Internet
- Audio visual presentations
- Demonstrations

Session 7 Community-Based Flash Flood Risk Management

Time: 60 minutes

Objective

To appreciate the importance of community involvement, and to learn how to proceed in promoting community participation in flash flood risk management by:

- ▶ Appreciating the importance of community involvement in flash flood management
- ▶ Learning how the community can participate in flash flood management
- ▶ Involving the government in community flash flood risk management

Activities

Activity 7.1: Importance of community-level flash flood risk management

Time: 10 minutes

- Step 1** Define what a community is.
- Step 2** Discuss the major features of community-based flash flood risk management and its importance. Discuss the need to involve communities in flash flood risk management.
- Step 3** Explain the comparative advantages of community-based flash flood risk management and highlight the fact that it can be more sustainable, cheaper, easier to implement, and less detrimental to the environment than other approaches to flash flood risk management.
- Step 4** Highlight the features of community-based approaches and discuss the advantages that they offer.

Activity 7.2: Process of community participation in flash flood risk management

Time: 20 minutes

- Step 1** Present and discuss the conceptual framework for community participation (see Figure 10 in RM 7.2). Clarify that the community not only manages the risk but also assesses the risk using local knowledge and experience.
- Step 2** Discuss how to form a Community Flash Flood Risk Management Committee (CFFRMC) and remember to mention the importance of arranging community meetings and conducting needs assessments.

Note to the trainer

Discuss the following questions with the participants and make sure that they understand how these apply to their particular situations.

Who calls the community meeting? How do you go about calling a meeting and where can it be held?

- Communities have social organisations such as village councils, youth clubs, and mothers' groups, which can serve

Note to the
trainer
(continued)

as centres for convening community meetings. It is important to remember that when the invitation to attend the meeting is extended by a person respected in the community or by a social worker, that the members of the community will see it as trustworthy.

- The meeting venue can be a public place such as a community hall, village council hall, or other location that is convenient for the maximum number of villagers.

Who should be invited to the meeting?

- When inviting community members to the meeting, remember to include people from all walks of life and from all segments of the society. Different people have different types of knowledge and experience, so see to it that the meeting includes a good balance in terms of ethnicity, caste, and gender. Securing the contribution of all groups will best serve the goals of the committee.

What initial information is required before the meeting?

- To initiate the discussion with the community, collect information on past flash flood events and on the losses that the villagers may have incurred. Discuss what the community can do for flash flood risk management.
- Assess the needs of the community with respect to education, awareness, training, weather forecasting, early warning, and demonstration for planning and flash flood risk management. The community can also assesses the risk of flash floods and prepare maps. (Note that the process of social hazard mapping is discussed in the forthcoming session).

What can the community do?

- Propose the ad hoc formation of a CFFRMC with broad participation and give the committee the responsibility for further planning and activities.

Activity 7.3: Structure, responsibilities, and empowerment of the CFFRMC

Time: 15 minutes

- Step 1** Engage the participants in a short question and answer session on how the committee should be structured, how many sub-committees there should be, and so on. Discuss the advantages and disadvantages of having either too small or too large a committee with respect to general operations and decision making.
- Step 2** Explain the structure of a typical CFFRMC. Clarify why an advisory committee is needed and how one can be formed. Remember to mention that based on the needs and on the recommendations of the advisory committee, additional committees can be formed as needed.
- Step 3** Present the roles and responsibilities of the CFFRMC and its sub-committees during all the phases of flash flood management, i.e., before, during, and after the flood event. Remember to point out that the committee is responsible for planning, implementing, and monitoring the various activities of flash flood risk management that will help the community be better prepared for a flood disaster.

- Step 4** Discuss the different ways that the CFFRMC can be empowered. Stress that institutional and financial empowerment are very important. The different sub-committees each have different responsibilities and a variety of skill types are required to staff them.
- Step 5** Discuss the mechanisms that can be used for the financial empowerment of the committee

Activity 7.4: Characteristics of good community governance

Time: 5 minutes

- Step 1** Discuss the importance of governance and enumerate the characteristics of good community governance.
- Step 2** Discuss possible dispute resolution mechanisms. Note that a cell, department, or division can be formed within the CFFRMC to deal with dispute resolution. Point out that it is always best when internal mechanisms can be devised to resolve disputes, but that other mechanisms are available when this is not possible.

Activity 7.5: Role of government in community flash flood risk management

Time: 10 minutes

- Step 1** Give a short presentation outlining why the government should be involved in community flash flood management.
- Step 2** Discuss how the government can participate in community flash flood management, what sort of activities it can be involved in, and how it can collaborate with the community.
- Step 3** Explain how the government can be involved before, during, and after a flash flood.

Session 7 Resource Materials

RM 7.1: The importance of community-level flash flood risk management

A community is a group of multi-stakeholders in a particular geographical location who are exposed to common hazards including flash floods. The community is not a homogeneous unit but a dynamic mix of different groups, interests, and attitudes.

Community-based risk assessment (Table 3) is a simple method used to assess risk and to help design risk management plans. Community involvement is essential for the successful and effective management of risk because local people have a detailed knowledge of their village and the immediate vicinity and because they have a personal and vested interest in local affairs. Local people are not only interested and motivated to help, but also have the ability and the access to local resources to carry out the needed tasks. Centralised management and responses often fall short when it comes to assessing the needs of the most vulnerable. Community mobilisation is important, as individual households cannot perform all the necessary preparations

effectively by themselves. A participatory approach ensures that activities are coordinated with others and that responsibilities are shared. An organising committee should bring the whole community together under a single umbrella and try to make everyone aware of available resources and of ways to protect the community; it can help to enhance confidence, skills, and the capacity to cooperate in order to undertake risk management as a communal effort.

Table 3: Features of a community based approach

Feature	Traditional	Community based
Concerned party	Agency	Community
Main actors	Programme staff	Community residents
Decision process	Top-down	Bottom-up
Participation	Selected/token	Decided by the community
Impact on community	Creates dependency	Empowering
Programme selection	Target specific	Needs specific
Gender aspect	Dominated by elites	Gender sensitive

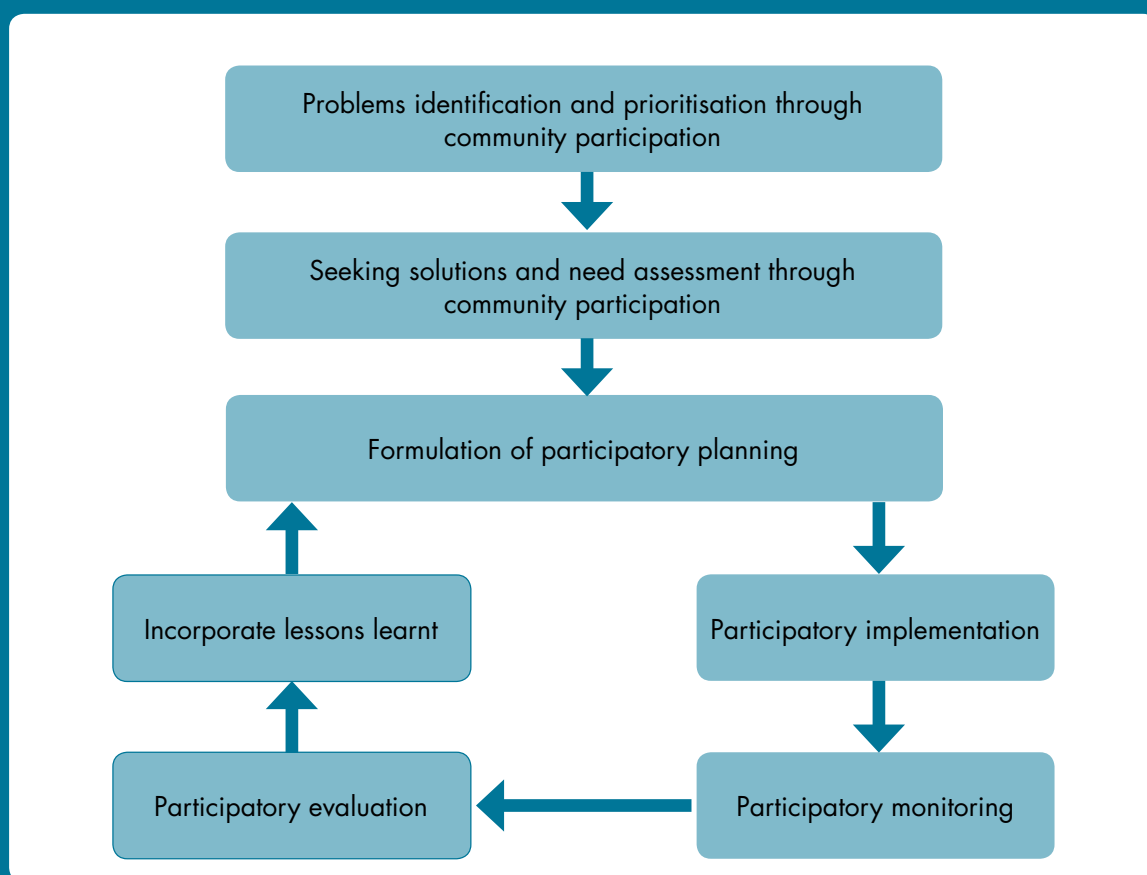
RM 7.2: Process of community participation in flash flood risk management

Community involvement is essential at every step, including risk identification, prioritisation, plan formulation, implementation, monitoring, and evaluation (ADPC/ECHO/UNESCAP 2004). Community-based risk assessment can be carried out using various participatory rural appraisal (PRA) tools that encourage community members to partake in the identification of flood hazards and in the preparation of risk maps based on their knowledge and experience of the local environment, resources, and socioeconomic practices. Figure 10 shows the conceptual framework for community participation.

Formation of a community flash flood risk management committee (CFFRMC) is the first step towards collecting information on the magnitude of a possible flash flood event. The CFFRMC investigates what institutions already exist and what their roles, responsibilities, and formation procedures are. It also disseminates information and provides an opportunity to involve all stakeholders including women and other marginalised groups.

It is important that the CFFRMC have a legal status. When the CFFRMC is registered, it has the legal status accorded to it by the government. The CFFRMC must have a constitution with clear objectives. In addition, its structure and responsibilities, funding sources, and functioning mechanism must be clearly laid out.

Figure 10: Framework for community participation



Source: Based on ADPC (2003)

Steps in forming a CFFRMC

- Arrange a community meeting
- Discuss flash flood risk with the community and draw their attention to their need to manage it
- Establish an ad hoc committee of five to seven members, remembering to include people from all sectors of the community, with due concern to gender

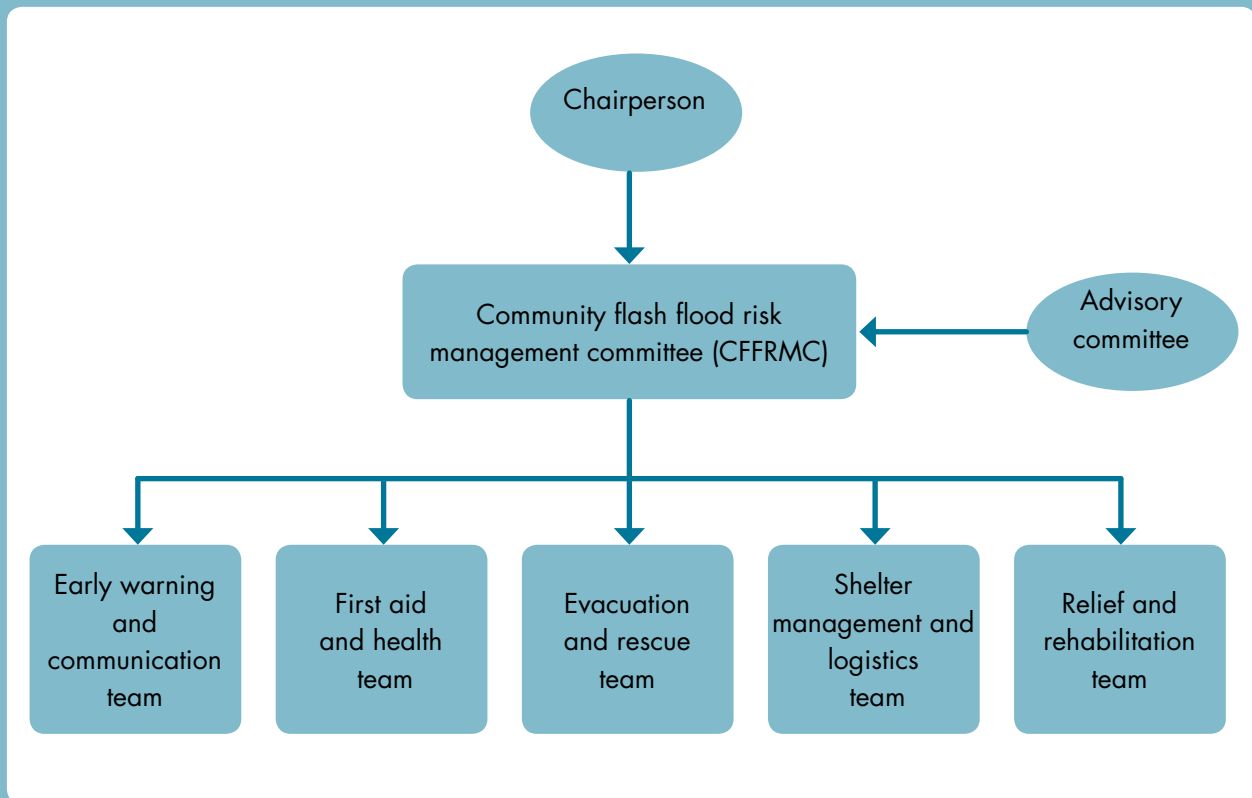
The main objective of this committee is to draw up a draft constitution and to facilitate the formation of the CFFRMC. The ad hoc committee should call for meetings to discuss the draft constitution, which should be amended to reflect the suggestions made in the mass meeting.

RM 7.3: Structure, responsibilities, and empowerment of the CFFRMC

A CFFRMC is a legal organisation that represents the community; it typically has 9 to 11 members who are elected from amongst a general assembly according to the procedures set forth in the constitution. The committee should ensure proper representation from different sections of society, particularly remembering to include women and disadvantaged groups. If the committee is too large, it can be difficult to notify all the members, to make decisions, and to reach consensus; while if it is too small, it may not be representative.

The CFFRMC should consist of different teams or sub-committees (Figure 11) each headed by a team leader and assigned particular responsibilities. The central committee should delegate responsibility for effective team work. The advisory committee is an essential part of the CFFRMC. The advisory committee consists of representatives from concerned district-level government organisations, concerned members of local administrative units, and other members that represent the interests of the various stakeholders. It is usually chaired by the head of the local government body.

Figure 11: Typical Structure of a CFFRMC



Source: Based on ADPC (2003)

The CFFRMC is responsible for overall risk management; it oversees activities before, during, and after the flash flood event. The major roles and responsibilities of a CFFRMC are to:

- organise and mobilise the community to prepare for a possible disaster so that the loss of life and property can be minimised;
- raise awareness and advocacy at a multi-stakeholder level;
- train volunteers and community members on what to do before, during, and after a flash flood event;
- maintain an emergency stockpile and ensure that it is equitably distributed in the aftermath of a flash flood event;
- manage and monitor the distribution of shelter and relief supplies among people who have been affected;
- monitor the allocation of relief to affected people so that equitable distribution is ensured;
- lobby local governments to design sustainable development plans for those that are most vulnerable;
- coordinate with various relief aid agencies;
- design evacuation and contingency plans;
- motivate the community to avoid construction and settlements in flood prone areas;
- develop a local flood warning system based on local knowledge;
- extend support to link scientific and local knowledge for early warning and preparedness;
- promote flood-friendly agricultural practices and explore other means of post-flash flood income generation.

Depending on the needs and on the advice of the advisory committee, various sub-committees can be formed as per the constitution of the CFFRMC. Some suggestions for major responsibilities that can be held by sub-committees are as follows.

- **Early warning, communication, and information:** This team develops early warning systems and disseminates information to the community and the concerned agencies. It develops systems for documenting the response by different teams and for assessing community needs.

- **First-aid and health:** The responsibilities of this team include mobilising and organising camps to treat injured people and raising community awareness about health, hygiene, and education in times of flash floods.
- **Evacuation and rescue:** This team evacuates affected people and, when possible, also removes domestic animals and other material goods along with the people.
- **Shelter management and logistics:** This team finds shelter for victims. Before a flood, it must establish and maintain stockpiles of materials (with community accountability) and develop logistical systems to distribute relief.
- **Relief and rehabilitation:** This team ensures the necessary stock of relief goods with proper security and monitoring.

The CFFRMC is a voluntary organisation and thus depends on volunteers. Each team should enrol a certain number of volunteers and to the extent possible, the team composition should reflect the local geography, gender, and social demography.

It is essential that the CFFRMC be empowered both institutionally and financially to be able to react to crises quickly and carry out its work effectively. The functional bodies must be able to react to a flood rapidly and make rational decisions. Committee members, team leaders, and volunteers need to have appropriate expertise and a clear understanding of their roles and responsibilities. They may also need training or skill development in various areas such as: early warning, preparedness and risk reduction, measurement of precipitation, water-level gauge recording, early warning systems, participatory hazard and vulnerability mapping, preparedness planning, community-based first aid, community-based disaster management, building mitigation structures, watershed management, and agriculture management.

It is important for the CFFRMC to be financially viable. The committee must establish close contact with external agencies, including government agencies, to obtain funds. Some possible fundraising mechanisms that have worked well in the past include organising social and religious events, selling natural resources that belong to the community (such as community forest resources and products), and levying local taxes. When funds are collected for community benefit it is important to maintain proper accounting of both income and expenditures.

RM 7.4: Characteristics of good community governance

Governance provides an enabling environment whereby communities can provide services for the common good. The key characteristics of good governance are: assessment of needs, prioritisation, and equitable allocation of resources. The governance process must encourage cyclical planning that allows for learning and improvement over time. Good community governance for flash flood risk management can be fostered by keeping in mind a few basic guidelines.

- **Participation:** A participatory approach that includes the whole community is important. Everyone in the community can participate by voicing their opinion on the need for the mitigation measures and possible solutions.
- **Communication:** The effectiveness of a CFFRMC can be gauged by the extent to which it has been successful in communicating to the community the potential problem of flash floods, its causes, and appropriate solutions to minimise losses. The peaceful resolution of stakeholder disputes and grievances in the committee are vital.
- **Efficiency:** It is achieved by minimising financial, political, social, and environmental costs.
- **Equity and inclusiveness:** It is necessary and important to promote the empowerment of women and marginalised groups, and to make sure that these groups have the opportunity to be involved.
- **Responsiveness:** The committee must be responsible and accountable to the community and it must include all stakeholders.
- **Transparency:** Transparency of procedures indicates good governance.

Different grievances and community complaints can be resolved through institutional mechanisms such as public cells which redress grievances under the CFFRMC. Cells help to resolve disputes, for example

regarding the allocation of shelter or the distribution of relief items. The secretary of the CFFRMC is responsible for logging appeals and researching the validity of grievances.

RM 7.5: Role of government in community flash flood risk management

The government can be involved in different phases of community flash flood risk management; some examples are given below (Table 4).

Government involvement in the CFFRMC is essential (although government is involved to a varying extent across the HKH region), as the government has superior financial resources, institutional mechanisms, and technical capacity. Government involvement can help to improve community preparedness and participation. It can also help to secure the legal status of the CFFRMC.

Table 4: Possible areas of government involvement in CFFRM

Pre-flash flood preparedness	During flash flood	After flash flood
Facilitate a meeting involving the CFFRMC, local government, and local NGOs before the monsoon to review the preceding year's successes and failures in flash flood management and to update the arrangements	Mobilise qualified search and rescue teams such as army or police according to the severity of the disaster	Contribute to the distribution of relief items
Provide funds for capacity building of the CFFRMC, awareness-raising campaigns, construction of mitigation structures, and construction of safe havens on uplands	Allocate health personnel and medicine	Assist in rehabilitation processes
Facilitate the strengthening of the functioning of the control room	Assist in providing basic necessities such as safe drinking water, food, and shelter	Make arrangements for financial support to the community
Assist in collecting grain and fuel to use during a crisis	Allocate security services to save property spared by the flash flood	
Provide technical assistance during construction of structures for mitigation and capacity building and awareness-raising campaigns		

Source: Shrestha et al. (2008)

Session 8 Gender Perspectives in Disaster Management

Time: 45 minutes

Objective

To understand how the gender dimension and gender issues play a role in disaster and flash flood risk management by

- ▶ Learning the concept of 'gender' and appreciating gender differences
- ▶ Understanding gender issues in flash flood risk management
- ▶ Learning how gender-sensitive flash flood risk management works

Activities

Activity 8.1: Concept of gender and gender differences

Time: 10 minutes

- Step 1** Engage the class in a short question and answer session in which the participants are asked to voice their understanding of 'gender'. Give a short presentation explaining how 'gender' differs from 'sex' and clarify the differences.
- Step 2** Discuss how society differentiates between activities that are perceived as 'man's work' and 'woman's work'.

Activity 8.2: Gender and flash flood risk management

Time: 15 minutes

- Step 1** Discuss how issues of gender are of concern in flash flood risk management.

Note to the trainer

The class may not be aware that access to and control over various resources can be gender specific. Clarify that gender as well as economic status, age, and physical fitness can all affect flood risk.

- Step 2** Discuss how women are generally more affected both during and after a flash flood.

Activity 8.3: Gender-sensitive flash flood risk management

Time: 20 minutes

- Step 1** Discuss the need for gender-sensitive flash flood risk management.
- Step 2** Discuss the most significant problems that women face during a disaster.
- Step 3** Discuss possible gender-sensitive approaches to flash flood risk management.

Session 8 Resource Materials

RM 8.1: Concept of gender and gender differences

‘Sex’ refers to the biological differences between men and women. These immutable differences have been made a major point of social difference in many cultures. ‘Gender’, on the other hand, refers to social constructs and perceptions on the role of women and men in society (Table 5). Different societies, cultures, and religions have different perceptions and assign different responsibilities to men and women in areas such as work, dress, custom, tradition, and religious observance.

Table 5: Differences between sex and gender

Sex	Gender
Biological	Socially constructed
Born with	Not born with
Universal	Place and cultural specific
Cannot be changed	Can be changed

In many cultures and societies women have limited access to various resources and they can be socially, culturally, and economically marginalised. The social construct of predefined gender biases creates unequal access to resources and opportunities. This is particularly noticeable at the household level where it is not uncommon to find that women have disproportionately poorer health and nutritional outcomes, lower levels of literacy and education, lower paid income-generating work, and higher morbidity and mortality rates relative to men. For the most part, the culture and society of the HKH region generally relegates women’s role to reproduction and household work; women are generally less exposed to the outside world and may be unaware of events in their surroundings beyond the household, including any impending natural hazards.

RM 8.2: Gender and flash flood risk management

Gender issues are vital to disaster risk management. Gender-biased attitudes and stereotypes can also complicate and prolong women’s recovery from disasters. This is unfortunate, since studies have shown that women are more likely than men to share ideas and resources, since they are more organised at the grassroots level (Mehta 2007).

Women, the poor, and other socioeconomically and physically disadvantaged people have less access to resources and as a consequence they may be severely affected by disasters. Those who are illiterate cannot read early warning preparedness announcements and instructions and may only marginally participate in disaster preparedness activities. During most disasters the percentage of deaths is higher among women and children, partly because women lack briefing on early preparedness measures. Women are also at greater risk because they are typically smaller and physically weaker and have less endurance than men, and when they are pregnant or lactating they are more vulnerable. Women have the primary responsibility for the care of infants, small children, the sick, and the elderly, and their clothing may restrict their mobility; both of these factors may slow them down at the very moment when time is crucial, further hindering women’s survival during disasters. Many women die in disasters when they try to save their children and their property.

Gender issues are seldom just women’s issues; they concern the family, the community, and the society and have financial and economic dimensions. It is important to build women’s capacity not only to save themselves, their children, and their property, but also to be active partners in mitigating flash flood risks.

RM 8.3: Gender-sensitive flash flood risk management

Women are typically absent from the fora where decisions are made, so when priorities are established, the interests of women are often poorly represented. In general, women are the most likely to be affected by floods, but their concerns are least likely to be addressed.

The CFFRMC also plays a role in training women to deal with disease control, malnutrition, food shortages, land treatment, and crop production. Adopting a gender perspective would advocate that the roles of men and women be examined separately and that strategies for protection and mitigation be targeted specifically at men and women based on their roles.

For the most part, women in the HKH region have lower literacy and educational levels than men; this has also contributed to their reduced access to post-disaster relief activities. Moreover, the lack of gender awareness in communications at the grassroots level means that women have had limited access to disaster-related information. It is important to bring gender issues to the fore when addressing capacity building and empowerment initiatives. The knowledge and skills gained for general preparedness are also useful in emergencies.

Women face specific problems during disasters. One recurring problem is the lack of privacy; in situations of prolonged water logging, the simple activity of bathing and tending to personal hygiene in relative privacy is more problematic for women than it is for men. Women are also more restricted in their mobility than men, as they are usually the ones responsible for the care of young children and the elderly. Women and girls of all ages are commonly harassed during disasters. Not only are the womenfolk commonly forgotten when information is disseminated, but they have the added burden of also being the ones tasked with collecting relief materials.

Women, the poor, and the more underprivileged segments of society have specific issues when it comes to combating disaster, but they can also bring a unique perspective which can be invaluable in saving lives and property, especially at the family level. For this reason it is necessary to keep the following points in mind when conducting gender-based risk management, as women can introduce innovative mechanisms and techniques.

- Remember to differentiate between different target groups and specific objectives and approaches for all intervention activities.
- Involve women in pre- and post-disaster management.
- When planning activities remember that women have particular needs with respect to security, hygiene, and related issues.
- Ensure girls' education after disaster.
- Protect the specific health needs of women.
- Help women become self-sufficient in terms of minimum income and financial security.
- Ensure equitable aid distribution.
- See that women can partake in the decision-making process by providing the capacity building and advocacy training that they need to be able to participate fully.

Session 9 Social Hazard Mapping and Risk Assessment

Time: 1 hour

Objective

To appreciate the importance of social hazard mapping and to learn how to implement it by:

- ▶ Understanding the concept of social hazard mapping
- ▶ Learning how to conduct social hazard mapping with a local community
- ▶ Learning about participatory GIS mapping (PGIS)

Activities

Activity 9.1: Concept and importance of social hazard mapping

Time: 10 minutes

- Step 1** Introduce the concept of social hazard mapping and explain who prepares the maps and how.
- Step 2** Discuss the processes of identifying potential stakeholders who will be involved in the social hazard mapping process. Highlight the fact that while it is important to involve social elites, key informants, and local leaders, it is equally important to involve community members from different castes and ethnic backgrounds and from all socio-cultural and economic groups, since each will be able to contribute a different type of knowledge and experience. Remember to emphasise gender issues and to stress the participation of women.
- Step 3** Discuss how social hazard mapping can be disseminated to and used by communities and local authorities.

Activity 9.2: Process of social hazard mapping

Time: 35 minutes

- Step 1** Introduce how social hazard mapping can be conducted in a community setting with local people who may be unfamiliar with maps in general (RM 9.2). Give practical advice. Make participants aware of possible pitfalls, and also include checklists that should be helpful in conducting on-site social hazard mapping.
- Step 2** Review the steps of social hazard mapping (detailed in RM 9.2):
 - Introductions and establishing rapport
 - Discussion of the map
 - Familiarising participants with map signs and symbols
 - Question and answer session
 - Marking the map
 - Preparing the legend
 - Emphasising community awareness

Note to the trainer

Clarify that one of the responsibilities of the CFFRMC is to collect the information that is needed to prepare a hazard map and to prepare the actual map. Alternatively, the CFFRMC can choose to assign the task of preparing the hazard map to another organisation. Regardless of who prepares the hazard map, the steps needed for the preparatory groundwork are the same. Some or all of the following tools and techniques can be used to collect all of the relevant information for the preparatory groundwork: participatory rural appraisal (PRA) methods such as observation, focus group discussions, in-depth interviews, key informant surveys, checklists, and review of previous documents and papers to collect information previously recorded about the community. (If the CFFRMC is not preparing the hazard map, then the group doing so should consult the CFFRMC for any additional information it can provide.)

Activity 9.3: Process of participatory GIS mapping (PGIS) of hazards

Time: 15 minutes

- Step 1** Explain what participatory GIS-based community hazard mapping is. Mention how GIS and remote sensing databases can be linked with the community-based exercise of hazard mapping. Social hazard mapping, in its most elementary form (as for example in Activity 9.2), uses only community-based knowledge and information. A greater degree of accuracy and sophistication can be achieved by using the PGIS method, which integrates community knowledge with spatial data.
- Step 2** Review the methodology of PGIS. Clarify that PGIS involves two steps. The first step is to collect information from the community as already outlined in Activity 9.2. The second step is to integrate the information collected by the community with the spatial data layers to prepare the social hazard map.
- Step 3** The information which is collected from the community can be analysed and integrated with the GIS/remote sensing based data directly in the field or it can be processed in the office. In either case, the end result is the flash flood hazard map.

Session 9 Resource Materials

RM 9.1: Concept and importance of social hazard mapping

A social hazard map is a map of the local flash flood hazards; it is prepared based on local knowledge and other available information. It can be prepared either by the CFFRMC or any other organisation in consultation with CFFRMC and the local communities (Boxes 3 and 4). It consists of information on the range of possible damage and disaster prevention activities. The activity of social hazard mapping helps the community become aware of the extent of the damage that possible flash floods can inflict, the possible hazard scenario, possible evacuation routes, sites, and so on; in general, it encourages discussion in the community for heightened awareness and better flash flood risk management (Box 5).

RM 9.2: Process of social hazard mapping

Social flood hazard maps reflect the location and the condition of a given area. A flood hazard map uses symbols to indicate the location of houses, assets, services delivery organisations, infrastructure (roads, schools, hospitals, and bazaars), and other community landmarks. It is a tool that the CFFRMC uses to encourage the participatory process of collecting baseline data and information; the data that are collected are plotted on a map to help the planning team analyse the strengths (resources/opportunities available) and risks (exposures and vulnerabilities) in the area in question (cluster, district, ward). It also helps in the identification of vulnerable

Box 3: Social hazard mapping – key considerations

Social hazard mapping is carried out by the community itself. It is usually coordinated by the CFFRMC and done in consultation with community members and a variety of stakeholders. It is also possible for outsiders to the community to prepare social hazard maps, but they should be aware of a number of potential pitfalls, such as the difficulty of identifying the correct people to liaise with, language challenges, and barriers in access to the community and in selecting participants. Sometimes outsiders do not know the local language and cannot communicate with the local facilitator. It is important to have a good facilitator who is also a key informant and who is capable of establishing a rapport with the community before conducting the exercise.

It is important to keep the channels of communications open with the local authorities; to report to them on the activities being conducted; and to obtain permission, if needed, before beginning.

Box 4: Planning ahead for field work

Social hazard mapping is a group activity. A little planning ahead can help to make the exercise a good success. When working in the field make sure that the following drawing materials are available: drawing pens of different colour, markers, pencils, erasers, A1 size plain paper, scales, measuring tape, etc. In addition to the drawing materials make sure that maps of the area are also available; these can be, for example, topographic maps, aerial photographs or high resolution satellite images (e.g., QuickBird, IKONOS). Note that it is best when the maps are printed on A1 or A0 size paper.

Box 5: Uses of flood hazard maps

By local people

- To consider proper land use planning
- To learn about flood history
- To organise for preparedness and evacuation
- To help prepare emergency evacuation plans
- To help identify communication channels
- To identify safe routes and places

By CFFRMC/local administrative authority

- To review land use planning/ urban planning
- To update disaster preparedness activities
- To review evacuation routes and sites
- To update specific assistance plans
- To promote education and awareness activities
- To update information
- To disseminate updated information

groups such as people with disabilities or those with special needs, who will need special consideration during emergency rescue and relief operations. Since the map includes all possible local resources, it can be of great help when rescue workers and others are searching for assistance in locating measures that can lessen the magnitude of loss, the safest path for evacuation, and safe places for temporary settlements.

Steps in social hazard mapping

Step 1: When conducting social hazard mapping in a community setting, remember to first greet the participants and put them at ease by clarifying the objectives of the work. Introduce each of your team members and ask the local participants to introduce themselves. Try to establish a good rapport between the outsider group and its mediator and the local facilitator and community members.

Step 2: The second step is the discussion of the map. Before the session begins, hang the map on a wall or position it appropriately so that it will be visible to all the participants. Regardless of the type of map, whether it is a topographic map, an aerial photo, or a remote sensing satellite image, introduce it to the local participants by pointing out some familiar landmarks. Explain how the map was produced and go into some detail about the orientation, the direction, and the scale (see Box 6). Point out reference points that will be familiar to them such as the settlement, agricultural land, the roads, the river, and other well-known community infrastructure. Clarify how to read the map and remember to explain the scale of the map in relation to the ground scale.

Step 3: Remind the participants of the need to familiarise local people with the different symbols, colours, icons, and other conventional signs used on maps to depict landmarks such as rivers, roads, settlements, schools, hospitals, irrigation canals, agricultural land, forest, and so on (see Box 7). It is important to do this before proceeding with the preparation of the social hazard map.

Step 4: Engage the local participants in a short question and answer session on what they think is the most essential information to include on a social hazard map and why.

Step 5: Ask the participants to identify and mark features such as the boundaries of the community, neighbouring settlements, various flood risk zones, highland and lowland areas, safe areas, and other points of reference (Box 8). When starting with a base map, verify and update features that are already identifiable on the map. When a new map needs to be created, proceed as follows.

- Draw the main objects such as the river and its tributaries, any canals and lakes, and the location of rain gauges.
- Draw settlements, houses, and infrastructure (e.g., roads).
- Indicate the different uses of land such as forests, pasture areas, open areas, and landslide areas.
- Indicate the location of communication infrastructure, telecom towers, electricity towers, transmission lines, and so on.

Box 6: Scale of the map

The scale of the map should be on the order of 1:10,000 to 1:15,000 to allow for easy identification of individual houses and evacuation routes, and for the participants to easily gauge the extent of a possible inundation. Explain that on a 1:10,000 scale map, 1 cm on the map corresponds to 100 m on the ground. It is essential to get across the concept of scale since this is fundamental to preparing and reading maps. Once the participants have a good handle on the concept of scale they will then easily be able to locate landmarks and be able to sketch information such as how far their houses and property are from the expected hazard area.

Box 7: Using colour and symbols

Discuss how different hazard zones can be indicated by marking them in different colours. Go over the colour conventions and the standard symbols used in mapping. By convention, red is usually used to mark the most high risk and critical areas. Agricultural land is typically depicted in yellow, forests in green, rivers and lakes in blue, and barren land in gray. Areas of risk can all be depicted in the same colour but with different intensity depending on the level of risk.

- Mark the location of areas that are routinely flood prone, areas that have experienced inundation at some time in the past, and area that are considered to be safe.
- Mark areas that are particularly flood prone.
- Mark the maximum height of past flood levels.
- Identify and map high, medium, and low risk flood zones by marking them with different colours.
- Identify the location of vulnerable communities, areas, and people.
- Mark internal and external safe areas.
- Map safe evacuation routes.
- Mark the location of safe evacuation sites, the control room, public security points, health care centres, and so on.

Step 6: Ask the participants to prepare a legend detailing all of the features that they have indicated. The legend should be clear and easily understandable by local people.

Step 7: After collectively preparing the hazard map, it is important to reiterate that everyone in the community should be made aware of it so that they all can be prepared for the eventuality of a possible flash flood and be aware of contingency plans.

Some tips for preparing a social flood hazard map

- As in standard mapping practice, the top of the piece of paper on which the map is drawn indicates north. The boundaries of wards and villages are marked. It is advisable to provide a legend and a scale for the map.
- Record the location of every cluster of households, of the markets, and of the public buildings.
- Record the location of structures such as canals, weirs, roads, airports, bridges, the path of the river, highlands, and lowlands. The location of vulnerable areas should noted and indicated on the map using special symbols.
- Record the location of evacuation routes, safe havens, and the locations that can be used as staging areas for emergency volunteers. Record the location of infrastructure and indicate whether it is available for use in emergency situations. Record the location of vulnerable areas, safe structural constructions, hazard prone houses and infrastructure, and the locations of the most vulnerable people.
- Public safety and security: indicate the location of civil defence installations, communications centres, emergency management centres, fire stations, hospitals and other medical facilities, mass emergency shelters, police stations and other installations that are available for public security, for stockpiling, and for the use of community emergency organisations.
- Utilities: Clearly mark communication lines and antenna complexes.
- Agriculture: indicate the location of food storage and processing facilities, irrigation systems, impoundments and reservoirs, levees, and dikes.

A comprehensive risk analysis for flash floods needs to be conducted in advance in order to be able to plan for all eventualities. The analysis begins by estimating the possible intensity and magnitude of the event and gauging the extent of the impact that it can have on vulnerable human lives and livestock; the analysis then proceeds by seeing what plans can be made for emergency shelter sites, evacuation routes, and emergency water sources. The risk analysis also involves making plans to train volunteers and response personnel and to disseminate information to locals about what to do in case of an emergency. Rapid onset disasters such as flash floods do not allow enough time to collect secondary information. It is very important that the CFFRMC collect such information well in advance of the onset of the flash flood.

Box 8: Information to include on the hazard map

- Inundated area, depth
- Flood concentration period
- Area to be evacuated
- Location of evacuation sites and routes
- Control room
- Dangerous spots
- Past flood record
- Predicted extent of flood and damage
- Location of houses, settlement and infrastructure
- Public safety and security: police, hospital
- Explanation and direction use in the map

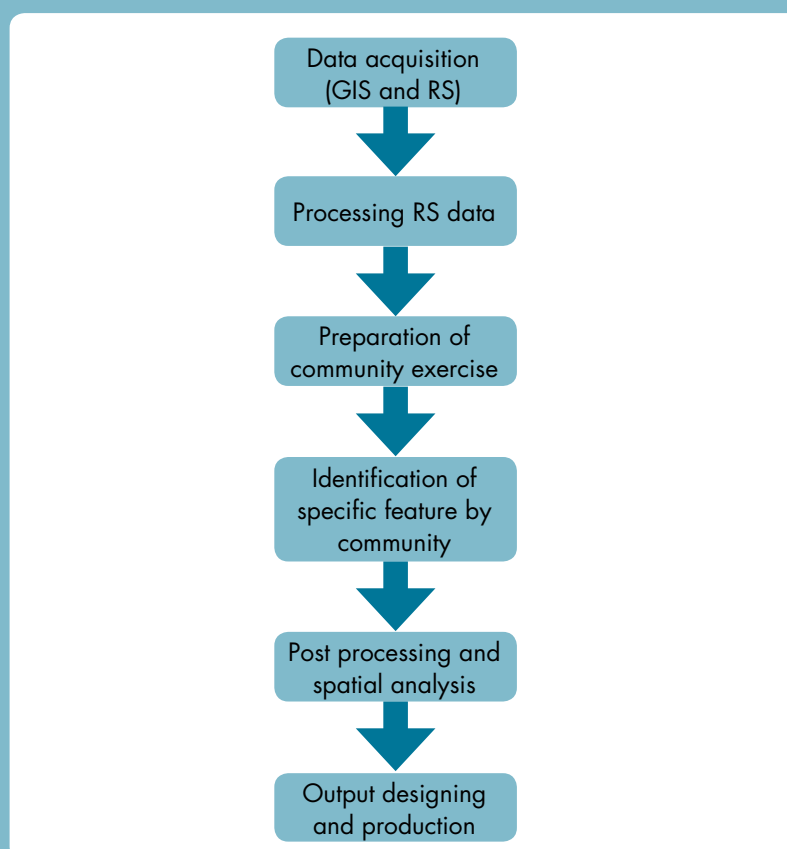
RM 9.3: Process of participatory GIS mapping (PGIS) of hazards

The community mapping exercise strongly links to participatory mapping and participatory GIS (PGIS) mapping (Figure 12). Participatory rural appraisal (PRA) is an important method of acquiring information on a local system within a short period of time. PRA is used to explore local or indigenous knowledge held communities by adopting informal interactions with them in their own setting. PGIS is an advanced method of preparing community based hazard maps by integrating both community-based knowledge and information with digitised spatial databases of the area in order to produce the most informative maps possible.

As defined by the Mapping for Change International Conference on Participatory Spatial Information Management and Communication, held in Nairobi, Kenya, in September 2005 (see <http://pgis2005.cta.int>), PGIS combines a whole range of geo-spatial information management tools and methods including: sketch maps, participatory three-dimensional models (P3DM), aerial photographs, satellite images, global positioning systems (GPS) data, and geographic information systems (GIS) data. These various tools are then used to bring together the spatial knowledge that local people have and to display it in the form of virtual or physical, two- or three-dimensional maps that are then used as interactive vehicles for spatial learning, as the basis for discussions, information exchange, analysis, decision making, and advocacy.

PGIS practice is geared towards community empowerment through the measured, demand-driven, user-friendly, and integrated application of geo-spatial technologies. GIS-based maps and spatial analysis becomes a major conduit in the process. A good practice is to embed PGIS into the decision-making processes; since PGIS is flexible it adapts to different socio-cultural and bio-physical environments, it makes use of multidisciplinary facilitation and skills, and it builds mainly on visual language. The practice integrates several tools and methods and at the core uses a combination of both 'expert' skills and socially differentiated local knowledge. It promotes interactive participation of stakeholders in generating and managing spatial

Figure 12: Participatory Community Hazard Mapping process



information and it uses information about specific landscapes to facilitate broadly-based decision-making processes that support effective communication and community advocacy (Rambaldi et al. 2006).

The participatory mapping method consists of two major steps: first, topographic maps, aerial photographs and satellite images are acquired and presented to the community as a 'blank' map to facilitate discussion and the identification of specific features. Second, the data derived through PRA methods are integrated using GIS and enhanced through additional spatial analysis. Participatory GIS is an emergent practice which is the result of a spontaneous merger of participatory learning and action (PLA) methods with geographic information technologies.

GIS has been widely used for the assessment of risk and the management of natural hazards by integrating it to manipulate information from different sources. It can be used to delineate the different flood risk zones in such a way that the information acquired can be communicated better and therefore more readily understood for decision making.