

Flood Early Warning Systems in Nepal A Gendered Perspective



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The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.



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Flood Early Warning Systems in Nepal

A Gendered Perspective

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Foreword

Reducing disaster risk and enhancing community resilience have been underlying commitments of ICIMODs programmes and initiatives in the Hindu Kush Himalayan region for many years. ICIMOD has prioritized strengthening resilience to climatic risks and hydrological hazards – especially high intensity rainfall, glacial lake outburst floods (GLOFs), regional floods, and flash floods – with a focus on research, knowledge, policy, education, and enhancing capacity, community resilience, and regional cooperation. In order to address the risks facing mountain communities, support their desire to better understand the flood hazards that might lead to disasters, and look at ways to mitigate the adverse impacts of floods and promote regional cooperation, ICIMOD has initiated a long-term programme on flood risk reduction with the aim of making information travel faster than flood water.

South Asia accounts for one-third of the floods in Asia, half of those killed, and more than a third of those affected. Over three decades (1976–2005), 943 natural disasters were reported in South Asia, of which one-third were caused by floods, primarily in the Indus, Ganges, and Brahmaputra basins. In Nepal, an average of more than 300 people are killed annually by floods and landslides. Experience shows that more women than men die during such disasters because of the lack of information, mobility, participation in decision making, and access to resources. The IPCC has warned that floods of the kind that Pakistan suffered in 2010 may become more frequent and more intense in the HKH region and other parts of the world because of climate change; while the risk is also increasing due to increased exposure and vulnerability. As a regional knowledge development and learning centre serving the eight countries of the HKH region, ICIMOD is providing a regional platform through its HKH-HYCOS Programme to assist mountain people in implementing improved flood forecasting at national and regional levels, while addressing upstream-downstream linkages, to save lives and livelihoods.

An end-to-end flood information system is required for timely flood warning and actionable response. Real-time information gathered from hydrometeorological stations and the products developed from the processed data must reach both men and women in vulnerable communities to enable better preparedness and action to be taken. An assessment has been conducted in four countries to improve understanding of existing early warning systems and improve their effectiveness. The objective was to assess the systems from a gender perspective to support the development of timely, reliable, and effective systems that can save lives and livelihoods. The assessment has examined the status of flood early warning systems, conducted gender analysis to understand the participation of women and their roles and responsibilities in early warning systems, and has developed some recommendations on developing effective systems.

This report presents the findings from Nepal, but the findings are relevant for those working in the HKH region and beyond. Through such studies ICIMOD aims to sensitize those involved on the need to integrate gender into flood early warning systems and to develop policies that encourage the participation and awareness of men and women and thus contribute to reductions in the loss of lives and livelihoods.



David Molden, PhD
Director General
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Foreword

Nepal is prone to annual floods and landslides leading to disasters. More than 80% of the rain falls during the monsoon period from June through September. There is increasing variability of rainfall with rise in extreme events. The Department of Hydrology and Meteorology (DHM) is the mandated organization for monitoring flood hazards and providing flood warning in Nepal. DHM has a network of hydrometeorological stations that carry out continuous measurements of rainfall, temperature and water level. DHM has been playing a prominent role in flood early warning by providing timely information.

There is an increased need for improved climate services in Nepal. Many vulnerable communities as well as various sectors such as aviation, agriculture, hydropower and disaster risk reduction need weather and climate information to improve their climate resilience. It is necessary to modernize the hydrometeorological system and real-time information systems to provide timely forecast and delivery, enhance preparedness, and ensure timely action of men and women in risk-prone communities who are the ultimate beneficiaries.

This is a timely publication that provides an overview of the early warning systems and recommends ways to improve them by incorporating the needs of women and men in the flood prone communities. We thank ICIMOD for giving us the opportunity to contribute to this publication. We are confident that we will continue to strengthen our collaboration towards minimizing the adverse impacts of flood disasters in Nepal and across the Himalayan region.



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Acronyms and Abbreviations

DDC	district development committee
DHM	Department of Hydrology and Meteorology
DMC	disaster management committee
GLOF	glacial lake outburst flood
ICIMOD	International Centre for Integrated Mountain Development
MOHA	Ministry of Home Affairs
NGO	non-governmental organization
NRCS	Nepal Red Cross Society
UNDP	United Nations Development Programme
VDC	village development committee
WMO	World Meteorological Organization

Some Key Terms

Disaster risk reduction: The concept and practice of reducing disaster risk through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Community preparedness: Actions taken by a community to mitigate the effects of potential disasters.

Community resilience: Community resilience is a relative term and refers to an ideal condition of a community in terms of its capacity to anticipate, prepare for, respond to, and recover quickly from the impacts of a disaster. The disaster resilient community is a positive concept, and while complete resilience is not attainable, every community is striving to achieve it.

Disaster: A serious disruption of the functioning of a community or a society causing widespread human, material, economic, and environmental losses, which exceed the ability of the affected community or society to cope using its own resources.

Flash flood: Sudden and extreme volume of water that flows rapidly causing inundation; can result in heavy loss of lives and destruction of property.

Flood: The temporary saturation of a normally dry area caused by a high flow or overflow of water in an established waterway such as a river or drainage ditch; may cause widespread inundation.

Forecast: Definite statement or statistical estimate or the likely occurrence of a future event or conditions for a specific area.

Gender: The social attributes and opportunities associated with being male or female and the relationships between women and men and girls and boys, as well as the relations between women and between men. These attributes, opportunities, and relationships are socially constructed and are learned through socialization processes. They are context/time-specific and changeable. Gender determines what is expected, allowed, and valued in a woman or a man in a given context. In most societies, there are differences and inequalities between women and men in responsibilities assigned, activities undertaken, access to and control over resources, and decision-making opportunities. Gender is part of the broader socio-cultural context.

Gender analysis: Gender analysis means assessing the vulnerabilities and inequalities between men and women before, during, and after a disaster event. It requires collection of sex disaggregated data for baseline and situational analysis. Analysis of this data leads to the development of policies, programmes, and projects which take account of gender in all phases of design and implementation and close existing gaps.

Gender mainstreaming: Mainstreaming a gender perspective is the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making both women's and men's concerns and experiences an integral dimension of the design, implementation, monitoring, and evaluation of policies and programmes in all political, economic, and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality (ECOSOC 1997).

Gender relations: Refers to the actual and perceived network of relations that occur between men and women. They involve daily life experiences as well as notions of gender relations which emanate from the media, religion, history, culture, etc. Usually gender relations are unequal because men have power and women do not (Ariabandhu and Miathree 2004).

Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current hazard events or conditions.

Risk: Risk describes the expected losses caused by a particular phenomenon and is a combination of the probability of an event with its negative consequences. $R = H * V / C$, where R is risk, H is hazard, V is vulnerability, C is coping capacity.

Vulnerability: The characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard; the inability of individuals, households, and communities to prepare for and respond to hazards; the degree of loss to a given element at risk. It is expressed on a scale of 1 (no damage) to -1 (total loss).

Executive Summary

The Hindu Kush Himalayan region is extremely vulnerable to various types of water-induced disasters, particularly floods and landslides. In Nepal, more than 300 people are killed annually on average as a result of floods and landslides. Inequalities in society are often amplified at the time of disasters, and poor people, especially women, the elderly, and children, living along river banks and in the plains are particularly vulnerable to flood hazards. Timely and reliable flood forecasting and warnings that incorporate the needs of both women and men can contribute to saving lives and property. Early warning systems that are people-centred, that provide warnings that are accurate, timely, and understandable to communities at risk, and that recommend appropriate actions for vulnerable communities are more effective and can save more people. The HKH-HYCOS project is being implemented by the International Centre for Integrated Mountain Development (ICIMOD) in collaboration with the World Meteorological Organization (WMO) and ICIMOD's regional member countries to address the challenges of ensuring end-to-end flood early warning systems that include data collection, transmission and analysis, and the effective dissemination of information to communities at risk. The project has established a regional flood information system and seeks to promote transboundary cooperation and strengthen the capacity of hydromet services to provide timely and reliable flood forecasts. For flood early warning systems to be fully effective, they must reach the end users and meet the different needs of women and men. Thus, a study on 'Early warning systems from a gender perspective with special reference to flood hazards' was conducted in four countries as a part of the project. This report presents the findings of the study in Nepal.

The study assessed the institutional arrangements, key stakeholders, legal provisions, coordination and linkage mechanisms, and four key elements of early warning systems – risk knowledge, monitoring and warning services, dissemination and communication, and response capacity – from the perspective of gender. It also gathered experiences from two villages with functioning community-based flood early warning systems. A literature review was carried out to collect state-of-the-art knowledge from national and international research publications, policy documents, case study reports, articles, databases, and electronic sources. Both qualitative and quantitative methods and tools were used to collect information at the national, district, and community levels, and both men and women were contacted in the different organizations and communities. A checklist of indicators was developed based on global gender and disaster risk reduction frameworks to collect and analyse information on gender sensitivity in early warning systems. A total of 26 organizations involved in disaster risk reduction were consulted. At the time of the study in 2012, seven of the organizations (27%) had projects or regular activities related to early warning systems, a further 15 (58%) had some activities related to early warning systems and/or flood hazard management, and five had projects on all four elements of people-centred early warning systems. The proportion of women staff in government and non-governmental organizations was about 19%. Women's participation in disaster risk reduction projects was higher in implementation than in project identification, design, and evaluation. The two case studies on community-based flood early warning systems showed that the effectiveness of flood early warning systems depends largely upon the community capacity to respond after the alert messages are received. For this, training on response, drills, and appropriate communication channels are necessary.

The study has improved understanding of the existing flood early warning systems in Nepal, and suggests ways to make early warning systems more effective and responsive to the needs of vulnerable groups, and women in particular. The report suggests that, in view of the diversity of development issues and livelihood challenges that communities face on a day-to-day basis, it is important to tune early warning systems according to the local context.

Early warning system infrastructure at the local level should be developed with the active involvement of local men and women as part of the development process. Early warning systems should be seen as a social and development activity rather than an exclusive domain of engineers and technicians. This simplification and democratization of early warning systems requires bridging the gap between technical departments and communities, building local capacity, recognizing the stake of the local community in contributing to and benefiting from early warning systems processes, and most importantly creating multiple uses of early warning systems technology and not just for a 'one time

disaster'. The early warning systems should be used with advanced applications to disseminate key messages that will also be useful for local livelihood needs, such as daily weather trends to support crop related decisions, market related decisions, and storage and transport related decisions. Further, it is important to recognize that women play an active role in family livelihood security and efforts must be made to involve women and men equally in creating and receiving early warnings and alerts. Women should be involved in local early warning system infrastructure management teams and be provided with mobile phones or portable radios to receive early warning messages.

This report presents the methodology and findings of the study, possibly the first of its kind in the region. The primary users of this report will be key national stakeholders, policy makers, planners, and community members who are at risk from flood hazards in Nepal. The report contributes to the Hyogo Framework for Action, which was endorsed by 168 national governments at the 2005 World Conference on Disaster Reduction. The Framework states strongly that the "gender perspective should be integrated into all disaster risk management policies, plans, and decision-making processes, including those related to risk assessment, early warning, information management, and education and training".



Chapter 1

Introduction

Background and Rationale

Nepal is a predominantly mountainous country with a total area of 147,181 km² covering five physiographic regions: the Terai, Siwaliks, Middle Mountains, High Mountains, and Himal. The elevation varies from 60 masl in the south to 8,848 masl in the north within a short horizontal distance of less than 200 km. Due to the fragile geology, rugged terrain, and monsoon precipitation, Nepal is prone to floods, landslides, and glacial lake outburst floods (GLOFs). Around 80% of the annual rainfall falls during the monsoon season, between June and September. The frequency and magnitude of extreme events, as well as Nepal's already pronounced seasonal variability, are expected to increase under climate change (IPCC 2012). Nepal ranks 12th in the world in terms of the proportion of the population exposed to the threat of floods annually (24%) (UNDP 2004). Poor people, especially women, the elderly, and children, living in rural areas and on the floodplains are particularly vulnerable to flood hazards. On average, floods and landslides cause around 300 deaths per year, with economic damage exceeding USD 10 million (Khanal et al. 2007). Between 1983 and 2010, floods and landslides killed 7,809 people, accounting for more than 35% of deaths from all natural disasters in the country (DWIDP 2010). This loss of lives and property could have been reduced with an effective flood early warning system.

The Hyogo Framework for Action (HFA), endorsed by 168 national governments at the 2005 World Conference on Disaster Reduction, recognizes early warning systems as an important element in disaster risk reduction, and hence to the achievement of sustainable development and sustainable livelihoods. The HFA further states strongly that the "gender perspective should be integrated into all disaster risk management policies, plans, and decision-making processes, including those related to risk assessment, early warning, information management, and education and training" (UNISDR 2005). The framework also stresses the importance of early warning, and encourages the development of early warning systems that are people-centred, whose warnings are timely and understandable to those at risk, and that include guidance on how to act upon warnings.

Records of natural disasters in the Himalayan region over the last few decades show that women are more at risk of dying than men (Mehta 2007). Studies indicate that more women than men die when disasters hit, and that this is the result of women's lack of information, mobility, decision-making power, and access to resources and training, as well as gender-based social/cultural norms and barriers, conventional gender responsibilities, and high rates of male outmigration (Nellemann et al. 2011; Mehta 2007; Ariabandhu 2009). During the 1991 cyclone in Bangladesh, the mortality rate for women was three times higher than that for men (UNEP 1997; Twigg 2009). A UNEP report (UNEP 1997) indicated that the main reason for the high mortality rate of women was that the early warning signals had not reached them.

Men and women both have valuable, but different, knowledge, skills, experience, and coping capacities. However, the strengths and capabilities of women are often ignored in policy decisions and in formal arrangements related to mitigation and recovery. Policy makers and planners generally give little attention to the social barriers and constraints that hinder women's participation in capacity building and their access to information that could help achieve better preparedness.

Gender differences are manifested in the disproportionately poorer health and nutritional status, lower levels of access to formal literacy and education, higher levels of economic poverty, higher morbidity/mortality rates, and high workloads of women compared to men, as well as extremely low rates of property ownership, participation in decisionmaking, and representation in governance institutions (Leduc 2011). The UN defines the status of women in the context of their access to knowledge, economic resources, and political power as well as their personal autonomy in the process of decision-making (UN 1996). Analysis of the status of Nepalese women in this context shows that the country still lags behind in the move towards equality. Nepal ranks fourth in the region and 102nd out of 186 countries in the world in its gender inequality index (UNDP 2013). The maternal mortality rate (deaths per 100,000 live births) is 170. Only 18% of women aged 25 and older have secondary education, the second lowest percentage in South Asia after Afghanistan, whereas the value for men is 40% (UNDP 2013). The low literacy rate and lack of awareness and opportunities make women highly vulnerable to natural disasters. Furthermore, inequalities that already exist in society are often strengthened at times of disaster.

In order to increase the effectiveness of early warning systems, it is essential to ensure that they benefit women and men equally, and for this it is essential to integrate the gender perspective. The different threats and concerns that impact men and women as a result of any natural hazards must be taken into account, and both men and women must participate in design, development, and implementation. The integration of a gender perspective into early warning systems improves their effectiveness by ensuring that more specific information is gathered and enabling more detailed analysis, which in turn can ensure more accurate and measurable responses (OSCE 2009).

A common criticism of most early warning systems is that they fail to reach the end users due to bureaucratic protocols, and as a result don't serve the purpose of early response and evacuation. Recently, there has been an increasing emphasis on involving and empowering the end users – the affected communities – in the entire loop of early warning transmission from collection to dissemination to reception. Further, for an early warning to serve its full potential, women, not only men, need to be empowered in using early warning technology, managing early warning mechanisms, and receiving early warning messages. In other words, making an early warning system gender inclusive is crucial to its success in saving lives.

The HKH-HYCOS Project

The International Centre for Integrated Mountain Development (ICIMOD), the World Meteorological Centre (WMO), and ICIMOD's regional partner countries developed the HKH-HYCOS (Hindu Kush Himalayan-Hydrological Cycle Observing System) project to support disaster prevention and flood management at the regional level by enhancing regional cooperation and technical capacity for collection, transmission, and sharing of hydrometeorological data. The overall objective of the five-year project (2010–2014) is to contribute to minimizing the loss of human lives and property damage through the timely exchange of flood data and information between and among partner countries. The project seeks to achieve this through an established and agreed platform which is accessible and user friendly. It also seeks to build the technical capacity of the national hydrological and meteorological services of partner countries, which are the mandated organizations to collect, transmit, assess, and disseminate flood early warnings to various stakeholders.

The project has established a regional flood information system (RFIS) to facilitate the transboundary exchange of real-time and near-real-time data, best practices, and know-how in support of flood management. The project has upgraded 32 hydrometeorological stations in four countries to transmit real-time data on river level and rainfall and other related data using advanced technologies for data collection and transmission.

The project recognized the importance of assessing existing flood early warning systems from a gender perspective as a basis for the development of an effective flood early warning system with flood information made available to vulnerable communities. Such assessments have been conducted in four countries: Bangladesh, Bhutan, Nepal, and Pakistan. This report presents the findings of the study in Nepal.

Study Objectives

- To gain knowledge about the status and effectiveness of existing early warning systems (policies and institutions) for flood risk management in Nepal
- To analyse the strengths, gaps, and needs of the various institutions involved in flood early warning systems in Nepal in terms of their technical capacity to carry out functions related to early warning systems, commitment towards the system, networking and coordination among different institutions involved in the system, and responsiveness towards gender and social inclusion
- To look further into the opportunities and challenges for gender integration in the present systems
- To recommend ways to make the present warning systems more effective and people-centred, as well as more responsive to gender concerns

Organization of the Report

The report is divided into six chapters. This first chapter introduces the background and rationale of the study and outlines the objectives. Chapter Two presents the key research questions and methodologies used to gather data and analyse the information related to existing flood early warning systems for flood risk management in Nepal. Chapter Three provides a review of relevant literature and outlines a conceptual framework related to three key aspects of the study – early warning systems, gender considerations in early warning systems, and flood early warning systems in Nepal.

Chapter Four presents the findings of the study and provides information related to the characteristics and key roles of the respondents, existing status of early warning systems, and gender sensitivity of the programmes carried out by various government, non-governmental, and humanitarian organizations in the country, including the UN and Red Cross, at the time of the study in 2012. Chapter Five presents the key gaps, challenges, and opportunities for ensuring gender sensitive early warning systems in Nepal. Finally, Chapter Six summarizes the key conclusions of the study and makes some recommendations to strengthen flood early warning systems in Nepal based on the gaps and opportunities identified.

Men participate in a focus group discussion in Banke District. During the field visit for this study, an attempt was made to have a focus group discussion involving both men and women. Because of existing culturally-defined gender roles and expectations, women were reluctant to sit together with men and were interviewed separately.



Chapter 2

Research Questions and
Methodology

The study sought to map the key stakeholders engaged in disaster risk management and flood early warning systems at the national and district levels and develop an understanding of the functioning of flood early warning systems at the community level from a gender perspective.

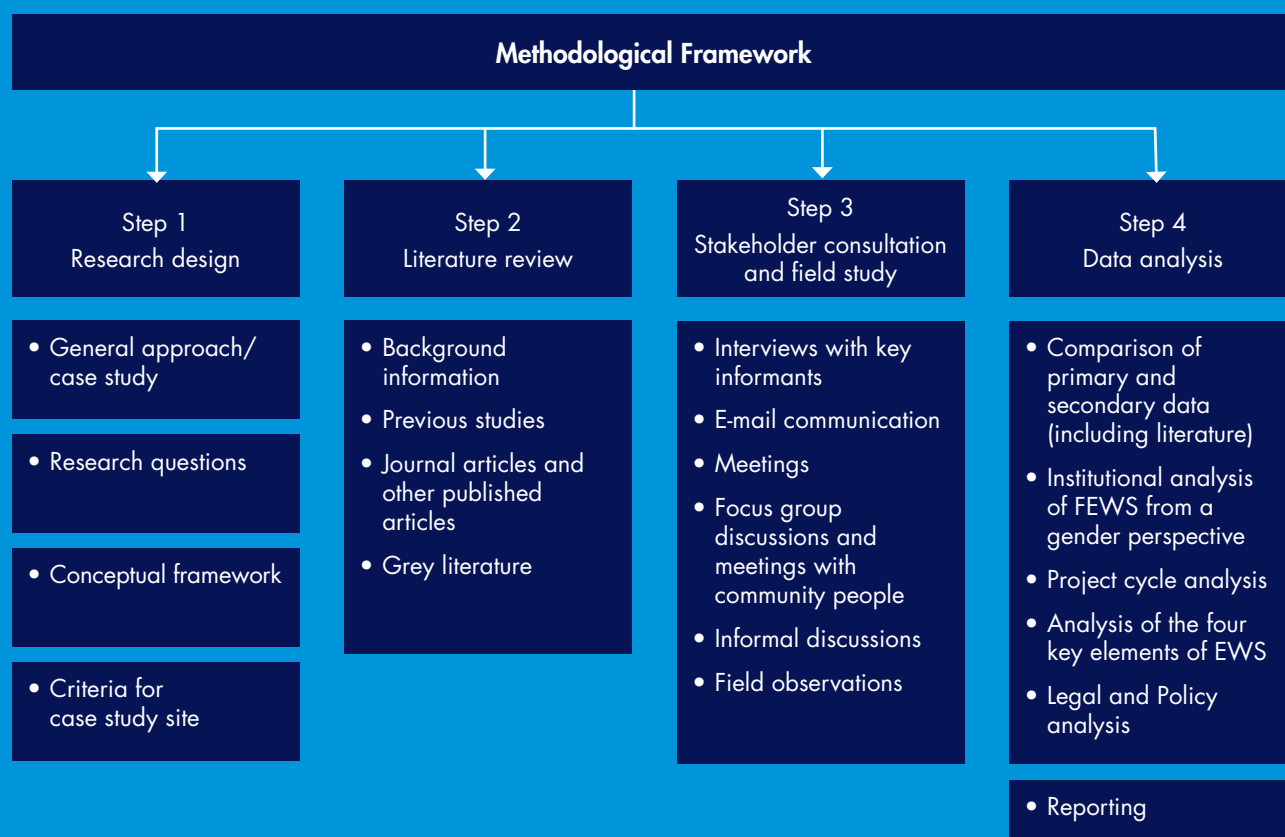
Methodological Framework

The overall methodological framework for the study is presented in Figure 1. The framework comprised the overall research design, literature review, field study, and data analysis. Data were collected from both primary and secondary sources. The elements of the framework are described briefly below.

The research design included both qualitative and quantitative methods, together with a disaster risk reduction framework and case studies. It included the criteria for site selection for the case studies, and guiding questions and checklists for group discussions and interviews. The assessment focused on the following questions.

- What are the status and effectiveness of existing early warning systems (policies, other instruments, and institutions) for flood risk reduction?
- What are the strengths, gaps, and needs of the various institutions (governmental and non-governmental) at national, regional, and local levels that are involved in the present early warning systems, in terms of their human resources, technical capacity to carry out relevant functions and commitments towards the system, networking and coordination with other institutions involved in the system, and responsiveness to gender and social inclusion?
- How can gender be integrated in to existing flood early warning systems?

Figure 1: Methodological framework used in the study



A literature review was conducted on early warning systems. National and international research publications, policy documents, case study reports, post-disaster reports, articles, databases, fact sheets, and electronic sources were reviewed. The desk review helped the project develop state-of-the-art knowledge on flood early warning systems from a gender perspective, and understand the level and challenges of gender integration.

The stakeholder consultation was carried out in 2012 and comprised both qualitative and quantitative methods. The qualitative information was supported by quantitative data wherever possible. Information was collected at national, district, and community levels through in-depth individual interviews with key informants, meetings, informal discussions, telephone conversations, and email communications. Both women and men, and people from different organizations and communities, were represented. The number and range of stakeholders consulted during the study are shown in Table 1. A total of 26 key informants interviews were conducted with gender focal persons from relevant organizations in the government sector, international non-governmental organizations (NGOs), UN and humanitarian organizations, and national NGOs. A list of the organizations consulted is given in Annex 1.

At the local level, separate key informant interviews were conducted with community members, both village leaders and ordinary men and women, by a team of consultants. Focus group discussions and field observations were carried out in two districts that had early warning systems in place.

Table 1: Stakeholders consulted

Stakeholder type	Men	Women	Total	% of women interviewees
Central government organizations	11	2	13	15
Local authorities (DDCs, VDCs, municipalities)	2	0	2	0
International NGOs	5	0	5	0
UN and humanitarian organizations	2	1	3	33
NGOs	4	2	6	33
Community representatives	19	7	26	27
Others (e.g., academics and individual experts)	4	2	6	33
Total	47	14	61	23

A checklist of indicators was developed based on global gender and disaster risk reduction frameworks and used to collect and analyse information on gender-sensitivity in the early warning systems. Only a few indicators were actually used in the data collection because of the lack of gender sensitive activities in the early warning systems. The checklist and questionnaire used in the interviews and case studies are given in Annex 2.

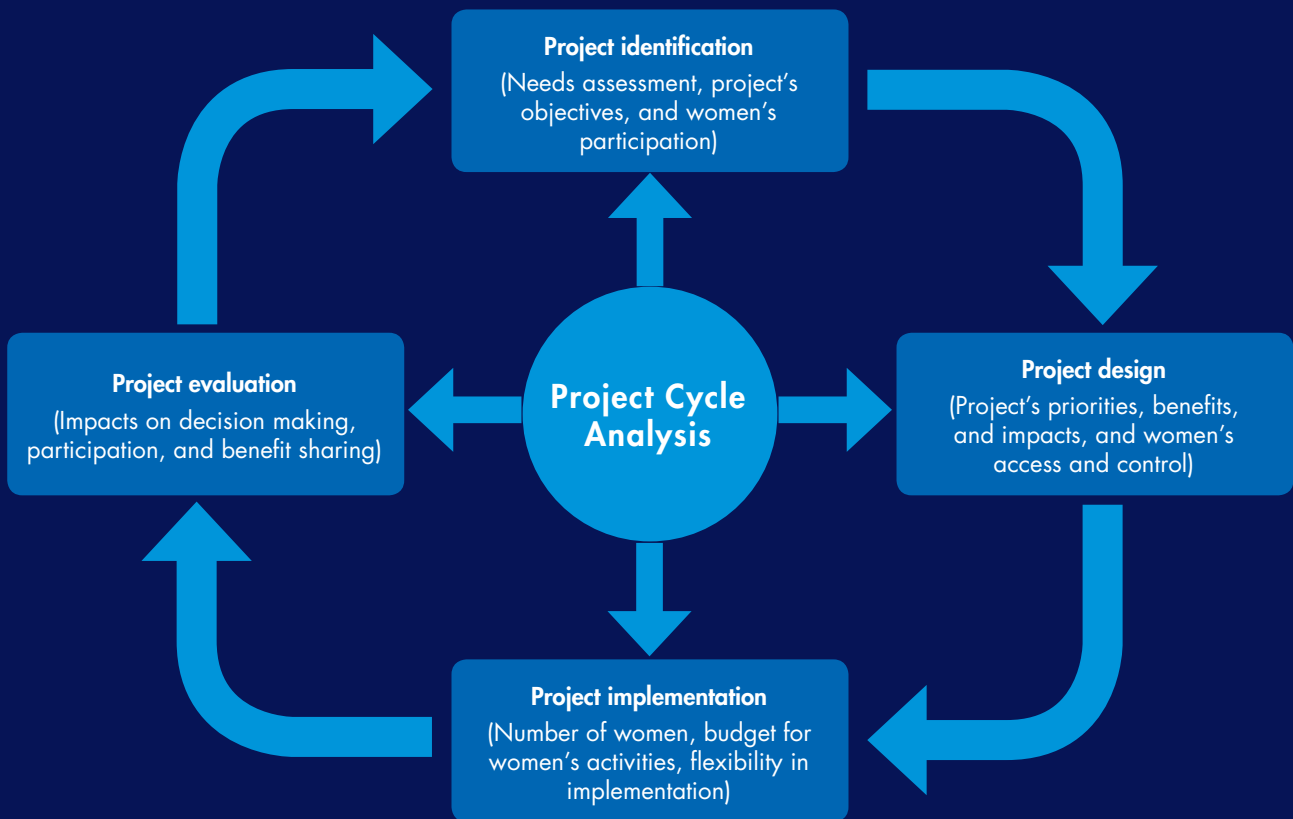
Frameworks for Analysis

Data analysis was an important part of the methodological framework for the study. There are a number of gender analysis frameworks available in the literature, for example the Harvard Analytical Framework (Overholt et al. 1985), Moser Gender Planning Framework (Moser 1993), Gender Analysis Matrix (GAM) Framework (Rani 1993), and Women’s Empowerment Framework (Longwe 1995). Two frameworks were used to analyse the data collected from the various sources in the study: the project cycle framework (Overholt et al. 1985) and gender analysis of the four pillars of people-centred early warning systems.

Project cycle analysis

The project cycle analysis (PCA) framework (Overholt et al. 1985) is part of the Harvard Analytical Framework; it divides the project cycle into four steps: (i) identification, (ii) design, (iii) implementation, and (iv) evaluation. The framework helps to analyse the differences between men and women in participation, roles and responsibilities, and decision-making power at different stages of a project cycle, and to assess changes resulting from the project intervention (Figure 2).

Figure 2: Project cycle analysis framework



Analysis of four key elements of people-centred early warning systems

A complete and effective early warning system should comprise the four interrelated elements of risk knowledge, monitoring and warning service, dissemination and communication, and response capability (Figure 3). A weakness or failure in any one part could result in failure of the whole system (UNISDR 2005).

Gender analysis was conducted for each of the four pillars in each early warning system. The analysis included an assessment of the differences in roles and responsibilities, participation, and decision making in every element of the system. It included differences between men and women in understanding hazards, monitoring and forecasting impending events, processing and disseminating understandable warnings, and taking appropriate and timely action in response to the warnings. Key points for each of the four elements of early warning systems were prepared to guide the analysis, for example, are vulnerabilities and risks known to both women and men, do warnings reach both women and men?

Figure 3: Four elements of an early warning system



Source: UNISDR (2005)

Opposite page: Volunteers conduct a door-to-door early warning orientation in Bardiya, Nepal



Chapter 3

Early Warning Systems –
A Review of
Current Knowledge

Why Early Warning Systems?

The occurrence and impact of disasters is increasing, a result both of the increase in the size and vulnerability of exposed populations as well as an increase in the frequency and severity of hydro-meteorological hazards (WMO 2014). Economic losses from disasters greatly set back hard-won development gains, particularly in low income countries like Nepal. Globally, the establishment of early warning and associated preparedness and response systems has helped to reduce the number of deaths from disasters over the last decade. Early warning systems promote the development and application of scientific knowledge, including improved information dissemination.

The goal of an early warning system is to protect lives and property. Early warning is thus one of the key elements in any disaster reduction strategy. The International Strategy for Disaster Reduction (ISDR) defines early warning as “the provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response” (UN 2006). Early warning systems can provide the necessary information and strategies to a wide array of actors to enable them to be proactive and better prepared for impending disasters. An effective system enables the concerned authorities and at-risk communities to know about the hazards at the locality, community vulnerabilities, and impending risk, to receive warning messages, and to mobilize their response capabilities to reduce risks. Early warning helps to reduce economic losses by allowing people to better protect their assets and livelihoods. For example, they can safeguard homes, sell livestock, or find the safest locations for shelter in times of flood or other disaster events, thus limiting not only the immediate impact of disaster but also effects on assets that can reduce economic wellbeing and increase poverty. Thus, effective early warning systems not only save lives but also help protect livelihoods and national development gains (UN 2006).

The need for a people-centric approach

Early warning systems have been developed for a number of applications, for example in conflict management, disaster preparedness, and health. The impacts of the Indian Ocean tsunami, hurricane Katrina in the USA, and floods in Pakistan and in Uttarakhand, India, all indicate deficiencies in existing early warning systems. All early warning systems need to be people the centric if they are to be effective. A global survey of early warning systems conducted by the UN indicated that in both developed and developing nations, the weakest elements are dissemination of warnings and preparedness to act (UN 2006). Often warnings fail to reach those who must take action, and when they are received they may not be understood by them or address their concerns. Root causes appear to be inadequate political commitment, weak coordination among the various actors, and lack of public awareness and public participation in the development and operation of the systems.

Early warning systems must be comprehensible and accessible to all users. They must deliver clear and concise messages tailored to the respective social and cultural contexts that reach the last mile of connectivity and support and empower people in protecting themselves. For this, an integrated approach is necessary that is based on the needs, priorities, capacities, and cultures of those at risk (OSCE 2009). Such an approach stresses the need for people at risk to be partners in the system and not controlled by it.

In Nepal, delivery of vital information to the public at risk has not always been successful. In many cases, local mechanisms for communicating risk and interpreting warnings remain weak (Lamichane 2011).

Flood early warning systems

Flood early warning systems include a chain of activities: understanding and mapping flood vulnerability, monitoring rainfall and water levels, forecasting impending events, processing, and disseminating and communicating understandable warnings to decision makers and the population so that they can take appropriate and timely actions in response (UNISDR 2007). Advances in science and technology during the last decade have improved the ability of flood early warning systems to reduce human loss. Considerable progress has been made in developing the knowledge and technical tools required to assess risks and to generate and communicate predictions and warnings, particularly as a result of growing scientific understanding and the use of modern

information and communication technologies (UN 2006). Figure 4 shows a schematic framework for a flood early warning system in terms of the four main pillars.

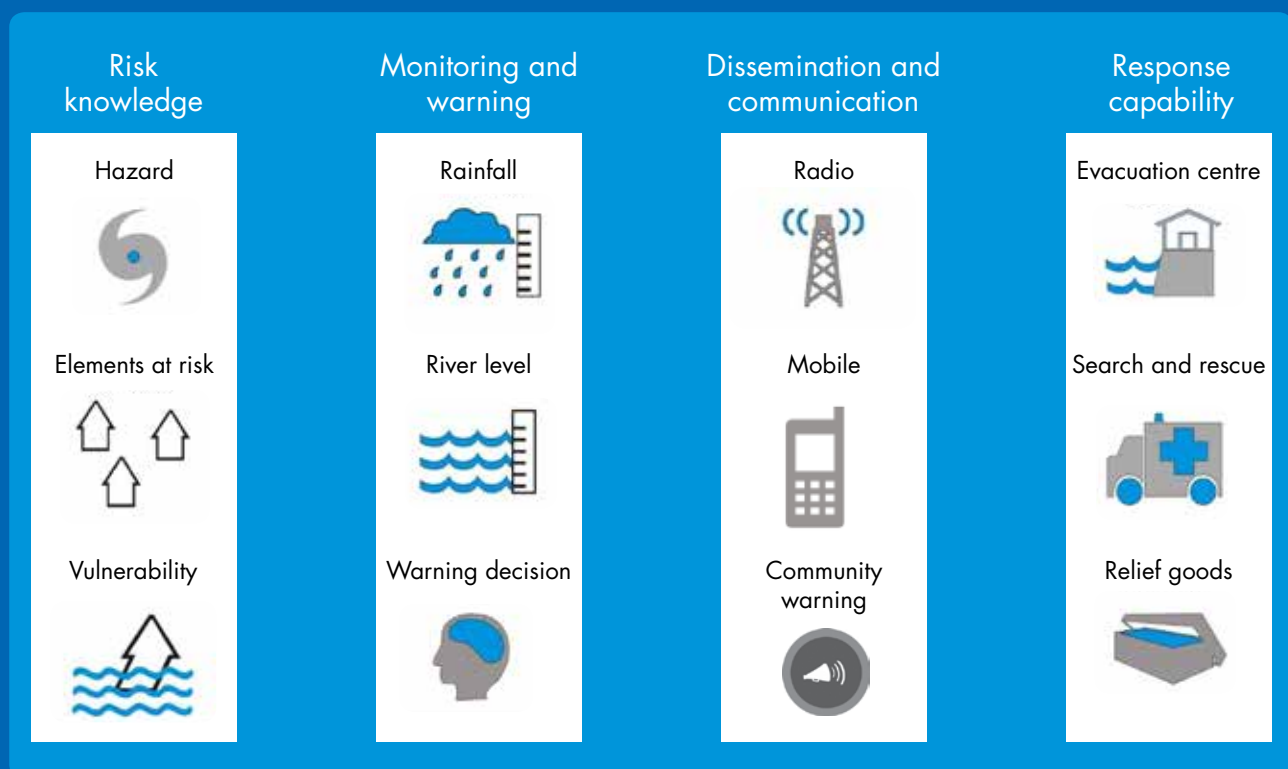
Why Include Gender Considerations in Early Warning Systems?

In the development context, ‘gender’ refers to the social attributes, opportunities, and relations associated with being a man or a woman in any given cultural or social group. It refers to socially constructed roles, responsibilities, and opportunities associated with men and women, as well as hidden power structures that govern the relationships between them (UNDP 2010). Gender determines what is expected, permitted, and valued in a woman or a man in a specific context (ECOSOC 1997). Gender relations are not fixed, but can and do change over time.

Gender equality means that both genders have equal conditions for realizing their human rights and potential; engaging in political, economic, social, and cultural development; and benefiting from the outcomes (UNDP 2010). An approach that takes gender into account recognizes that men and women have different priorities and needs and face different constraints, and thus different measures might be needed for women and men. Applying additional supportive measures to ‘level out the playing field’ is known as gender equity.

Women and men are affected differently by natural disasters (see box) and have different needs in terms of early warning systems. Messages reach them in different ways, they may understand the implications differently, and they have different responsibilities and possibilities for response. Differences in daily activities also impact on access to communication and opportunities for participation in disaster reduction activities. For example, in a field survey conducted by Rana (2011) on community-based flood warning systems in Nepal, the daily activity calendar of men and women showed that women mostly had roles related to taking care of children and the elderly, cooking, and performing household chores, while men were working in the fields and socializing in the community. These socially and culturally constructed roles and responsibilities increase women’s vulnerability during and after floods. To be fully effective, early warning systems must recognize and address these differences. Until now, however, discussions

Figure 4: Components of a flood early warning system



Source: adapted from Neussner (2009)

of gender in early warning systems appear to be limited. Since the 1980s, a considerable amount of work has been carried out on conflict early warning, but little attention has been paid to the differences between men's and women's situations, needs, perception of threats, vulnerabilities, or experience in the development and implementation of early warning systems for conflict prevention (OSCE 2009). Experience with conflict early warning over the past few decades has shown that the systems developed have also overlooked the contribution of women in information and response (UNWomen 2012). With advances in technology, new ICT tools have been introduced for early warning dissemination to support early action and timely response, but these have also overlooked the gender perspective. A guide for gender responsive conflict early warning developed by UN Women (UNWomen 2012) indicates that despite the existence of a number of initiatives and programmes on gender integration over the past few decades, the lack of attention to gender issues and the low participation of women in early warning initiatives have not been overcome. This lack of recognition of gender differences is equally true for natural disaster prevention.

Gender inequalities in access to and control of early warning systems draws its legacy from human society's stereotypical view of technology as being male-centric, which is reflected in many spheres of life. For example, in agriculture, it is typically men who master and control technical instruments. According to Kramarae (1988), women's use of and association with technology reflects their major occupations in life, for example, telephones are used by women operators and receptionists, whereas men repair them. As noted by Turkle (1984), in the earlier stages, computers were seen as a scientific and masculine activity due to the prevalent association of men with science. Today, computers have been erasing gender barriers. Similarly, several research studies have shown that access to mobile phones has empowered and strengthened women's social circles and support networks. For example, Handapangoda and Kumara (2013) found that mobile phones helped reduce women's information poverty in Sri Lanka; and opened them up to a newer, non-traditional fun space, which was a clear manifestation of choice and power.

An effective early warning system must have last mile connectivity. According to the world disaster report of 2009 (IFRC 2009), reaching the last mile is defined as reaching the most vulnerable group, especially those who are marginalized and not part of the development process, often women, children, and the elderly. The report states that women do not have as much access to information as men, and often information is passed on through men. Using an example from Bangladesh, the report indicates the importance of including the gender perspective in disaster preparedness and highlights the need for gender sensitivity in early warning and early action.

Women are affected by natural disasters differently than men

Several studies have shown that disaster mortality rates are higher for women than for men, and that this is caused by differences in the vulnerability of women and men that are the result of socially constructed gender roles. Following the 2004 Asian tsunami, Oxfam found that in many villages in Aceh, Indonesia, and in parts of India, women and girls accounted for over 70% of the dead. In the 1991 cyclone disaster in Bangladesh, 90% of the 140,000 victims were women and girls (Ikeda 1995). A study of 141 countries found that more women than men are killed during disasters and at an earlier age, particularly in poor communities, because of the discrimination they suffer due to their gender (Neumayer and Pluemper 2007). All these cases indicate that women are affected differently to men and also more severely. Women are more vulnerable to disasters due to social and cultural norms and barriers, which suggests we need different approaches and strategies for women and men when dealing with flood risk management and reduction.

Gender analysis helps in identifying differences between men and women in terms of activities, conditions, needs, control over resources, and access to development benefits and decisionmaking. Three elements need to be examined: division of labour, access to and control over resources, and gender needs (practical and strategic).

Gender mainstreaming is achieved when women's and men's experiences are integrated into the design, implementation, monitoring, and evaluation of policies and programmes in all political, economic, and cultural spheres, ensuring that men and women benefit equally (ECOSOC 1997). Women's physical size, strength, and endurance in relation to men; states of pregnancy and lactation; primary responsibility for infants, small children, and the elderly; and often clothing may all serve to slow them at the very moment when time is crucial to survival during a disaster. There are differences between women and men in knowledge, skills, roles, responsibilities, access to information, preferred medium for communication, and opportunities for learning, while social constraints and cultural practices also impact women and men differently. All these differences need to be considered in the design and implementation of an early

warning system (Shrestha et al. 2008). Integrating a gender perspective can improve the effectiveness of early warning systems as it enables more specific and differentiated information to be gathered, and more precise and detailed analyses to be made, which leads to better preparedness and preventive mechanisms, and more accurate and measurable responses, thus reducing loss.

Schmeidl and Piza-Lopez (2002) offered three hypotheses related to gender and early warning in conflict situations, which are also relevant to early warning for disaster prevention:

- 1) incorporating gender-sensitive indicators into collection and analysis processes for early warning makes existing models more comprehensive and allows for 'early' early warning by anticipating macro-level conflict through micro-level events;
- 2) incorporating micro-level changes and interactions between men and women helps fine-tune the formulation of political and humanitarian response in order to address the specific vulnerabilities of men and women and ensure that discriminatory policies are not perpetuated in post-conflict situations; and
- 3) early warning and preventive activities can be made more effective by utilizing the untapped potential of women, women's networks, and women's organizations as actors for peace.

Flood Early Warning Systems in Nepal

At the national level, the Department of Hydrology and Meteorology (DHM), under the Ministry of Science Technology and Environment (MoSTE), is mandated to monitor all hydrological and meteorological activities in Nepal. DHM collects hydrological, meteorological, and climate information and disseminates it to a variety of stakeholders for water resources, agriculture, energy, and other development activities (www.dhm.gov.np). DHM has 286 meteorological stations nationwide. The stations are regularly monitored and the information is collected centrally at the DHM office. In addition there are 170 hydrological stations, including 20 with sedimentation monitoring. Most of the hydrometeorological stations are manually operated, while some have been upgraded to automatic stations, able to continuously monitor flood parameters such as rainfall and water level around the clock and to transmit the data in real time.

A number of flood early warning systems have also been put in place to forewarn communities of impending flood disasters; some of these are described below.

Glacial lake outburst flood early warning system for Tsho Rolpa

In the 1990s, DHM set up a glacial lake outburst flood (GLOF) early warning system downstream from Tsho Rolpa glacial lake in the Tama Koshi basin in eastern Nepal. This was one of the first GLOF early warning systems in South Asia. The system consisted of a set of sensors and automatic sirens at 19 locations downstream. The sensor was set to trigger an alert to warn communities downstream along the Rolwaling and Tama Koshi rivers when a certain level was reached in the lake. The communication of the warning from the sensing system to the villages was based on extended line of sight (ELOS) using very high frequency radio together with meteor burst communications technology (Shrestha et al. 2008). The system worked for a few years, but inadequate operation and maintenance, vandalism, and others led to the system becoming defunct (Ives et al. 2010).

Disaster preparedness and early warning systems for floods, landslides, and earthquakes: The case of Tajikistan

In Tajikistan, Oxfam runs a disaster preparedness programme in an area vulnerable to floods, landslides, and earthquakes. In the rural areas where Oxfam works, cultural norms dictate that women's access to education and paid work is low, and their community participation and mobility are very limited. Many households are run by women and are often very vulnerable, given the significant male out-migration to Russia. A core element of this programme is encouraging women to be actively involved in preparing the community for future hazards, and in planning rescue responses. Female trainers and community mobilizers run women-only groups to build women's confidence, encourage them to voice their concerns, and deliver training in specific skills such as first aid and disaster management. These women then go on to train other women in their homes. The impact of this disaster preparedness work is significant. In a recent landslide where 35 households were at risk of being buried, a female community mobilizer had prepared the community so well that the risk of imminent landslide was noticed, a warning given out, and the area evacuated, with the result that no lives were lost. Forty years earlier, 134 people had died from a similar landslide in the village.

Source: Oxfam (2009)

Flood early warning system on the Bhote Koshi

An early warning system has been set up on the Bhote Koshi River by the Bhote Koshi Power Company (BKPC). There are a number of potentially dangerous glacial lakes upstream of the power project, some of which have burst in the past; in the Sun Koshi disaster of 1981, a glacial lake outburst flood from a lake in China washed away several bridges along the Arniko Highway, including the China-Nepal Friendship Bridge at the Kodari border (Mool et al. 2001). The early warning system consists of two sensor stations at the Friendship Bridge which transmit a warning in the event of a GLOF to sirens located downstream at the headwork and at Hindi village, and a warning-cum monitoring station at the powerhouse. A spillway can be opened so that flow is no longer diverted for power production and the powerhouse is shut down (www.bhotekoshi.com.np/socialdetail.php?id=33). The BKPC carried out community awareness raising activities to inform and prepare the local people, and installed warning signs at four different river crossings selected in consultation with the community. In the event of a GLOF or sudden spillway release, people are advised to move to a place at least 20 m above the normal riverbed level. However, the present dam is located only 6 km downstream from the Friendship Bridge and if a GLOF does occur, the warning system provides only five minutes lead time to make the preparations.

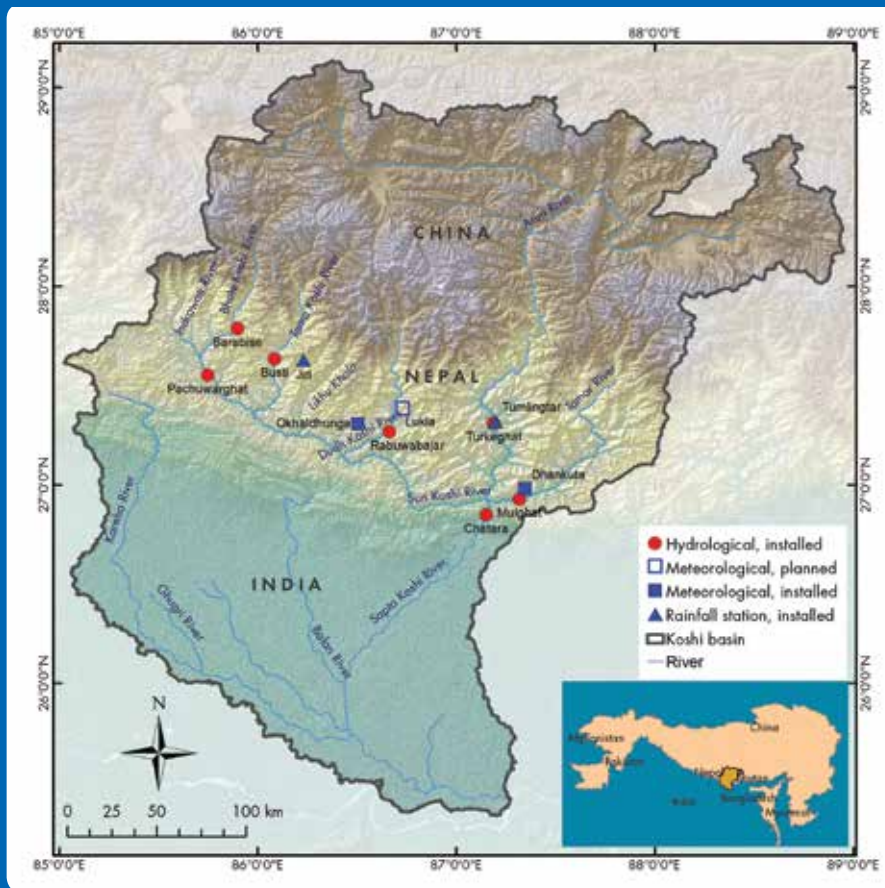
Web-based telemetry flood early warning system at DHM

DHM has made concerted efforts to develop a web-based telemetry system in various rivers to provide real-time data and information on water levels and provide flood warnings to the various stakeholders. It has upgraded 11 hydrometeorological stations in the Koshi Basin (Figure 5) as part of the HKH-HYCOS initiative to improve flood forecasting and provide early warnings in real time. These hydrometeorological stations transmit real time data to the national and regional information system to enable timely warning. The water levels in the rivers are monitored using automatic sensors based on pressure and radar technologies and data is transmitted via the Internet using a combination of Code Division Multiple Access (CDMA) and Global System for Mobile Communication (GSM) technology. The Iridium satellite is included as a backup to transmit data when all other communication systems

Hydrological monitoring station installed in Barabhise, Nepal



Figure 5: Real-time hydrometeorological stations in the Koshi basin



Source: ICIMOD

fail. Danger and alert levels have been established at each of the hydrological stations to trigger a warning based on a rise in water level. DHM has now installed more than 40 automatic stations throughout the country which are providing real-time data through this web-based telemetry system (www.dhm.gov.np). However, there is no system for authoritative issuing of flood early warnings to those at risk.

Community-based flood early warning systems

Since 2002, Practical Action has been working on flood early warning systems for communities in Nepal. In the initial period, observation towers were set up with a siren system to watch and warn communities of impending flood disasters (Practical Action 2009). This introduced the concept of early warning systems, but the technology has now been improved. In the western region of Nepal, Practical Action and DHM have piloted a community-based flood early warning system in the West Rapti basin. Real-time information on water levels at the upstream gauging station operated by DHM is provided to communities to warn them of impending floods (Practical Action and Mercy Corps 2012). The high water level that occurred in the West Rapti basin in 2012 was successfully communicated to the communities and timely action was taken (Gautam and Phaiju 2013).

Practical Action has also established a community-based flood early warning system in Banke and Bardiya districts in collaboration with DHM and local NGOs. The institutionalized system includes local governmental and non-governmental organizations in the network for early warning. Key contact details for various levels of informants have been prepared and communication channels developed for dissemination of warnings during floods. Communities are considered to be an integral part of the system and participate in risk assessment, communication and dissemination, and immediate response activities. A similar system has been installed by Mercy Corps in Kailali and Kanchanpur districts. Experience from the floods in September 2012, when heavy rainfall occurred over the Far Western and Western regions, further demonstrated the usefulness of such systems in saving lives by providing timely warnings to the communities. Efforts are being made to replicate this system in other river basins.



Early warning in action: Case study in Nepal

On 3 August 2012 in Banke District communities used the early warning system to prevent a major disaster. Incessant monsoon rain had raised water in the West Rapti river to a critical level, 7.24 m, and a flood was imminent.

Fortunately for downstream communities, the early warning was activated as planned at the first warning level. An electronic display board at the District Administration Office (DAO) sounded a siren when water reached the critical level. Mr Dhundi Raj Pokharel, the Chief District Officer, then advised security forces to disseminate information to police posts in the vulnerable communities. Local task forces then sprang into action in communities in the five affected VDCs and the communities took avoidance action. Mr Pokharel considered that the early warning system had been a great achievement. He said "I am happy that despite the huge flood, there were no human casualties".

Lives were saved in the downstream communities in Nepal and India because of timely information. This highlights the importance of preparing communities to face natural disasters. The community-based disaster risk reduction projects in Nepal are ensuring that communities can protect themselves and their livelihoods from the impact of natural disasters.

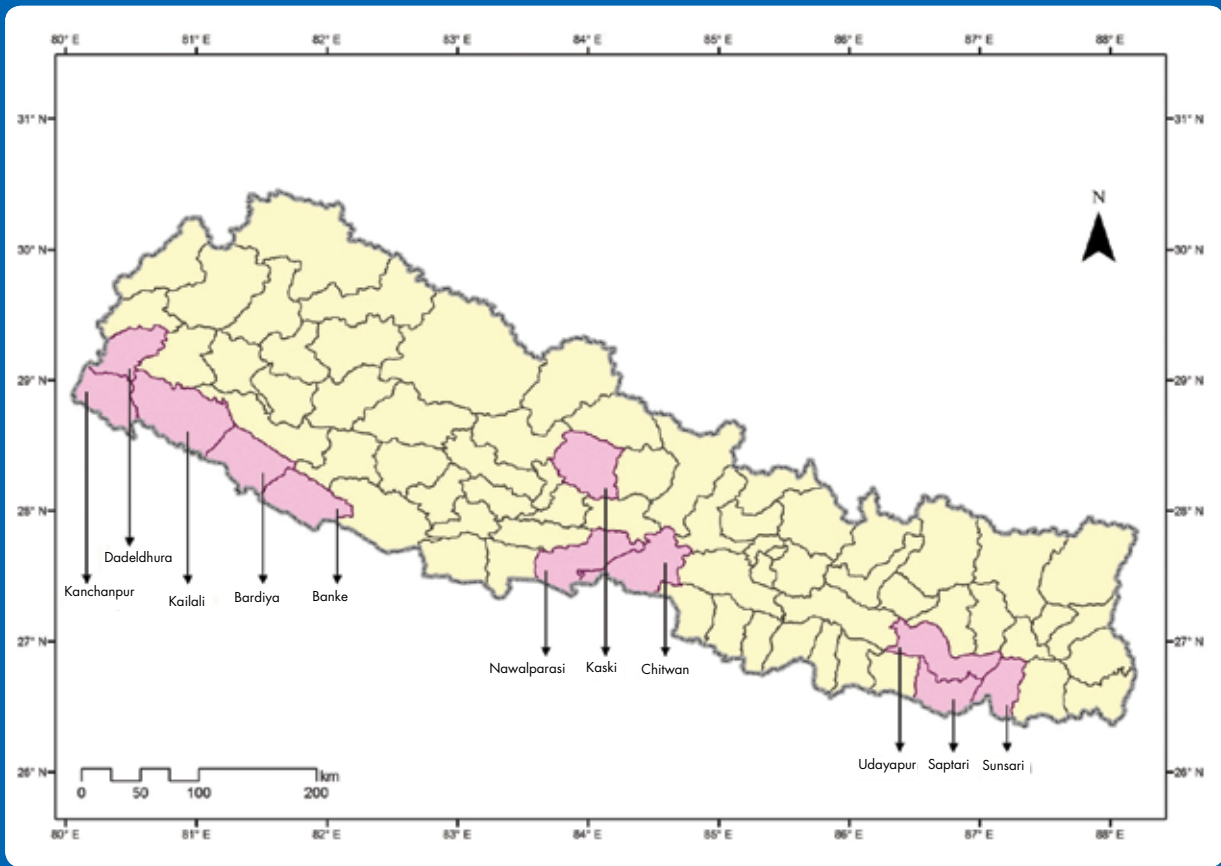
Source: <http://un.org.np/attachments/early-warning-action/flood-case-study-19-july-2012>

Communities use an observation tower equipped with sirens to watch for impending flood events and warn others

In February 2011, the Government of Nepal launched the Nepal Risk Reduction Consortium (NRRRC), which identified five flagship priorities for disaster risk reduction. Flagship 4 of the NRRRC focuses on community-based disaster risk reduction as a priority, and has created a consensus with stakeholders on the minimum characteristics of a disaster resilient community. The characteristics include an inclusive community-based early warning system at village development committee (VDC)/ward, district, regional, and national levels (Figure 6) .

Nepal's Strategic Program for Climate Resilience (SPCR) includes a project – on building resilience to climate – related hazards [led by the World Bank]. The objective of the pilot project for climate resilience (PPCR) is to enhance government capacity to mitigate climate-related hazards by improving the accuracy and timeliness of weather and flood forecasts and warnings for climate-vulnerable communities. This programme seeks to establish a multi-hazard information and early warning system, modernize the existing hydrometeorological network, and put in place an agricultural information management system.

Figure 6: Districts with community-based flood early warning systems



Source: ICIMOD, data from Practical Action



Installation of automatic weather station



Chapter 4
The Study Findings

Analysis of Institutions Involved in Disaster Risk Reduction from a Gender Perspective

Early warning systems require contributions from a wide range of actors and institutions, including local communities, national governments, regional organizations, NGOs, the private sector, and the science community (UN 2006; IPCC 2012). A total of 26 institutions involved in different aspects of disaster risk reduction in Nepal were consulted about the status and effectiveness of existing early warning systems (policies and institutions), especially those for flood risk management (Annex 3). The broad roles of these key stakeholders were analysed from a gender perspective based on key informant interviews in the respective organizations, focus group discussions, and secondary information.

The organizations consulted were from four broad categories: (i) government organizations; ii) international NGOs; iii) UN and humanitarian organizations; and iv) national NGOs (Table 2). There is an ongoing effort through the NRRC flagship priorities to review efforts in disaster risk reduction in Nepal, identify institutional strengths, and propose institutional arrangements for effective implementation. But at present, there is no comprehensive or systematic documentation specifically for flood early warning systems at the different levels (community, district, and national) that describes institutional roles, structures, systems, and practices, or overall architecture.

Women’s representation in the institutions

The level of women’s representation in terms of staff numbers within the institutions is shown in Table 3. Women were inadequately represented in all the institutions, comprising less than 20% of staff on average, and only 15% in the government agencies. Representation at different levels of authority was not analysed, but the general impression was that the proportion of women at higher levels of authority was lower than at lower levels. The low numbers of women staff may contribute to underrepresentation of the specific needs of women in planning, designing, and implementing plans for disaster risk reduction and early warning systems.

Institutions and their roles

The findings indicated that multiple institutions are involved in disaster risk reduction in Nepal but their roles, inter-relationships, coordination mechanisms, and accountability arrangements are not very clear or explicit. Figure 7 shows the overall distribution of roles and responsibilities of the 26 institutions consulted in various aspects of disaster risk reduction activities, while Figure 8 provides details for the different institutions.

Table 2: Number and type of organizations consulted

Type	Number	% of total
Government agencies	13	50
INGOs	5	19
UN and humanitarian organizations	2	8
National NGOs	6	23
Total	26	100

Table 3: Number of women staff in the organizations consulted

Organizations	Total number of staff	Women	%
Government	1,348	200	15
Non-government, UN, and humanitarian	692	179	26
Total	2,040	379	19

Figure 7: Organizations consulted and their roles in disaster risk reduction (n=26, most organizations have multiple roles)

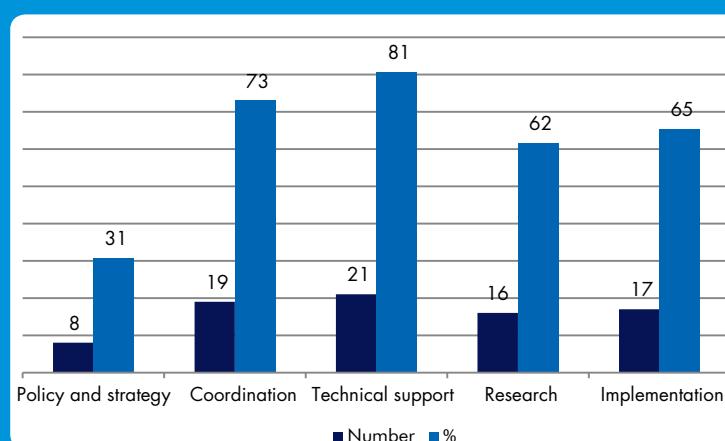


Figure 8: Roles and functions of different organizations in disaster risk management in Nepal

Policy	Coordination	Technical support	Research	Implementation
	Department of Hydrology and Meteorology			
	Department of Soil Conservation and Watershed Management			
	Department of Water-Induced Disaster Preparedness			
Ministry of Defence				
Ministry of Education				
Ministry of Federal Affairs and Local Development				MOFALD
Ministry of Health and Population				
Ministry of Home Affairs				MOHA
Ministry of Irrigation				
Ministry of Information and Communication				
		Ministry of Tourism and Civil Aviation		
	Ministry of Women and Children			
National Planning Commission				
	Mercy Corps			
	Oxfam			
	Plan International (Nepal)			
	Practical Action (Nepal)			
	Save the Children			
	Nepal Red Cross Society			
	UNDP-CDRMP			UNDP-CDRMP
		Agro-Farm Foresters' Association, Nepal		
			Centre for Disaster Management Studies	
				Centre of Resilient Development
	DPNet			DPNet
			National Disaster Risk Management Forum	
		Society of Hydrologists, Nepal		

Most of the activities in disaster risk management are being undertaken by multiple organizations with overlapping roles and responsibilities (Figure 8); 19 of the 26 organizations were involved in coordination; 21 in providing technical support, and 17 in implementation, while only eight were involved in formulating policy and strategy frameworks. The policy and strategy related activities are mainly carried out by central level government organizations, and implementation by local NGOs and community-based organizations, supported by INGOs and national NGOs.

Institutions involved with early warning systems

Of the 26 organizations interviewed, only four (15%) had ongoing projects or regular activities on early warning systems for flood hazard, while the remainder either had (or had previously had) projects or activities on other early warning systems or on flood hazard or risk mitigation in general (Table 4).

Table 4: Organizations with early warning systems projects

Categories	Number	%
Organizations with projects or regular activities on early warning systems for flood hazards	4	15
Organizations with projects or regular activities on early warning systems, but not for flood hazards	3	12
Organizations with no projects or regular activities on early warning systems, but some activities related to some aspects of early warning systems or flood hazard/risk mitigation	15	58
Organizations that had previously had projects or regular activities on early warning systems or flood hazard/risk mitigation, but not at the time of the survey	4	15

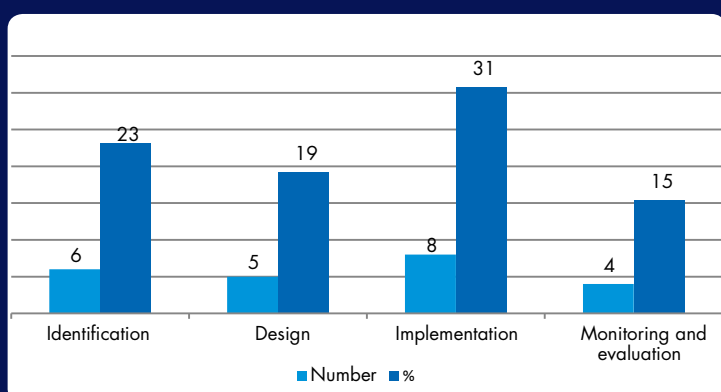
Integration of Gender Considerations in Projects and Activities

Two frameworks were used to analyse the level to which gender considerations were included in the different activities related to early warning systems and flood risk management: the project cycle framework and the four pillars of people-centred early warning systems.

Project cycle analysis

The engagement of women in the 26 institutions was mapped in terms of the four phases of the project cycle analysis framework: identification; design; implementation; and evaluation. The results are shown in Figure 9. Very few organizations had ensured women’s participation in all four phases of the project cycle; 23% had involved women in project identification, 19% in design, 31% in implementation, and only 15% in project monitoring and evaluation. The low involvement in monitoring and evaluation indicates that women have a weaker role in decision making, whereas the higher involvement in implementation may reflect more involvement in routine tasks. The actual roles and quality of women’s participation in the different phases requires further research and understanding. It is important to ensure that women’s participation is mandatory and equitable from the design phase of a project onwards in order to ensure effective and sustainable outcomes from early warning systems initiatives and disaster risk reduction programmes.

Figure 9: Engagement of women in different phases of project cycle management (n = 26)



Four pillars analysis

Gender ‘neutral’ actions in the disaster risk management cycle are generally not ‘neutral’, rather, they force women into situations of distress, humiliation, and increased risk of becoming victims of violence, and perpetuate a system of reduced access to the opportunities and options available to their male counterparts (Ariabandhu 2009). These problems can be mitigated to some extent by involving women at all stages of the cycle, so that any potentially negative impact’s of specific actions (or lack of action) and decisions on women are more

easily recognized and addressed, and women are better informed about activities. There are no specific policies or guidelines for women’s participation in early warning systems projects or activities in Nepal, but government agencies usually follow the National Planning Commission’s guidelines, which have a mandatory provision for women’s participation in development initiatives (minimum 30%).

Assessment of the scenario of early warning systems from a gender perspective showed that gender integration is at a very early stage. None of the organizations surveyed had a mandatory provision to achieve a gender balance in early warning systems activities and no early warning systems project proposal had outcome indicators disaggregated by gender. For almost all the organizations, gender in early warning systems activities was limited to the formation of community organizations and capacity building and training. Only one organization had an explicit gender policy specifically designed for early warning systems, while a few had some provisions or practices related to gender in some early warning system elements. Most of the organizations were involved in multiple hazards and were using a gender-neutral approach; all five of the organizations involved in all key components of flood early warning systems included gender considerations in at least some elements.

Gender analysis was conducted for the 26 institutions in terms of the specific activities related to each of the four key elements or pillars of an effective people-centred early warning system (Table 5).

Risk knowledge

There are provisions in policies, strategies, and guidelines to engage women’s organizations in the capacity building of women, men, and the elderly. The Government of Nepal has also issued guidelines and mandatory directives on the minimum number of women to be involved in users’ groups and community-level development activities. However, as yet no appropriate tools or standards have been developed, no attempts have been made to design gender-sensitive alerts and messages, and there has been no appropriate training on hazard vulnerability capacity assessment.

Overall, only a third of respondents said that they had an institutionalized system for knowledge management and documentation in the case of early warning systems. None of the organizations performed comprehensive hazard and vulnerability assessments with sufficient emphasis on women’s traditional knowledge and perceptions.

Gender-sensitive risk assessment: Disaster risk assessment is the problem analysis phase in a disaster risk reduction intervention and a part of the ‘risk knowledge’ pillar in an early warning system. The risk assessment process includes hazard assessment, vulnerability analysis, and capacity assessment of the local population. Active participation of women, men, the elderly, and disadvantaged groups in general, is necessary to ensure that the risk assessment is effective and realistic. Experience from the Kailali disaster risk reduction initiative implemented by Mercy Corps and NRCS indicates that women and the socially marginalized have the capacity to be key actors in disaster risk reduction interventions, and women groups were involved in vulnerability analysis and preparation of hazard maps.

Table 6 summarizes the responses on the level to which gender considerations were included in risk assessments. The majority of responses to the

Members of the local community monitor rainfall in Malghat, Nepal



Table 5: Involvement of organizations in the key elements of people-centred early warning systems

Organizations	Risk knowledge	Monitoring and warning services	Dissemination and communication	Response capability
Government agencies				
Department of Hydrology and Meteorology		•	•	
Department of Soil Conservation and Watershed Management		•	•	•
Department of Water-Induced Disaster Prevention	•	•	•	•
Ministry of Defence	•			•
Ministry of Education	•			
Ministry of Federal Affairs and Local Development (MOFALD)	•		•	•
Ministry of Health and Population	•			
Ministry of Home Affairs	•	•	•	•
Ministry of Irrigation	•	•	•	
Ministry of Information and Communication	•			
Ministry of Tourism and Civil Aviation			•	
Ministry of Women and Children	•			
National Planning Commission	•			
INGOs				
Mercy Corps	•	•	•	•
Oxfam GB	•	•	•	•
Plan International Nepal	•		•	•
Practical Action Nepal	•	•	•	•
Save the Children			•	•
UN and humanitarian organizations				
Nepal Red Cross Society	•	•	•	•
UNDP-CDRMP	•		•	•
National NGOs				
AFFAN			•	•
CDMS			•	•
CORD				•
DPNet			•	•
NDRMF				•
SOHAM	•			
Total	18 (69%)	9 (35%)	17 (65%)	17 (65%)

Table 6: Inclusion of gender considerations in disaster risk assessment

Question	Response (n = 26)	
	Yes	%
Are the hazard, vulnerability, and risk maps gender disaggregated?	4	15
Do women participate in risk assessment?	5	19
Are the risk reduction strategies gender sensitive?	4	15
Has gender analysis been conducted?	3	12
Have women's capacities, knowledge, and attitudes been incorporated and documented in the assessment?	3	12
Have women's organizations been engaged in risk assessment?	3	12
Has an advocacy campaign been carried out for gender-sensitive risk assessment?	2	8

questions were along the lines ‘we have not gone into that detail’. Due to the mandatory provisions and guidelines of the National Planning Commission, all government agencies are trying to incorporate the concept of gender-sensitive risk assessment and reduction and to engage women in all phases of the project cycle management.

Monitoring and warning services

It is important to engage men and women in regular monitoring of hazards in the locality to generate information for warning purposes. Involvement of both women and men will help identify the information accurately, on time, and earlier, and will help reduce the risks. Only nine organizations (35% of the total) were involved in monitoring and warning services, and of these four had mobilized women’s groups and individuals to conduct hazard monitoring.

Dissemination and information

Women were not considered as recipients of disaster alerts when disaster messages were sent. Sending disaster messages through radios and mobile phones does not ensure that the messages are received by women and girls. Some organizations had formed women’s groups and mobilized women and girls in early warning systems. However, neither the messages nor the dissemination mechanisms were gender sensitive.

Response capacity building

The majority of the organizations surveyed were involved in response capacity building. However, this was not systematic and was generally not directly linked to early warning systems activities. Although women play an important role in responding to disasters and are able to cope with, adapt, and withstand the impact of disasters, they are usually not involved in the early warning system processes. Questions were asked about the involvement of women in response capacity building as a part of the early warning systems and disaster risk reduction activities. When women were involved in the hazard, vulnerability, and capacity assessment process, this also meant that they played an active role in response capacity building at the community level. As male members of the family usually go out for work, women were more readily available for risk assessment and other community development work.

The involvement of the organizations in the four pillars of early warning systems is summarized in Figure 10. Five organizations were involved in all components of early warning systems for flood hazard, but only one integrated gender considerations in them all, while the remainder included gender considerations in some components.

Legal and Policy Instruments

The Ministry of Home Affairs is the nodal body in the field of disaster management in Nepal. There are provisions for a Central Natural Disaster Relief Committee, Regional Natural Disaster Relief Committee, and District Natural Disaster Relief Committee to coordinate disaster preparedness and response activities.

Nepal has been active in disaster risk reduction for more than three decades. These legal and institutional provisions are flexible; all the activities required for gender-sensitive early warning systems can be done using these instruments. The key legal and policy instruments related to disaster risk reduction and early warning systems in Nepal are the

- Natural Disaster (Relief) Act (1982),
- Nepal Water Resources Act (1992),
- Building Code (1994),
- National Action Plan on Disaster Management (1996),
- Local Self Governance Act (1998),
- The Tenth-Plan (2002–2007),
- Nepal Water Resources Strategy (2002),
- Medium Term Expenditure Framework (MTEF),
- Hyogo Framework for Action (HFA 2005), and
- National Strategy for Disaster Risk Management (2009).

Figure 10: Involvement of women in the four key elements of early warning systems in Nepal

Risk knowledge	Monitoring and warning services
<ul style="list-style-type: none"> • There is limited involvement of women in risk assessment (hazard, vulnerability, and capacity assessment for local hazards). • Only four of the 26 organizations surveyed (15%) had a provision for gender disaggregated vulnerability assessment. • No organizations have a sufficient focus on women’s and men’s traditional knowledge and perceptions. • Community-based organizations, and women’s groups in particular, are not yet linked to the organizations that collect scientific information. 	<ul style="list-style-type: none"> • Mostly men are involved in observing and documenting hazard occurrence, establishing community-based early warning systems, training on early warning systems equipment installation, operations and maintenance. • Only four of the 26 organizations surveyed (15%) had mobilized women’s groups or individual women for monitoring and warning services. • The flood monitoring and forecasting work carried out by DHM at the national level is centralized, and women’s groups find it very hard to receive information in a timely manner.
Communication and dissemination	Response capability
<ul style="list-style-type: none"> • Mostly men are involved in disseminating disaster alerts and radio messages. • Mandatory provisions for the involvement of women in DRM committees at local levels have given women some access to early warning systems messages. • Women are less well targeted by communication products and services • Women normally don’t receive hazard warnings because they only receive information indirectly (from men in the community). • There is no feedback mechanism to show whether the risks and warnings are understood by women and the illiterate. 	<ul style="list-style-type: none"> • Both men and women take part in training on what to do at times of disaster, managing disaster events, response activities, contingency planning, and others. • Women’s engagement in response capacity building is increasing due to the mandatory provisions in government rules and guidelines and strategies of the organization’s responsible. • Due to social norms and barriers, women still don’t come forward during planning for response preparedness and capacity building.

The government included a ‘Disaster Management Programme’ for the first time in its 10th National Development Plan (2002-2007). This plan had the objective ‘to contribute substantially to making public life secure by managing natural and anthropogenic disasters systematically and effectively, and by making development and construction related programmes in the country sustainable, reliable, and highly gainful’. A clause to strengthen the provisions for assessing disaster risk in development infrastructure was also highlighted. Strategies related to early warning systems in the 10th Plan include adoption of suitable technology to minimize environmental impacts and losses, carrying out effective public awareness activities, and preparation of hazard maps for vulnerable areas.

Management of water-induced disasters is one of the priority areas of the Water Resources Strategy (2002). According to this strategy, water-induced disaster prevention, warning/preparedness, and mitigation measures will be established in at least 20 priority districts in the short term, and for the whole country by 2027.

The Nepal National Strategy for Disaster Risk Management (2009) states that all issues on gender and social inclusion will be mainstreamed into all phases of disaster risk management. In the strategy, the role and importance of effective community-based disaster risk reduction is considered a priority, while mainstreaming gender is of importance. The National Adaptation Programme of Action (NAPA) to Climate Change project in Nepal proposes a more comprehensive approach to climate change adaptation at the local and national level by incorporating a key set of environmental indicators into the national adaptation programme’s surveillance activities. The NAPA priority areas include vulnerability assessment at the local level, surveillance of hazards, risk knowledge, and response capacity building (GoN 2010). Climate change has a direct impact on change in precipitation/rainfall and the occurrence of floods, thus an integrated approach is highlighted involving all stakeholders and tools for community-based early warning systems.

Many of the existing disaster risk reduction tools and frameworks such as vulnerability progression, key elements of people-centred early warning systems, and the vulnerability analysis framework are not gender sensitive. Furthermore, the existing institutional structure needs support at all levels of government for effective implementation of these policy frameworks and strategies.

Policy provisions, strategies, and programme guidelines are flexible, but are not specific enough for gender integration in disaster risk reduction, including early warning systems activities. An effective early warning system contributes to building safer and more resilient communities, but equal involvement of men and women is required to address specific needs and priorities (Gautam 2009).

Case Studies on Community-Based Flood Early Warning Systems

Two case studies were carried out on community-based flood early warning systems implemented by Practical Action in Chitwan and Banke districts. Field visits were made to the two districts and information collected from individuals as well as through group discussions. A checklist was used for focus group discussions involving community members and related stakeholders at community and district levels.

Bacheuli village in Chitwan District

Bacheuli village lies 35 km to the southeast of Narayanghat Bazar, Chitwan. Bacheuli is one of the most flood affected villages in Chitwan District. It is surrounded by different streams including the Khageri, Budhi Rapti, and Dhungre Khola, which ultimately join the Thuli Rapti river.

Flood is a devastating and recurring disaster in the village; the Rapti River has a repeat interval of 7–10 years for large floods. Following a devastating flood in 1954, the Nepal Timber Corporation was established to manage felled and swept away trees and forest resources. Devastating floods causing significant damage were recorded in 1970, 1974, 1990, 1993 (three killed), 2002 (three killed), and 2005. Large areas of agricultural land were destroyed by each flood. Local government and NGOs have provided support for river training and response operations, including construction of embankments and dikes in the village, with support from the District Development Committee (DDC), Chitwan. A vulnerability assessment of the community flood hazard showed that lack of awareness, poverty incidence, unequal access to resources, physical vulnerability, lack of meaningful participation of women in early warning systems, and traditional beliefs were the key underlying causes of the unsafe and more vulnerable conditions in the community.

Flood early warning system

The Local Disaster Management Committee (LDMC) which is chaired by the Village Development Committee (VDC) (currently the VDC secretary), has a five-member early warning sub-committee. A hydrological station at Rajaiya on the east Rapti River operated by DHM monitors the water level. Alert and danger levels have been established by DHM based on past flood records and in consultation with the community. An information flow chart has been prepared where alert levels are communicated by the gauge reader to the chairpersons of the local and district disaster management committees, FM stations, Practical Action, and the communities. The LDMC committee is equipped with a set of sirens and basic search and rescue items, including life vests and ropes. Sirens have been set at three levels to be alert, to be prepared, and to move/evacuate. Lead time from the station to the village is about four hours, which is adequate time for people to evacuate and save lives and property. All households have been informed about the early warning system mechanism, with contact details for Chitwan District, to facilitate better preparedness. This list is updated on an annual basis or as necessary. Community members have been trained in flood evacuation drills. This is a simple system of the type that the community can afford, and is linked with emergency response agencies (security force, District Disaster Relief Committee, District Development Committee and others).

Flood early warning system in action in Bacheuli village

“On 24th August 2010, there was continuous rainfall for more than ten hours. I received a phone call from Badri Bahadur Dhakal, gauge reader at Rajaiya gauge station for Rapti River, at 2:30 PM. Badri informed me that the water level at Rajaiya was 3.8 m, which was below danger level but something to worry about as the rain was still pouring down [warning level 3.5 m, danger level 4.2 m],” said Dukharam Mahato, an LDMC task force member. His team has a person responsible for getting the information from the gauge reader, and a team responsible for disseminating information to the community with the help of a hand operated siren, hand microphone, and CDMA phone. The task force also has a search and rescue team, first aid team, and volunteers responsible to help people in the case of an emergency. The task force is responsible for coordinating with, and is answerable to, the DMC.

Mahato called the other DMC members to ask for their suggestions. A quick decision was made to observe the water level downstream as well. Nakul, the DMC member responsible for the downstream, reported that the water level had risen to three times higher than usual. The DMC members then gathered in the VDC building, which was earlier identified as the midpoint during any emergency. The most vulnerable wards, Ward No.1 Badreni, Ward No. 7 Magartol, and Ward No 2 Sauraha, were informed first, as they would be flooded first. The task force members were then on standby for response. After the information on the danger level was disseminated, the task force stood by with life-saving equipment such as life jackets, ropes, boats, and first aid kits ready for use at any time. Everyone and everything was in place to alert the community. “We informed the community about the water level through a hand-held microphone as the siren could not communicate the water level information. Though people had reacted to the siren more during the mock drill, we decided to use the siren only when the water reached danger level to avoid chaos and confusion. Our community was not flooded, but we were successful in informing them about the rising water level”, said Nakul. (Source: http://practicalaction.org/region_nepal_ews)

Gender aspects

The community discussions revealed that there are clear roles and responsibilities and that gender issues are considered. Two of the five members of the committee responsible for the actual warnings are women, including the committee coordinator. The village has its own search and rescue team, the members of which know the special needs of women, children, the elderly, and those with disabilities. Training on disaster response, including early warning systems, was provided by the DDC and Practical Action. Women, children, the elderly, and those with disabilities were specifically oriented. The early warning messages and alerts and dissemination means are gender neutral. Attention was given to gender issues while forming the LDMC and in the selection of participants for the training courses.

Lessons learned

There is a provision for local level hazard monitoring, especially monitoring of flood level, and dissemination of flood warnings to households, via siren. Both men and women have a level of response capacity. The community-based early warning system has been integrated with the water level and rainfall monitoring system of DHM.

Community members, including women, were trained on the response to early warnings and safety. People are aware of the safety tips in times of disaster; they are familiar with the escape routes and safest location near their houses. The early warning system practised in Bacheuli village appears to be sustainable; however, sustained coordination among the DMC, local authorities, and NGOs is crucial.

The confidence level of both men and women has improved. According to community members, all communities affected by the Rapti River can directly replicate this system in their area where there is a weather station and/or river gauge.

The success of the system depends largely on the capacity of the community to respond after alerts and messages are received. The community capacity, especially the capacity of the most vulnerable, needs to be enhanced.

Holiya village in Banke District

Holiya village has 1,115 households with a total population of 6,290 (3,315 male, 2,975 female; Census 2011), with a high incidence of poverty associated with low income and a low level of land ownership. The village is characterized by river systems in which flow levels are influenced by rainfall far upstream, with floods occurring more regularly in recent years. Evacuation efforts take many hours.

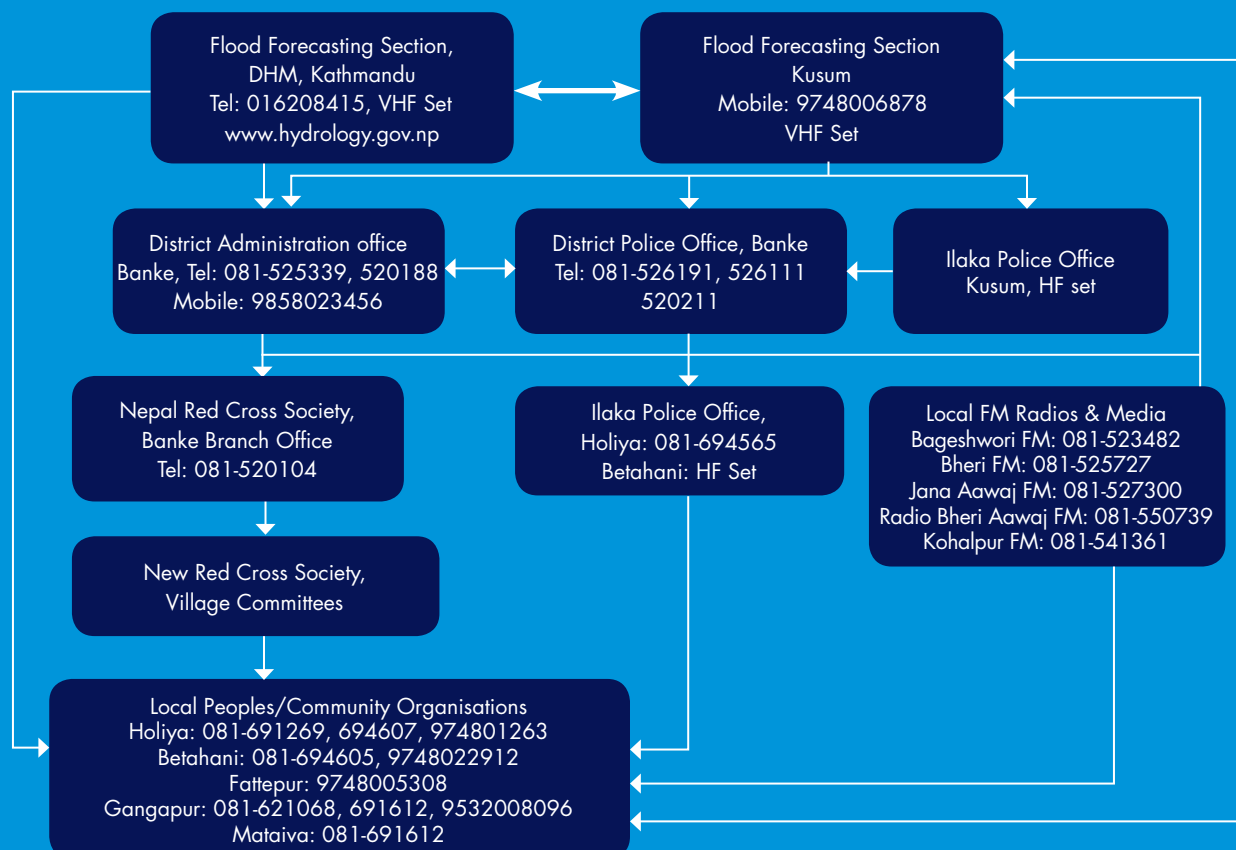
Recurring, almost annual, floods have had a marked impact on the lives of the village people. Many have lost their lives due to flooding in the past 15 years (one killed in 1998; two in 2004; four in 2006; seven in 2007; one in 2010; two in 2011, and one in 2012). Poor quality houses, unscientific agricultural practices, lack of land use planning, and the frequently changing river course, among others, have made this village vulnerable to floods. The 2006 and 2007 floods had a particularly devastating impact on the village. The 2007 flood claimed seven lives; whereas floods in 2006 had the highest level of property damage (estimated at USD 1,437,000).

A community vulnerability assessment showed poverty, unequal access to resources, lack of meaningful participation of women in early warning systems, and traditional beliefs to be among the key underlying causes of the higher vulnerability and flood risk in the community.

Flood early warning system

In 2007, the Nepal Red Cross Society (NRCS), Practical Action, and the Centre for Social Development and Research (CSDR) put an early warning system in place in Holiya village (Figure 11). This has enhanced community capacity for monitoring flood levels and disseminating flood warnings and alerts, and increased community awareness of response activities. The rain gauge station installed by DHM in the Kusum River has helped in providing rainfall data and information to local stakeholders, including the media and the community.

Figure 11: Early warning information mechanism in Banke District



Source: Practical Action (2009)

A local disaster management committee (LDMC) was formed in 2009 which has the responsibility for managing early warning systems at the community level. The LDMC is an institution created by the community themselves with their own representatives. It is currently composed of ten members including two women. The formation process was facilitated by staff members of the Nepal 'Scaling up early warning systems' project. They emphasized the importance of a local level institution for disaster risk reduction. The committee is involved in mobilizing resources, building community response capacities, and managing early warning systems. Although there is no standard operating procedure (SOP), an understanding has been developed of the roles and responsibilities of DMC members, which is followed.

The committee is equipped with a siren and basic search and rescue equipment. The committee and other community members have received training on various aspects of disaster risk reduction including early warning systems.

One of the key responsibilities of the DMC is to make sure that an early warning system is in place and functional to reduce the flood risk in and around the village, and save both lives and property. A system has been established with sounding of a siren when the water at the west Rapti River crosses the danger level. The committee is also responsible for operating a river gauge at Kusum. The gauge reader informs the community, Chief District Officer (CDO), police, and FM station when the level of the river rises above 4.5 m. When the siren is sounded, the community members start to move to safer places. The community members consider that the early warning system is timely. It covers all aspects of a people-centred early warning system: it covers the majority of households, is low cost, uses locally available technology, and is affordable and manageable by the local community, as human resources are also available locally for repairing the equipment. The initial cost for the early warning systems was around NPR 300,000 (approx. USD 3,500), which was provided by Practical Action and NRCS. According to the community members, there is virtually no additional cost for repair. The community has created a fund to sustain the initiative, with a basic amount contributed by Practical Action and NRCS and additional funds raised by the community through 'muthi daan' (a traditional practice in rural Nepal to collect assets in kind to use in emergencies; cereal/grain is collected from each household and stored in a safe place). The system is connected with the DHM station at Kusum, CDO, DDRC, VDC, and police.

Gender aspects

The participation of women in formal meetings and in the decision-making process is still a challenge. When floods occur, men and women help each other to be safe. But women's participation is very low in committees and meetings. During the field visit for this study, an attempt was made to have a focus group discussion involving men and women members of the DMC and other community members, but women were reluctant to sit together with men and had to be interviewed separately. There are a number of reasons for this. The local society still considers implementing an early warning system, and use of equipment such as blowing sirens, to be 'technical' and the preserve of men, and the culture still seems reluctant to accept women coming forward in social gatherings and community services. The warning information is transmitted by siren or loudspeakers by the men in public places less frequented by women. Thus, women, who have less knowledge about the nature of hazards and more limited response capacities, are likely to remain more affected than men. These findings confirm those of an earlier field-based study carried out in Banke and Bardiya districts, which concluded that the community-based flood early warning systems in the area didn't consider the needs of both men and women and thus didn't take differential gendered vulnerabilities into account (Rana 2011).

Lessons learned

Community members have increased their knowledge over the years through the project interventions and learning by experience. Hazard monitoring at local and regional levels, and response capacity building of community members, have clearly increased. However, the dissemination of disaster alerts is seen as 'gender neutral', and the mechanisms of information dissemination still need a special focus on and attention to women.

Community members said: "In past years, we could not sleep at night during the rainy season fearing how and when the flood will come. But now, we can trust that we will hear the siren before flood and will have time to save

our lives". The effectiveness of the early warning system was demonstrated during the flood on 3 August 2012. Incessant monsoon rain raised water in the west Rapti River to a critical level of 7.24 m, meaning that a large flood was imminent. Fortunately for downstream communities, the early warning system was activated as planned at the first warning level, and an electronic display board at the District Administration Office (DAO) sounded a siren. Dhundi Raj Pokharel, the Chief District Officer (CDO), then advised security forces to disseminate information to police posts in the vulnerable communities. Police forces were also dispatched with ropes and life jackets to prepare for the oncoming flood. The warnings were further disseminated locally. For example, Pralad Dhobi, a member of the communication team in Holiya, immediately alerted his community to the flood threat by blowing a hand-operated siren. This enabled the communities to utilize the early warning provided by the system and move to higher ground, thus preventing a major disaster. Mr Dhobi said the early warning system in Holiya "saved lives and valuable property because communities got flood information."

Response capacity building is another key element in an effective community-based early warning system. Training was provided to community members, including women, on the response to early warnings and the safety of lives.

With support from external agencies, the current early warning system in Holiya village is running well. Formation of a community level group (the DMC), linkages with local government and NGOs, provision of hazard monitoring and dissemination through locally available materials, and response capacity of community members are key aspects indicating sustainability of the system. The community has also raised funds (currently around NPR 30,000) through *muthi daan* and from income generated by utilizing the boat received as part of the SAR equipment, which will be used to support victims and for some disaster related activities.

This is very good system, and can be replicated in many places. The challenge to sustainability lies in maintaining the mechanism and the relationship with the local government and technical institutions responsible for hazard monitoring and dissemination, as well as ensuring local level risk assessments on a regular basis, and engaging vulnerable community members.

Summary

Community-based flood early warning systems have been established by Practical Action in cooperation with DHM in Bachauli and Holiya villages. An early warning information mechanism has been put in place in coordination with various actors, including the flood forecasting section of DHM, local gauge reader, District Administration Office, district police, local police, Nepal Red Cross Society, local FM radio and other media, and district and local DMCs and the communities. Training on preparedness and response were provided to the local communities to enable timely response. Gender issues are considered to some extent, although women's representation in meetings and local DMCs is low.

People recommended that more mitigation activities are needed. The sustainable solution for effective reduction of disaster impacts is to build the response capacity of vulnerable communities. River training is a viable option for hazard prevention. The early warning system is helpful in saving lives, but is also required to save land and other property. For this, there is a need to work on an integrated approach addressing all aspects of flood hazard, including structural and non-structural measures.

It became clear during the field visits and interviews that although people expressed their awareness about the special needs of women during disasters, the need remained for meaningful participation of women in the decision-making processes.

Information, institutional arrangements, and warning systems should be tailored to meet the needs of vulnerable groups such as women, the elderly, children, and other physically or socially disadvantaged groups. Most of the activities in the study area, including the alert dissemination mechanism, are seen as 'gender neutral'.



Chapter 5

Key Challenges, Gaps and Opportunities

Numerous challenges, gaps, and opportunities for integrating gender considerations into early warning systems in Nepal were identified during the study. Some of the points relate to increasing the effectiveness and sustainability of early warning systems in general, but are included as these improvements provide a necessary basis for usefully integrating gender considerations. The key points are summarized below.

Challenges and Gaps

- Capacity is not fully utilized due to the lack of involvement of women. Women's participation is generally limited to users' committees, which have a limited role and little active involvement in decision-making processes.
- Women comprise 19% of the total staff in the organizations consulted, and appear to be even less well represented at decision-making levels, indicating the need to encourage and provide opportunities for women in the future.
- Many organizations have been undertaking disaster reduction initiatives in isolation; these initiatives need to be linked to and integrated with other initiatives in order to maximize overall impact.
- A number of relevant ministries are not linked to disaster risk management, for example those concerned with tourism and other economic sectors. Early warning systems for flood and other hazards are essential for tourists; and tourism activities should be disaster – and gender-sensitive. Similarly other economic sectors (for example transport and industry) are affected by disasters and should be linked with disaster risk management.
- At present, coverage of flood early warning systems is limited to selected geographic areas; they should be extended to provide more complete coverage with further improvements in technology.
- In view of the diversity of development issues and livelihood challenges that communities face on a day-to-day basis, it is important to tune early warning systems according to the local context. To ensure that they are sustainable, they should also be used with advanced applications to disseminate key messages that will also be useful for local livelihood needs, such as daily weather trends to support crop related decisions, market related decisions, and storage and transport related decisions.
- It is important to recognize that women play an active role in family livelihood security and efforts must be made to involve women equally with men in creating and receiving early warnings and alerts. Women should be involved in infrastructure management teams for local early warning systems and they must be provided with mobile phones or portable radios to receive warning messages.
- Providing education about gender-sensitive early warning systems, vulnerability and risk, and knowledge about what actions can be taken can result in better preparedness and response, thus improving the effectiveness of early warning systems. However, coordinating and managing this at national and district levels is a challenge.
- Most organizations in Nepal have a mandatory provision for the inclusion of women in user groups, which has been effective. Such mandatory provisions are lacking for disaster risk reduction projects, including early warning systems.

Opportunities

- Most of the organizations analysed had a sound technical capability.
- The environment for inclusion of women and girls in disaster risk reduction and early warning systems was clearly positive. Gender focal points had been appointed in the various ministries and departments and NGOs, and participation of women in project design and implementation is increasing.
- As one of the areas for project/programme evaluation, gender was a key outcome indicator for some of the organizations consulted.
- The security forces are a huge and valuable resource for disaster risk management. It would be helpful if these forces could be utilized for risk reduction as well as response.
- The diverse stakeholders representing INGOs, NGOs, and government and community organizations working on disaster risk reduction have different knowledge and skills, which need further strengthening and scaling up.
- A number of activities related to disaster risk reduction have introduced gender and social inclusiveness in disaster preparedness; these need to be strengthened, expanded, and scaled up to make early warning systems more effective.
- Given the knowledge gaps, there are opportunities for capacity building to link the various levels of institutions, to link to other disaster risk reduction and management efforts, and to develop a coordinated approach towards more effective early warning systems.

Chapter 6
Conclusions

Development of gender-sensitive tools and mechanisms for disseminating and receiving alerts, and for response capacity building of women and girls, are a necessity for improved early warning systems.

Although, there is a positive trend in understanding of gender issues, integration of the gender perspective into early warning systems in general, and those for flood hazards in particular, is at an early stage in Nepal. Gender inclusion in early warning systems tends to be limited to risk assessment and the participation of women in community groups and capacity building and training, although almost all of the organizations consulted had a positive attitude towards making disaster risk reduction gender sensitive by involving women and men in the risk assessment, project formulation, and implementation. Many respondents considered women's participation to be key to developing an effective early warning system. However, very few had plans for making the tools, processes, and early warning messages gender-sensitive. Sensitization on the development of gender-sensitive tools in early warning systems, including gender-sensitive risk assessment, gender-sensitive mechanisms for disseminating and receiving alerts, and response capacity building of women and girls, is needed in order to make early warning systems in the country gender-sensitive and thus more effective. Mechanisms and strategies targeted to women, and commitment to them by key stakeholders at all levels, are crucial for gender integration in early warning systems.

Based on the current study, the following recommendations are made to ensure that early warning systems are effective and functional:

- The capacity of key stakeholders, including staff and volunteers, on gender-sensitive early warning systems needs to be enhanced. Regular interactions and repeated training activities on gender-sensitive early warning systems are needed to address the problems of turnover of trained staff and of changes in the community (since many men migrate for off-farm employment).
- Gender issues should be integrated into the project cycle management of disaster risk reduction programmes, including the disaster risk assessment, early warning system, information management, and community awareness and training. Women's participation needs to be ensured in all phases of the disaster risk management cycle.
- Gender disaggregated data on local hazards, community vulnerability, capacities, and risk need to be mainstreamed and unified involving all stakeholders. In addition, tools and frameworks for disaster risk reduction and early warning systems need to be revised to make them gender sensitive.
- Gender analysis should be made mandatory at the design phase of any disaster risk reduction project, and of early warning systems projects in particular.
- There is a need for more research on various aspects of early warning systems from a gender perspective to improve existing systems.
- Information, institutional arrangements, and warning systems should be tailored to meet the needs of vulnerable groups such as women, the elderly, children, and other physically and socially disadvantaged groups. In the study area, most of the activities, including the alert dissemination mechanism, are seen as 'gender neutral'. Special attention should be paid to including gender in early warning system initiatives in future.
- There is a need to initiate public-private partnerships for early warning systems and to promote corporate social responsibility to share the burden of government responsibility for disaster risk reduction.
- There is a need to strengthen the gender cells or focal points in each ministry, department, and disaster committee at the various levels. Networking is also needed among these different organizations to share information and experience on early warning systems from a gender perspective in Nepal.
- Recognition of women's contribution and integration of gender concepts in overall development frameworks and strategies should be strengthened.
- Better coordination among key stakeholders and communities, and between organizations, is crucial for gender integration in early warning systems and disaster risk reduction programmes. Linkages between national agencies and community-based organizations need to be strengthened.
- MoHA needs a more holistic and integrated approach to disaster risk management and to expand the current focus on response capabilities.
- Comprehensive and gender-sensitive early warning systems should be developed and implemented at a national level by consolidating the efforts of individual organizations on community-based early warning systems.



Local search and rescue volunteers perform flood drills before the monsoon

- Currently, most organizations in Nepal focus their efforts on response capacity building and communication and dissemination, without linking to systematic risk assessment and monitoring mechanisms at the national and community levels. All four key elements of people-centred early warning systems need to be promoted strategically from a gender perspective at both national and community levels.
- Capacity building of communities on early warning systems needs to be continuously strengthened. The capacity of women’s groups and other organizations in risk knowledge, monitoring and warning, dissemination and communication, and response capacity needs to be built; ultimately this will sustain community-based early warning systems.
- The mechanism of early warning systems at the local level needs to be maintained, including the functional relationship of DMC/community members with the local government agencies and technical institutions that provide early warning information. The role of DMCs in hazard monitoring, dissemination, and coordination needs to be strengthened.

Adopting a gender-sensitive early warning system approach with appropriate policies in place will help in reducing the disaster mortality of women and contribute to reducing the adverse impact of flood disasters.

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Annex 1: Organizations Consulted

Government ministries/departments

1. Department of Hydrology and Meteorology, Ministry of Environment
2. Department of Soil Conservation and Watershed Management DSCWM, Ministry of Forests and Soil Conservation
3. Department of Water-Induced Disaster Prevention (DWIDP)
4. Ministry of Defence
5. Ministry of Education
6. Ministry of Federal Affairs and Local Development (MOFALD)
7. Ministry of Health and Population
8. Ministry of Home Affairs
9. Ministry of Irrigation
10. Ministry of Information and Communication
11. Ministry of Tourism and Civil Aviation
12. Ministry of Women, Children and Social Welfare
13. National Planning Commission

International non-governmental organizations

14. Mercy Corps Nepal
15. Oxfam GB
16. Plan International (Nepal)
17. Practical Action Nepal
18. Save the Children

UN and humanitarian organizations

19. Nepal Red Cross Society (NRCS)
20. UNDP – Comprehensive Disaster Risk Management Project

National non-governmental and other organizations

21. Agro-Farm Foresters' Association Nepal (AFFAN)
22. Centre for Disaster Management Studies (CDMS)
23. Centre of Resilient Development (CoRD)
24. Disaster Preparedness Network (DPNet)
25. National Disaster Risk Management Forum (NDRMF)
26. Society of Hydrologists and Meteorologists (SOHAM)

Activities related to gender sensitive EWS

Government ministries/departments

Department of Hydrology and Meteorology (DHM), Ministry of Environment – DHM is the key agency for providing and disseminating weather related information. There are several ongoing projects at DHM that relate to early warning systems and strengthening the capacity of DHM to mitigate the adverse impacts of water related disasters by improving the accuracy and timeliness of data and information and its application to end users.

Primarily, flood risk assessments are conducted from a technological perspective, as they analyse thresholds and determine the danger level of water discharge. No specific gender lens, purely technical issues are addressed. DHM monitors hazards using hydro-meteorological and satellite information and provides limited forecasts. The department is linked to MoHA, DWIDP, and MOAC for communication and information dissemination. Media channels including radio, television, SMS systems, and websites are used to disseminate warning messages. These

messages are not specifically designed for women or other vulnerable groups. DHM has initiated collaboration with Practical Action for community based early warning systems to make information flow to those communities where action will be taken.

Department of Soil Conservation and Watershed Management (DSCWM) – The department is involved in coordination, implementation, technical support, and research related to disaster risk management. No specific early warning systems project exists at present. Gender issues are addressed through users' committees at the community level. The ministry follows the guidelines issued by NPC, with mandatory provision for the involvement of women in users' committees. The ministry also provides technical support and scaling up of activities through district soil conservation offices across the country. No specific mechanism exists for engaging women in monitoring and dissemination of information/warnings. Projects are handed over to the users' committees once completed. Awareness raising posters and pamphlets are distributed to the general public, but do not have a specific focus on women.

Department of Water-Induced Disaster Prevention (DWIDP), Ministry of Irrigation – DWIDP's work focuses primarily on the technical aspects of flood risk assessment and mitigation. Response mechanisms are mainly related to river control. The department also conducts awareness training but not with a specific focus on women. Public awareness materials like posters, pamphlets, and leaflets are produced and distributed. Women are not well targeted as the department sees the community as a whole. There are no women specific activities; however as per NPC guidelines women's involvement in users' committees is mandatory.

Ministry of Defence (MoD) – The army has some regular training programmes on disaster response focusing mainly on search and rescue operations. No gender sensitive risk assessment is done. The army communication network is utilized to report internally. It does not communicate directly with the public except on activities related to response and recovery. The army is the key unit dispatched for response operations. The personnel are trained about the kind of special needs that will be needed during rescue operations for women, the disabled, the elderly, and others.

Ministry of Education (MoE) – The ministry has a gender based budgeting and planning process in place and also carries out vulnerability assessments focusing on women's vulnerability. Recommendations are made through ministry level action committees and national development action committees. The national plan has incorporated some issues on flood/disaster. The ministry does not carry out hazard monitoring and does not make or disseminate hazard warnings.

Ministry of Federal Affairs and Local Development (MOFALD) – The ministry is mainly involved in policy/strategy formulation, coordination, and technical support. At present, no specific projects exist on early warning systems. Many local development projects on disaster mitigation have been implemented through DDCs throughout Nepal, but not directly by the ministry itself. The ministry has developed guidelines to include women in local development activities. The ministry coordinates Flagship 4 of the NSDRM and is working to make all VDCs Flagship 4 compliant, which includes early warning systems and also addresses gender issues. The ministry's performance monitoring mechanism includes gender indicators.

Ministry of Health and Population (MoH) – The ministry is involved in formulation of policy/strategy, coordination, technical support, and research activities primarily related to public health management. There are no flood related projects at present, even though epidemics may result from floods. The ministry has a gender focal point to consider gender sensitivity within the organization and beyond. A gender responsive budgeting and monitoring mechanism has been established. Monitoring is done for epidemics and other disease-related outbreaks; some of which may result from floods or similar hazards. Very little research has been undertaken on the correlation between flood hazard and disease outbreaks in the Nepalese context. Every year people die from diarrhoea in the mid-west. This may be due to poor sanitation conditions resulting in contaminated drinking water. However, there is not enough research evidence. The ministry produces and disseminates lots of material on health issues through different channels and media sources. Gender issues are addressed in the dissemination process, but not specifically on flood hazards and early warning systems.

Ministry of Home Affairs (MoHA) – The ministry is mainly involved in development of policy, strategy, and programmes, and coordination and technical support related to disaster risk management. Its first responsibility

is for disaster preparedness and response to disaster events. Disaster risks are assessed through past experiences and case studies. There is no specific project at present related to early warning systems. No systematic gender considerations are made while analyzing vulnerability and capacity. Communication networks (primarily police and radio) are utilized for disseminating information. An Emergency Operations Centre (EOC) network has started documenting data disaggregated by gender. These procedures have incorporated gender sensitive strategies. The ministry occasionally conducts public awareness campaigns and trainings where women's issues are considered.

Ministry of Irrigation (Mol) – The ministry provides policy support, coordination, and technical assistance related to disaster risk management in Nepal. Among the four components of early warning systems, the ministry works partly on risk knowledge, risk monitoring, and communication/dissemination. Response is limited to closing canal intakes when flooding crosses the danger limit, flood hazard problems are addressed at the design stage. There is no practice or culture of documenting women's knowledge, perceptions, or experience separately while designing a project. The ministry and district offices work through users' committees and build their capacities. Women's participation is limited to the mandatory minimum number of women as per the NPC guidelines (33% representation in user groups). No women specific activities or impact indicators have been considered yet, apart from the number of women in the users' committees. There are no other mechanisms or forums for engaging women. Monitoring systems are limited to safety of infrastructure and involve designated staff members. Data are not disseminated externally; they are for internal use and future reference only. No warning is sent to communities.

Ministry of Information and Communication (MoIC) – The ministry's work focuses on developing communication policies and strategies. There are no projects, risk assessments, or mechanism for monitoring flood/early warning systems provisions at present. The ministry coordinates the public service advertisements of the government. Each type of media (print, FM radio, television) receives a package of public service advertisements from the government. Flood/disaster issues are addressed through these advertisements. The ministry does not produce the content itself, but coordinates with sectoral ministries. For web-based telemetry, the telecom provider plays a key role in data transmission and acquisition.

Ministry of Tourism and Civil Aviation (MoCTCA) – The ministry works on disaster, focusing on tourism sites, e.g., providing meteorological warnings to mountaineers. It coordinates with DHM to get weather information. It has no risk assessment or response mechanism.

Ministry of Women, Children and Social Welfare (MoWC) – The ministry is involved in policy and programme strategy, coordination, and technical support related to women's empowerment and development. There are no early warning systems projects for flood hazard at present. It focuses on improving women's status through capacity building, income generation, and savings and credit activities. The district women development officer represents the ministry in the DDRC, but until now no meaningful representation has been made.

National Planning Commission (NPC) – The NPC is involved in formulation of policies and guidelines, coordination, technical support, and research. It develops national level plans in which gender based budgeting and planning processes are included. It conducts women vulnerability assessments and recommendations are made through different ministries and other related national development action committees. The national plan has incorporated issues related to flood disaster risk management. Monitoring is carried out based on indicators identified within the specific projects and programmes.

International non-governmental organizations

Mercy Corps – Mercy Corps implements early warning systems projects in schools (SCORE project on early warning systems) mainly in Kailali, Kanchanpur, Bardia, and Tanahun districts. Women are involved in all phases of the project cycle. Mercy Corps has specific gender-related outcome indicators. The impact on women is evaluated. Gender considerations are integrated into disaster risk reduction. The organization works with women's groups, and their traditional knowledge on disaster risk reduction, needs, and concerns are analysed. Both women and men take part in early warning systems and other disaster risk reduction activities. Women and men are equally involved, and the organizational arrangements are established in a gender balanced way. Women's organizations are involved in vulnerability analysis and hazard mapping. Gender differentiated data are maintained. Gender

perspectives have been mainstreamed in all the processes. Women's participation in all the processes is ensured. Messages are gender sensitive. Men and women are both involved in the communication system. A coordination mechanism has been established with the Red Cross, police, media, and district authorities. Warnings are respected. The response capacity building activities are gender sensitive.

Oxfam – Oxfam implements early warning systems projects in Dadeldhura, Sarlahi, Saptari, Dhanusa, and Rautahat districts. Women vulnerability assessments were carried out during the project formulation stage. Knowledge attitude and practice (KAP) analysis was also carried out at the project sites with a special focus on women and disadvantaged groups. Women's traditional knowledge was assessed and respected in the KAP analysis. Women and men are both involved in risk assessment. Organizational arrangements are in line to engage women in capacity building, training, and assessments. Women and men are equally involved in vulnerability analysis. Gender differentiated data and maps are available to distribute to different stakeholders. Equal involvement of men and women is ensured in the project formulation, implementation, and monitoring stages. Oxfam coordinates with police, district authorities, and other stakeholders during disaster response periods. Gender issues are also incorporated in different awareness raising materials like street drama, PSA, radio programmes, and print materials.

Plan International – Plan International is mainly involved in coordination, technical support, implementation, and research on child-focused disaster management programmes in Morang, Sunsari, Banke, Makwanpur, Sindhuli, and Rautahat districts. Attention is paid to the participation of women and children in development programming. There are no specific early warning systems projects, but women participation in all projects is encouraging. Women focused capacity building activities are being carried out, but not necessarily related to response capacity building.

Practical Action – Practical Action works closely with DHM, MoHA, and MOFLAD at the central level and local NGOs at the community level. Currently, early warning systems programmes are being implemented in Tanahun, Banke, and Bardia districts. Some successful activities have been accomplished in Kailali and Chitwan districts. The gender focus has generally been guided by the organizational strategy, and sufficient focus is given, especially during training sessions and formation of groups. Practical Action is one of the few organizations in Nepal which works in all four key components of early warning systems. Warning alerts and emergency communications are disseminated using a variety of channels including CDO, police, FM, mobile phones, landline, and sirens are some of the channels/means/media. Women volunteers are also mobilized for early warning systems dissemination at the community level. Response capacity is built through essay competitions, letter writing contests, quiz contests, debate competitions, and FM radio.

Save the Children – Save the Children implements school disaster risk reduction programmes in Ilam and Taplejung targeting approximately 26,000 direct beneficiaries. Needs are assessed involving both men and women. Gender indicators are included at both output and outcome levels. Both boys and girls participate in the school disaster risk reduction activities. Gender disaggregated data are available. However, there are no specific projects on early warning systems. The primary focus is on children, so women's issues also have a high priority. Women's needs, concerns, and knowledge are included in vulnerability assessments. Radio programmes and psycho-social activities are being implemented in target areas for wider coverage, and the content of media products is reviewed from a gender perspective.

UN and humanitarian organizations

Nepal Red Cross Society (NRCS) – The Nepal Red Cross Society has implemented early warning systems in partnership with Practical Action and Mercy Corps in Kailali, Kanchanpur, Bardiya, and Tanahun districts. NRCS is represented in the DDRC. The organization works in all parts of disaster risk management, with special expertise on response and recovery. NRCS has a women empowerment department, which coordinates all gender-related concerns and issues. Women are involved in all stages of the project cycle. The M & E framework considers gender issues and these are being integrated into risk reduction strategies. Women's needs and concerns are analysed. The capacities of women and men are identified, and their traditional knowledge is also respected. Women's organizations are involved in vulnerability analysis and hazard mapping. Women's needs, concerns, and knowledge are included

in the assessment. Gender differentiated data is also maintained. The Red Cross is among the first organizations to respond to natural disasters. They coordinate with local youth, police, armed forces, and other bodies. Their response system ensures that gender issues are addressed and all works ensure that both women and men take part in the response mechanism.

United Nations Development Programme – Comprehensive Disaster Risk Management Project (UNDP-CDRMP) – The CDRMP provides technical support to MoHA in formulating policies/strategies, capacity building, coordination, and implementation of CDRM projects. The project covers 35 districts in Nepal. Gender disaggregated data are collected. Gender sensitivity analysis was not done at the start of the project; however women are given high priority while forming community disaster management committees, in training, and in disseminating early warning messages. CDRMP has strengthened national and district level emergency operations centres (EOCs) in the project areas that are effective in end-to-end early warning systems. EOCs receive and analyse information and disseminate early warnings. Response capacity building is also being held by the programme through staff and DMCs. The project is highly conscious about gender issues, and practical tools, approaches and budget have been allocated to address gender sensitive issues.

National non-governmental organizations

Agro-Farm Foresters' Association Nepal (AFFAN) – AFFAN is involved in research, technology transfer and community capacity building in flood damaged areas in various agro-climatic regions of Nepal. Various agro-forestry designs developed by the NGO have been widely applied in reclaiming flood-damaged areas in the country.

Centre for Disaster Management Studies (CDMS) – CDMS is an active national NGO in the field of disaster research and response capacity building. The majority of the board members and staff, including the chairperson, are women. CDMS focuses primarily on hazard specific research and response capacity building of community members.

Centre of Resilience Development (CoRD) – CoRD works on building community resilience in some parts of Nepal. Early warning systems is one of its priority areas for building community resilience, although it now focuses on building earthquake resistant houses and community awareness.

Disaster Preparedness Network (DPNet) – DPNet is the pioneer organization involved in networking of disaster risk reduction organizations in Nepal. It provides technical support to government organizations in formulating policies and strategies. It also implements projects on disaster risk reduction based on available resources. It does not have an early warning systems project at present. DPNet develops tools and techniques for disaster risk reduction in the country.

National Disaster Risk Management Forum (NDRMF) – NDRMF is a national NGO involved in response capacity building of communities and implements some flood risk management activities. Currently, it does not have any early warning systems project.

Society of Hydrologists and Meteorologists, Nepal (SOHAM) – SOHAM is the network of hydrologists in Nepal. It conducts research and technology transfer activities. Currently, it does not have any early warning systems projects.

Annex 2: Stakeholder Consultation Questionnaire and Checklist

Checklist of questions for interview

1. General

1.1 Organization

Name of the organization/institution:

Nature of work:

- Policy/strategy formulation
- Coordination
- Implementation
- Technical support
- Research
- Other, please specify

1.2 Work

Does your organization have any projects/activities related to early warning systems, particularly for flood hazards?

- If yes, what is the name or the project or what are the key activities?
- When was it started?
- What is the duration?
- What is the geographic coverage?
- Direct beneficiaries?
- Indirect beneficiaries?

1.3 Human resources in the organization

Total number of staff:

of female staff:

of female staff in decision-making positions (section chief, head, officer level staff in the organization):

2. Project cycle analysis

To what extent do women participate in project identification, design, implementation, and M&E? What is the proportion of women in decision-making positions? Is the needs assessment gender sensitive? Is the budget gender sensitive? Are there any provisions for women's participation in community groups and committees and for the involvement of women's organizations in disaster risk reduction and early warning systems activities?

2.1 Project identification

Was a needs assessment especially for women carried out during the problem analysis phase?

Do the project's general objectives adequately reflect women's needs and women's participation in project activities?

2.2 Project design

Is there any outcome indicator related to project impact on women's actions?

Is there any outcome indicator related to project impact on women's access and control?

2.3 Project implementation

Total # of project personnel

Total # of women staff

Total # of women staff in operations and logistics

Budget allocated for women staff activities?

Is there any flexibility for women staff (e.g., leave, travel, childcare)

2.4 Project evaluation

Women's participation, impact on women indicators...

3. Gender-sensitive risk assessment

Were the hazard, vulnerability, and risk data segregated by gender? Were women's organizations involved in the risk assessment process? Did the acceptable risk include women's views? Did the capacity assessment include gender segregated data?

3.1 Identifying risk

- Are there gender segregated risk reduction strategies?
- Are risk assessment processes gender sensitive? (participation, women's organizations, gender segregated hazards, vulnerabilities, and risks)

3.2 Determining the risks faced by men and women separately, in each region or community.

- Have women's traditional knowledge and perception in the analysis and evaluation of the characteristics of key risks been included?

3.3 Determining vulnerability

- What is the level of participation of women in vulnerability analysis?
- Has gender analysis been conducted for the identification of gender-based inequalities between men and women?
- Have gender-based aspects of access to information, modality, and access to income and other resources, the key determinants of vulnerability, been included?
- Has a historical analysis been carried out of disaster damage experience disaggregated by sex to identify vulnerability and capacity?
- Have women's needs, concerns, and knowledge in the community vulnerability assessments for relevant natural hazards been identified?

3.4 Identifying capacity

- Has women and men's traditional knowledge been acknowledged and assessed?
- Has the capacity of all women's groups, organizations, or institutions been assessed along with those of men?
- Have the specific functions, roles, and responsibilities of women and men been identified and built into the analysis?
- Have the gender specific support mechanisms required for women to become involved in risk management programmes and actions (e.g., issues of mobility, children) been identified?
- Have women's organizations been engaged in capacity building of women?
- Have female role models been identified to advocate for gender-sensitive risk assessment?

3.5 Determining the acceptable level of risk

- Have both women and men in the development of hazard and risk maps been involved?
- Have gender-differentiated data for assessing acceptable levels of risk been collected/analysed?
- Is gender analysis included among the key elements of people-centred early warning systems?

4. Risk knowledge

Are there provisions in policies, strategies, and guidelines to engage women's organizations in the capacity building of women and men, developing standards/tools for risk assessment, dissemination of alerts, training, and hazard, vulnerability, and capacity assessments?

Organizational arrangements

- Organization-wide task force on gender to implement change assigned to coordinate hazard identification, vulnerability, and risk assessment
- Gender mainstreamed in the legislation or government policy mandating the preparation of hazard and vulnerability maps for all communities
- Women and women's organizations involved in the development of national standards for the systematic collection, sharing, and assessment of hazard and vulnerability data
- Equal opportunities for men and women to be part of the scientific and technical expert groups assessing and reviewing the accuracy of risk data and information

- Strategy to actively engage women and men from the communities in local hazard and vulnerability analyses
- Women and men equally involved in the process to review and update risk data each year, and include information on new or emerging vulnerabilities and hazards

Natural hazards identified

- Women's traditional knowledge and perceptions included in the analysis and evaluation of the characteristics of key natural hazards including floods
- Women and men involved equally in the development of hazard and risk maps
- Risk maps reflect gender differentiated impacts of the risk
- Hazard maps include gender differentiated data

Community vulnerability analysed

- Women's needs, concerns, and knowledge included in the community vulnerability assessments conducted for floods
- Risks assessed
- Assessment of gender specific hazards and vulnerabilities to determine the risks faced by men and women in each region or community
- Gender differentiated results of risk assessments integrated into local risk management plans and warning messages
- Information stored and accessible
- Central library or GIS databases with gender differentiated data established to store all disaster and hazard risk information
- Gender differentiated hazard and vulnerability data available to the government, the public, and the international community

4.1 Monitoring and warning services

- Provision for ensuring women's participation in all early warning systems processes
- Institutional mechanisms established
- Gender perspectives mainstreamed in all the processes, roles and responsibilities of all the organizations generating and issuing warnings

Monitoring systems developed

- Equal involvement of women and men in the committee that sets up technical warning systems for all hazards
- System established to verify that warnings have reached both women and men equally
- Documentation of the hazards women consider relevant, gender-differentiated data and analysis from regional networks, adjacent territories, and international sources accessible
- Forecasting and warning services established
- Data and warning products that can be understood by both women and men
- Women and men trained on how to forecast hazards using different resources
- Women and men's traditional knowledge considered equally in forecasting hazards

4.2 Dissemination and information

Is there any provision to make sure that women will receive disaster alerts/warnings on time? Are there efforts or provisions to ensure that the disseminated alerts/ warnings/ messages/ information are gender-sensitive?

- Organizational and decision-making processes institutionalized
- Warning dissemination chain ensures that both women and men receive information
- Women and men are both part of a volunteer network trained and empowered to receive and widely disseminate hazard warnings to remote households and communities
- Effective communication systems and equipment installed
- Communication and dissemination systems are tailored to the needs and social behaviour of both women and men
- Warning communication technology is accessible and reaches women and men equally

- Gender experts or women’s groups are consulted to assist with identification and procurement of appropriate equipment or mechanisms
- Multiple communication mediums used to disseminate warnings, encompassing those used or preferred by women
- Consistent warning dissemination and communication systems reach women and men equally
- Two-way and interactive communication system allows for verification, so it can be determined that both women and men have received warnings
- Women and men trained and employed to maintain equipment and upgrade programmes of back-up systems in the event of failure
- Warning messages recognized and understood
- Warning alerts and messages take into consideration the behaviour patterns of women and men
- Messages incorporate an understanding of the values, concerns, and interests of women and men
- Messages can be understood by both women and men
- Studies undertaken to determine how women and men access and interpret early warning messages
- Gender-sensitive lessons learned incorporated into message formats and dissemination processes

4.3 Response capability

What are the provisions/ efforts/ practices current in your organizations to ensure that warnings/alerts received by women will enable them to respond promptly and properly? Are the response capacity building activities gender sensitive?

- Warnings respected
- Warnings distributed by credible sources reach both women and men
- Gender-sensitive strategies are developed to build credibility and trust in warning development
- Disaster preparedness and response plans established
- Disaster preparedness and response plans are gender sensitive
- Hazard and risk maps include gender differentiated variables for vulnerability and risks, and are used to develop emergency preparedness and response plans
- Gender-sensitive up-to-date emergency preparedness and response plans are disseminated to women and men
- Gender-sensitive strategies are implemented to maintain preparedness for recurrent hazard events including floods
- Feedback from regular tests and drills are undertaken to test if the early warning and dissemination process and responses reach women and men equally
- Community response capacity assessed and strengthened
- Women’s ability to respond effectively to early warnings is assessed
- Gender-differentiated response to previous disasters analysed and gender-sensitive lessons learned are incorporated into future capacity building strategies
- Women-focused organizations are engaged to assist with capacity building
- Gender-sensitive community and volunteer education and training programmes are developed and implemented

4.4 Public awareness and education enhanced

What are the means of public awareness with regard to response capacity building? Any separate tool or approach for women capacity building in practice?

- Simple information on hazards, vulnerabilities, risk, and how to reduce impacts is disseminated equally to vulnerable women and men and in a language they can understand
- Women and men are educated on how warnings will be disseminated, which sources are reliable, and how to respond to different types of hazards after an early warning message is received
- Women and men are equally trained to recognize simple hydrological hazards to allow immediate response
- Gender-sensitive ongoing public awareness and education are built into school curricula from primary schools to university
- Media that women prefer are used to improve public awareness

- Public awareness and education campaigns are tailored to the specific needs and concerns of women and men
- Public awareness strategies and programmes are evaluated at least once a year to determine if women are effectively involved in the response process

5. Key strengths, challenges, needs, and areas for improvement

Could you please provide us with your experiences on the key strengths, challenges, and areas for improvement in early warning systems in Nepal, and particularly mainstreaming the needs and concerns of women?

- Strengths
- Challenges
- Needs/areas for improvement

Checklist of questions for case studies

General

1. Name of the district/village:
2. Name/sex of the respondent(s):
3. Number of people that participated in the discussion by gender:
4. Observations: main occupation, living conditions, housing and roofing types, population density, land use pattern, natural resources etc. to be documented based on observation and secondary sources.

Key natural hazards

1. Key natural hazards in the locality
2. Floods: frequency, severity, households affected, damage caused in the past, coping mechanisms, duration of flood period
3. Mitigation measures: existing practices. Support received from local government, NGOs
4. Hazard assessment, risk assessment, if any
5. Past disaster events in the locality, if any

Early warning systems/gender

1. Do you have any early warning system in place? If yes, is this indigenous or introduced? Did you receive any support (financial and or technical) from NGOs, government, or any other organization?
2. What type of early warning system is in place in this locality?
3. How does it function? Who owns it? How does it sustain? Any committees to manage it?
4. Who are in the committee (men/women)?
5. Are there clear roles and responsibilities of the committee members? Is it gender disaggregated?
6. Is it effective and sustainable? (Early warning system is timely, covers all aspects of people-centred early warning systems, i.e., covers majority of households, low cost, locally available technology, affordable by local community, human resources are locally available for repairing, is tested)
7. Any gender related queries/concerns – participation/mobilization of women and children, training provided
8. Any other concerns regarding flood hazards, early warning systems, and gender concerns based on the discussion and observations
9. Is the community early warning system linked to government early warning systems (if any)?

Lessons learned

- Any success/failure cases? Any lessons learned from the implementation of this early warning system?
Community experience and reflections
- Replicability to other areas/regions
- Recommendations for further improvements



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