Institutional and Legislative Systems for Early Warning and Disaster Risk Reduction

Sri Lanka

Regional Programme on Capacity Building for Sustainable Recovery and Risk Reduction

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SRI LANKA

United Nations Development Programme

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The analysis, opinions and policy recommendations contained in this publication do not necessarily reflect the views of UNDP.

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Contents

Acronyms 1

Executive Summary 3
Background 3
Main Findings of the Study 3
Main Recommendations for Stakeholders 5

1 Background on UNDP Support to Institutional and Legislative Systems for Early Warning and Disaster Risk Reduction 8
1.1 Background on ILS for Early Warning 8
1.2 EWS in the Aftermath of the 2004 Tsunami 9
1.3 Guiding Principles for People-centred EWS 9
1.4 Indicators of Good Practice in ILS for EWS 11

2 Gender and Institutional and Legislative Systems for Early Warning 12
2.1 The Gender Experience of the 2004 Tsunami 12
2.2 Observations on Gender and DRR in the Region 13
2.3 UNDP's Eight-point Agenda on Gender Equality in Crisis and EWS 14

3 Country Background 15
3.1 Governance in Sri Lanka 15
3.2 Judicial and Legal Systems 16
3.3 Natural and Human-made Hazards in Sri Lanka 17
3.4 National Disaster Management Legislation 18
3.5 National DRR Institutions 18
3.6 Regional DRR Cooperation 21

4 Governance and Institutional Arrangements for Early Warning 22
4.1 Policy, Planning and Legal Frameworks to Support Early Warning 22
4.2 Roles and Responsibilities of Actors in the EWS 24
4.3 Assessment of Institutional Capacities 29
Summary of Main Points 29
Recommendations for Stakeholders 30

5 Risk Knowledge 31
5.1 Assessment of Risks and Vulnerability 31
5.2 Risk Communication and Public Awareness 33
5.3 Utilization of Risk Knowledge for Codes and Regulations 34
Summary of Main Points 37
Recommendations for Stakeholders 38

6 Monitoring and Warning System **39**
6.1 Institutional Mechanisms for Monitoring and Warning 39
6.2 Hazard Forecasting and Warning Systems 40
Summary of Main Points 43
Recommendations for Stakeholders 43

7 Dissemination and Communication **44**
7.1 Institutional Roles in Warning Dissemination and Communication 44
7.2 Hazard-specific Dissemination and Communication 47
7.3 Communication Systems and Technology 47
Summary of Main Points 49
Recommendations for Stakeholders 50

8 Response Capacity **51**
8.1 National Emergency Operations Centre and Response Capacity 51
8.2 Development of Disaster Preparedness and Response Plans 51
8.3 Development of Local Preparedness and Response Capacity 53
8.4 Assistance Providers 54
8.5 DRR and EWS in Disaster Recovery 54
Summary of Main Points 55
Recommendations for Stakeholders 55

9 Gender Aspects in the Context of Institutional and Legislative Systems for Early Warning in Sri Lanka **56**
9.1 Gender-related Disaster Effects 57
9.2 Good Practices in Support of Gender Equality in DRR and EWS 58
9.3 International and Domestic Gender Equality and Human Rights Policy and Law 59
9.4 Governance, Institutional Arrangements and Gender 60
9.5 Gender Equality in Domestic Disaster Policies, Plans and Legislation 61
9.6 Stakeholders on Gender Aspects in DRR and EWS 61
Summary of Main Points 62
Recommendations for Stakeholders 63

Annex I – Glossary of Key Terms **64**

Annex II – Documents Consulted **66**

Annex III – Developing Early Warning Systems: A Checklist **69**

Acronyms

ADPC	Asian Disaster Preparedness Center
ASEAN	Association of Southeast Asian Nations
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BPA	Beijing Platform for Action
CBO	Community-based Organization
CCD	Coast Conversation Department
CEB	Ceylon Electricity Board
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CENWOR	Centre for Women's Research
CHPB	Centre for Housing Planning and Building
CRED	Centre for Research on the Epidemiology of Disasters
DAD	Development Assistance Database
DART	Deep-Ocean Assessment and Reporting of Tsunamis (buoys)
DCC	District Coordinating Council
DDC	District Development Committee
DDMC	District Disaster Management Committee
DMC	Disaster Management Centre
DOA	Department of Agriculture
DOI	Department of Information
DOM	Department of Meteorology
DRR	Disaster Risk Reduction
DWRR	Disaster Warning Response and Recovery
ENSO	El Niño Southern Oscillation
EOC	Emergency Operations Centre
EWS	Early Warning System
FAO	Food and Agricultural Organization of the United Nations
GBV	Gender-based Violence
GDP	Gross Domestic Product
GIS	Geographic Information System
GN	Grama Niladhari
GoSL	Government of Sri Lanka
GSM	Global Systems for Mobile Communications
GSMB	Geological Survey and Mines Bureau
GTZ	German Technical Cooperation Agency
HIC	Humanitarian Information Centre
ICS	Incident Command System
ICT	Information and Communications Technology
IDP	Internally Displaced Person
ILO	International Labour Organization
ILS	Institutional and Legislative Systems
IOC	International Oceanographic Commission
IOTWS	Indian Ocean Tsunami Warning System
IRI	International Research Institute for Climate and Society
LIRNEasia	Learning Initiatives on Reform for Network Economies in Asia
LTTE	Liberation Tigers of Tamil Eelam
MASL	Mahaweli Authority of Sri Lanka (Mahaweli River Basin Management Agency)
MDG	Millennium Development Goal
MOH	Ministry of Health
NARA	National Aquatic Resources Research and Development Agency
NBRO	National Building Research Organization
NCDM	National Council for Disaster Management
NDMC	National Disaster Management Centre (now the National Disaster Relief Services Centre)

NDMP	National Disaster Management Plan
NGO	Non-Governmental Organization
NHO	National Hydrographic Office
NOAA	National Oceanic and Atmospheric Administration (USA)
NSF	National Science Foundation
PTWC	Pacific Tsunami Warning Center (USA)
RADA	Reconstruction and Development Authority
SAARC	South Asian Association for Regional Cooperation
SLRCS	Sri Lanka Red Cross Society
SLUMDMP	Sri Lanka Urban Multi-Hazard Disaster Mitigation Project
SMS	Short Message Service (mobile phones)
SOP	Standard Operating Procedures
TRIAMS	Tsunami Recovery Impact Assessment and Monitoring System
UDA	Urban Development Authority
UHSLC	University of Hawaii Sea Level Center
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNIFEM	United Nations Development Fund for Women
UN/ISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
VAM	Vulnerability Assessment and Mapping (WFP)
WCDM	Women's Coalition for Disaster Management
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization

Executive Summary

Background

The development of Early Warning Systems (EWS) has received an exceptional amount of attention and resources in the aftermath of the 26 December 2004 Indian Ocean tsunami disaster. A lot of emphasis has been placed upon technical and instrumental arrangements, while ***policy, legal and institutional changes that provide the basis for risk reduction are still to be improved, enacted and translated into practice***. This includes the need to devote more attention to community-based or 'people-centred' and gender sensitive approaches in the establishment of EWS. Ultimately, the success of EWS must be measured by the degree to which vulnerable communities are empowered to receive, understand and respond to warnings in an effective manner. Unless women participate actively in these systems, little progress can be made.

This report summarizes the results of a study commissioned by the United Nations Development Programme (UNDP) in 2007 that captures:

a. The status of Sri Lanka's institutional, policy and legal framework for EWS and disaster risk reduction (DRR);

b. The main gaps remaining to establish a comprehensive EWS within a holistic DRR policy; and

c. Recommendations for stakeholders[1] on the immediate strengthening of EWS through the policy, legal or institutional framework.

The review of Sri Lanka's institutional, policy and legislative arrangements is structured around the discussion of six main areas that are at the centre of effective, people-centred EWS. These are:

1. Governance and Institutional Arrangements
2. Risk Knowledge
3. Monitoring and Warning System
4. Dissemination and Communication
5. Response Capacity
6. Gender Aspects

1 With particular emphasis on government and UNDP.

Main Findings of the Study

1. Governance and Institutional Arrangements

The Sri Lankan government has demonstrated its commitment to DRR and the development of an integrated EWS by passing the innovative Disaster Management Act No. 13 of 2005, by establishing the Disaster Management Centre (DMC) under the Ministry of Disaster Management and Human Rights, and by developing the *Road Map for Disaster Risk Management, Volumes I and II*. Furthermore, a national disaster policy and plan have been drafted that spell out the establishment of an Early Warning Unit in the DMC and set out a vision and general guidelines for EWS (awaiting approval). A master plan and schema for the end-to-end multi-hazard EWS including identification of all actors and their roles has not yet been established. The Early Warning Unit in the understaffed DMC is not yet fully functional and warnings are mostly managed by the Department of Meteorology (DOM). The system involves a multitude of other institutional actors but the roles of individual agencies and coordination mechanisms of an integrated system remain unclear. Linkages between different administrative levels for warning also require clarification and formalization including the development of standard operating procedures (SOP).

The DMC has made much progress in supporting district level disaster planning, while there is further room to strengthen the capacities of Provincial Councils in exercising their DRR mandates. The Road Map outlines some key steps to develop EWS, but they centre on the needs of individual agencies and do not reflect an integrated assessment of capacity gaps in the system. Important gaps include the fact that about 10 percent of the population may be living outside the reach of communications loops. This illustrates the need to focus more on capacity development in vulnerable communities. The non-governmental organization (NGO) network has important resources to support EWS but faces some issues related to registration, lack of respect for humanitarian law, etc. that prevent it from reaching its full potential. Private sector cooperation in EWS is improving, particularly in the tourist sector. More efforts could be undertaken to tap the potential of the media in EWS.

2. Risk Knowledge

Responsible organizations in Sri Lanka are putting considerable efforts into strengthening the systematic collection, sharing and analysis of data on hazards and vulnerabilities and in disseminating this knowledge through training and education. However database development suffers from varying formats for data used by multiple actors, imprecise estimates of disaster losses and difficulty getting reliable information from districts. A wide range of different tools are currently used for the historical analysis and prediction of future disasters that would benefit from synchronization within the country and across the region. Very few risk assessments have been conducted at the community level and the understanding and documentation of social, economic and environmental vulnerability factors is still fragmented. The translation of risk knowledge into standards, codes and regulations suffers from weak enforcement related to: a) a lack of unified risk reduction policies and integrated development strategies; and b) a lack of awareness of relevant legislation and norms. A number of agencies are engaged in training, education and capacity development that include the incorporation of DRR into school curricula, the establishment of university courses and ad hoc training courses. However, the efficiency of these investments (in terms of resource allocation and use) and the effectiveness (in terms of coverage of critical areas, and adequacy of contents and methodology) is unclear.

3. Monitoring and Warning System

Sri Lanka has made progress toward strengthening hazard monitoring and warning systems. An integrated multi-hazard monitoring and warning system, with the Early Warning Unit of the DMC at the centre of coordination (as outlined in the draft National Disaster Management Plan of 21 March 2007), is however still in the early stages of development. The DOM is the lead institution for tsunami early warning and works closely with the Irrigation Department and others on drought and flood warning. The DOM needs to upgrade aging and insufficient observation and data communication facilities and mechanisms. The flood classification system, dam operation standards, and development of a national hydro-meteorological data management system require particular attention. The Department of Agriculture plays a major role in dissemination of drought warning information but the low capacity to deliver localized forecasts that meet end user needs (such as crop forecasting and predicting drinking water needs) is a major constraint. A number of additional institutions are involved in the monitoring of various other hazards but some require more capacities and not all are mandated to issue technical warnings. Communication with regional and international monitoring and warnings systems also require strengthening. In general, monitoring and early warning capacity needs to move closer to communities to stay relevant and lead to warnings that can be acted upon.

4. Dissemination and Communication

The regional and national Indian Ocean Tsunami Warning Systems have been forerunners in enhancing dissemination and communication systems and in identifying technical and institutional gaps. The DOM plays a key role in the formulation and delivery of warnings, and the Inspector General Command System of the Sri Lanka Police maintains a well-rehearsed communication system. Communication in Sri Lanka reaches from the national level to district levels and further on to divisional and local authorities. The communication to the Grama Niladhari level is mainly through police stations and fixed telephone lines. Various methods are used to reach the public i.e. alarms, sirens, loudspeakers, beating of drums and public announcements through radio and television. Major gaps in Sri Lanka include inadequate institutional capacity; information and communications systems that are not up to international technical standards; and need for alternative communications systems mobilizing social networks. Other needs include the clarification of roles and authorities of different government actors; formalization of procedures for the release and exchange of information among government staff, and with media and civil society; standardization of communications systems; and dealing with panic and false alarms. The confusion over government roles and authority and inadequate cooperation among information providers reverberates with the media and the public who may be skeptical about the sources of messages and the messages themselves, seriously threatening the effectiveness of the system.

5. Response Capacity

Successful warnings should activate an orderly movement of people out of harm's way and motivate them to seek shelter and secure their assets. A technically sound warning is ineffective if people do not know what to do next. Efforts are underway in Sri Lanka to improve the ability of people to respond to warnings and – more broadly – to disasters. These include the establishment of Emergency Operation Centres at national and district levels, the introduction of Incident Command Systems and disaster planning at district levels. However, there is a continuing tendency towards a top-down approach and cooperation between local and national actors requires further intensification. Local authorities are not yet fully prepared to respond to major hazards and require more operations training and equipment. Efforts to strengthen community level capacities are also underfunded and not hooked up with higher level disaster planning and capacity building exercises. Although the frequency of evacuation drills is increasing, considerably more work is needed to reach all vulnerable communities, and build and maintain people's risk awareness and coping capacities.

6. Gender Aspects

Overall, Sri Lanka has the most advanced human development indicators in South Asia. Sri Lanka has a constitution that guarantees equal rights and has ratified the relevant international conventions. Gender equality has been reached in primary and secondary education and the number of women in universities is on track for reaching equality by 2015. However, high literacy and education levels have not yet been translated into adequate economic opportunities, parity in legal rights and adequate political participation. Women and children suffered significantly higher casualties in the 2004 tsunami. In the aftermath of the disaster, women's vulnerability to gender-based violence increased due to, among other, stress and men's increased alcohol consumption, as well as weak designs for sanitary facilities in collective temporary accommodation. Having often lost their livelihoods and roles as bread-winners, men suffered in terms of their psycho-social well-being and their specific needs were also poorly understood by assistance providers. Gender and cultural 'blindness' by assistance providers was maybe most obvious when recovery strategies threatened to remove traditional practices in the east of the country that ensure women's right to land.

The institutional and legal frameworks governing DRR and EWS offer opportunities for ensuring that risk reduction and early warning policy and practices are supportive of the needs of both women and men, however, neither the Disaster Management Act nor the Draft National Disaster Management Policy address gender explicitly. There is relevant gender expertise and capacity in the Ministry of Women's Affairs, Women's Bureau, National Committee on Women, Ministry of Women's Empowerment and Social Welfare, and in more than 3,000 national NGOs that interface with gender aspects. Other stakeholders include the Centre for Women's Research, as well as many donor and international NGOs. The DMC is well positioned to build its own capacity for gender awareness and to use its influence for the inclusion of gender aspects in DRR. Together, these institutions can help to ensure that far more women participate in EWS, and that warning messages, processes and procedures employ a gender sensitive approach considering specific concerns such as physical strength, security and protection.

Main Recommendations for Stakeholders

1. Governance and Institutional Arrangements

Work towards passage of the National Disaster Management Policy, so that development of the EWS is more completely secured as a national priority.

Integrate the concepts, mechanisms and activities of early warning into the National Disaster Plan, and ensure that provincial and district plans do the same.

Continue to support the DMC development and elevate the development of the Early Warning Unit to a higher priority.

Develop a master plan and schema for the end-to-end multi-hazard EWS, identifying all actors and their roles as well as how funded projects contribute.

Develop detailed guidelines and SOP to cover EWS in structural and operational detail.

Elaborate on the EWS chapter in the Road Map so it can serve as a prioritized and comprehensive plan for EWS capacity development, covering all major hazards and encompassing all major stakeholders from government, private sector and civil society, including the media.

- Within the Road Map/Plan, focus resources to strengthen capacities at the local level, in particular in vulnerable communities.

Follow up on EWS project evaluations, and generate community feedback to feed results and recommendations into EWS development.

1.1 Including women and men in governance and institutions for EWS

Support the review of disaster management policies, plans and legislation to address gender-based vulnerability and increase equality in EWS participation and decision-making.

- Specifically ensure that the plan for EWS capacity development encourages participation of women from different sectors (government, civil society, communities, etc.)

Clearly stipulate activities that designate EWS roles of and protective measures for women and men, and girls and boys.

Provide support for gender awareness training to government staff and research to increase knowledge about gender aspects.

2. Risk Knowledge

Promote coordination for risk mapping and data collection/analysis, and tackle the problems associated with database development, including standardization of methodology across the country and in the region.

Promote community-based participatory vulnerability mapping and assessments nationwide using networks of

trained volunteers or NGOs to reach vulnerable groups and communities.

Strengthen risk communication methods in public awareness activities to ensure that different target groups understand the risks they face. Use vulnerability data from participatory assessments at the community level to identify priority needs and messages.

Increase risk knowledge regarding small-scale disasters and their cumulative impact. Modify mitigation measures so that they are hazard-specific and address anthropogenic causes of 'natural' disasters.

Focus efforts on updating policies and enforcing laws and regulations related to land use, environmental and natural resources protection, building codes and integrated coastal management, in light of up-to-date knowledge of risks.

2.1 Strengthening understanding of gender-based vulnerability and capacity

Promote gender analysis and the development of monitoring and evaluation tools to assess the vulnerability of each gender and their access to information regarding hazards and vulnerability, and to follow up on equality in all EWS projects and programmes.

Draw attention to the increased vulnerability of women to gender-based violence following disasters for consideration in preparedness planning, and raise awareness of harmful response and recovery practices.

Make effective use of education systems, female politicians and legislators, and organizations and groups with gender-related mandates to further risk knowledge and participation in risk management and EWS.

Provide capacity development support to community groups and networks to help change attitudes and promote empowerment of women through risk knowledge.

Ensure the participation of women in the development of building codes, land titling and environmental protection laws and practices.

3. Monitoring and Warning System

Address gaps and deficiencies in staffing and equipment of technical agencies responsible for monitoring and warning, and ensure key actors are provided with legitimate mandates (following a mutually agreed master plan, see recommendation no. 1) to coordinate, monitor and issue warnings.

Continue to enhance support for the DMC, DOM and the wider network of relevant agencies for development of an integrated forecasting and warning system.

Work on reducing information gaps between the DMC, DOM and other organizations monitoring various hazards, as well as between central authorities and communities.

Ensure that resources are available to strengthen community level monitoring and early warning within more comprehensive community preparedness and risk management initiatives.

Involve NGOs such as the Savordaya and the Sri Lanka Red Cross Society, the private sector and the media to push dissemination and capacity building, particularly at the local level.

3.1 Meeting warning needs specific to gender, age and physical capacity

Involve women in assessing their own risks and in designing warning systems that reflect their monitoring and warning needs relative to individual hazards.

Increase resources to incorporate protective measures in EWS for the disabled and elderly.

4. Dissemination and Communication

Conduct a gap analysis to determine the reach of communications networks and technologies, considering the necessary redundancy and direct resources to areas in need of coverage.

Unify the concepts of warning dissemination and communication across organizations through development of a clear flow-chart supported by cross-organizational SOP.

- Formalize arrangements for information exchange and communication among government staff, media and civil society.

Provide support for training human resources to manage technical and operational aspects of dissemination and communication.

Strengthen dissemination and communication capacity at community levels within more comprehensive community preparedness and risk management initiatives.

Facilitate feedback from the community on the use and effectiveness of warning messages.

Strengthen public perception of warnings as protective mechanisms. Start a dedicated information campaign involving community leaders to build trust in the system.

Support development of media partnerships in EWS, at national and local levels.

4.1 Ensuring warning messages reach both genders

Prepare actionable warning messages that employ a gender sensitive approach in the context of community disaster preparedness and awareness programmes. Various times of day and the activities that females and males will be engaged in should be considered in terms of how each group can be effectively reached, and the reaction time they will need to flee to safety relative to the types of disasters they may face. The protection of children will require extra time for evacuation.

5. Response Capacity

Prioritize and coordinate the provision of resources to the capacity development of local authorities and communities for preparedness and response

Strengthen cooperation between national and local actors by ensuring that planning is a joint exercise, and that community-based work undertaken by NGOs and grass-roots organizations is recognized and incorporated in the overall planning.

Develop regulations and SOP for each hazard/area that mandate the:

- Frequency of evacuation drills in high risk areas;
- Evaluation of drills according to specific indicators of success and feedback from participants;
- Clear identification and realistic mapping of evacuation routes;
- Identification of designated places for evacuation; and
- Development of specific procedures for where to seek shelter and how to reach these safe areas considering the needs of particularly vulnerable groups.

Devote adequate human and material resources in order to increase the coverage of response drills, evacuation information and response planning, particularly in high risk areas and communities.

Ensure that NGOs and businesses have plans to support the response to warnings.

Undertake lessons learned exercises after evacuation drills or actual warnings, and ensure that a responsible coordinating body stores and analyses results for follow-up and incorporation into ongoing preparedness plans and training.

5.1 Learning to design EWS that work for women and men

Develop gender sensitive guidelines that focus on all aspects of DRR and EWS using a cooperative approach, and make use of lessons learned in previous disasters in Sri Lanka and other countries.

Empower women through training and replication of good practices to become actors in community-based DRR and EWS.

Evacuation drills, routes and procedures should be mapped taking into account gender considerations such as access, security, etc. for women.

1 Background on UNDP Support to Institutional and Legislative Systems for Early Warning and Disaster Risk Reduction

Between 1984 and 2004, the United Nations Development Programme (UNDP) supported a portfolio of over 50 disaster risk reduction (DRR) programmes in 63 countries, mainly devoted to the strengthening of organizational and institutional capacity. In 2004, the Disaster Reduction Unit of UNDP's Bureau for Crisis Prevention and Recovery conducted a review of UNDP's support to Institutional and Legislative Systems (ILS) for DRR. The review highlighted the importance of establishing linkages between effective and 'good' governance, risk reduction and the mitigation of impacts from recurring disasters. Devastating events causing high numbers of casualties, such as the December 2004 Indian Ocean tsunami and the October 2005 earthquake in northern Pakistan reemphasized the urgent need to further strengthen ILS for DRR within a governance framework.

Since the 2004 tsunami, two significant earthquakes in Indonesia as well as severe flooding in Thailand in 2006 have served as stark reminders of the high levels of risk in Asia. These disasters revealed the persistent shortcomings of national warning and response mechanisms, and exposed under addressed risks of vulnerable populations. There is a need to understand and analyse existing DRR strategies, policies, organizational relationships, mechanisms and processes, laws and regulations, and resources and procedures at all levels of administration. Responding to this need UNDP's Regional Programme on Capacity Building for Sustainable Recovery and Risk Reduction undertook the current study in collaboration with UNDP Country Offices in Indonesia, Sri Lanka and Thailand in 2007. The study focuses on the review of early warning systems (EWS) within the context of national DRR strategies, institutions and legislative systems.

1.1 Background on ILS for Early Warning

Laws and regulations provide the basis for enforcing rules to promote rights and obligations of groups and individuals. However, laws by themselves mean very little, they are a means towards the achievement of policies such as DRR strategies and/or frameworks. Policies have to reflect the social, economic and cultural realities of a given country. Policy makers have to consider to what degree policies can be easily implemented through formal institutions and mechanisms, or whether they require the participation of informal institutions and mechanisms including non-state actors. The latter is particularly relevant for the effectiveness of EWS.

Typically, laws provide incentives (e.g. subsidies) and disincentives (e.g. penalties) to engage in or avoid certain desired or undesired actions. They also frame institutional relationships between agencies and the distribution of roles and responsibilities, including the roles of the wider population. In the context of EWS, laws set objectives, standards and assign mandates and responsibilities to different actors in the monitoring and early warning process. Regulations, standard operating procedures (SOP) and codes describe specific procedures and norms, seeking to encourage certain types of behaviour. The effectiveness of any EWS depends upon political will, the administrative and technical capacity of a given country, and the degree of acceptance and awareness of rules by the population. EWS require a people-centred approach where formal mechanisms such as laws, protocols and standards complement informal mechanisms such as the engagement and participation of communities.

Box 1: Institutional and Legal Systems and Governance

Institutional and legal systems (strategies, policies, laws and regulations, organizational structures, mechanisms and inter-agency processes and resources) form the backbone of a country's **governance framework**. UNDP promotes the following key characteristics of 'good' or democratic governance in all its governance interventions including support to EWS:

- Participation of citizens
- Institutions of accountability
- Impartial mechanisms to enforce the rule of law
- Multiple and transparent flows of information
- Processes and mechanisms that increase the effectiveness of services
- Increased capacity of stakeholders in multiple sectors and at all levels
- Partnerships and a long-term human development
- Pro-poor and gender equality orientation

The public needs to fully understand and be consulted in the design of EWS plans and procedures. The public also needs to be able to monitor EWS performance and hold service providers accountable. If public access to information and to legal systems is weak, and if both local agencies and communities lack appropriate resources to act upon warning messages, it will be difficult to ensure compliance and acceptance of responsibility. EWS become effective and sustainable when citizens start to acknowledge their entitlement to a minimally safe environment, when they can easily access credible information on the performance of EWS, and when they realize their own rights and duties in early warning.

1.2 EWS in the Aftermath of the 2004 Tsunami

Since its creation in 1949, the Pacific Tsunami Warning Center (PTWC) has effectively issued warnings preventing deaths from underwater seismic events in the Pacific Ocean. However, the tsunami in 2004 demonstrated the importance of national and local capacity to receive, interpret, disseminate and respond to such warning messages. Many deaths could have been prevented if these capabilities had been in place. The initiative "Building Back Better," supported by the UN Special Envoy for Tsunami Recovery has developed key propositions from lessons learned in the tsunami.[2] While all ten propositions are important for establishing a strong basis for early warning, the following are particularly relevant:

> ***Proposition 3:*** *Governments* ***must enhance preparedness*** *for future disasters. The recovery period offers the opportunity to enhance relationships among government, the private sector and the international assistance community for preparedness. Governments must act rapidly* ***to reform laws and institutions*** *capitalizing on the availability of new resources for preparedness.*

> ***Proposition 10:*** *Good recovery must leave communities safer by reducing risks and building resilience.* ***Education and public awareness*** *has been shown to save lives.* ***Legal frameworks*** *must be in place to ensure priority at national and local levels but need to be followed by* ***long-term financial investment and training and mainstreaming of risk reduction*** *in recovery and development strategies.*

The increased attention to EWS in the region since the 2004 tsunami indicates that governments have started to consider preparedness measures within a more comprehensive DRR framework. EWS plans and projects emphasize the need to strengthen connections between vulnerable communities, government warning agencies and international services and actors. In close collaboration with the governments of India, Indonesia, Maldives, Sri Lanka and Thailand a number of bilateral and multilateral organizations have undertaken regional early warning projects. These include the United States Agency for International Development (USAID) Indian Ocean Tsunami Warning System (IOTWS) Program. As part of its engagement, USAID has conducted a study of the DRR capacities in relation to individual national disaster management organizations (implemented by Asian Disaster Preparedness Center – ADPC). UNDP has worked in close collaboration with IOTWS to share information and analysis. The UN International Strategy for Disaster Reduction (UN/ISDR) is working with UNDP and governments to develop Strategic National Action Plans for DRR in tsunami affected countries.

1.3 Guiding Principles for People-centred EWS

> *"More effective prevention strategies would save not only tens of billions of dollars, but save tens of thousands of lives. Funds currently spent on intervention and relief could be devoted to enhancing equitable and sustainable development instead, which would further reduce the risk for war and disaster. Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did NOT happen."*
>
> **Kofi Annan, "Facing the Humanitarian Challenge: Towards a Culture of Prevention", UNGA, A/54/1**

Most disaster management and contingency plans focus on post disaster response with often only a few lines and/or little energy devoted to EWS. This tendency has so far undermined the potential impact of EWS as a preventive tool for saving lives and avoiding disasters.[3]

The UN/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.*

2 UN Secretary-General's Special Envoy for Tsunami Recovery, William J. Clinton, *Lessons Learned from Tsunami Recovery: Key Propositions for Building Back Better*, December 2006.

3 Including incorporation of early warning in ongoing DRR.

The objective of people-centred EWS is:

…to empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life and damage to property and the environment and loss of livelihoods.

In March 2006, the Third International Conference on Early Warning sponsored by UN/ISDR and the German Government identified the following areas as critical for establishing a people-centred EWS. These areas provide a structured approach to EWS that this report follows:

1. Governance and Institutional Arrangements – The aim is to develop national institutional, legislative and policy frameworks that support the implementation and maintenance of effective EWS.

2. Risk Knowledge – The aim is to establish a systematic, standardized process to collect and assess data, maps and trends on hazards and vulnerability. This area includes the establishment of organizational arrangements, identification of natural hazards, analysis of community vulnerability, assessment of risk, and storage and accessibility of information.

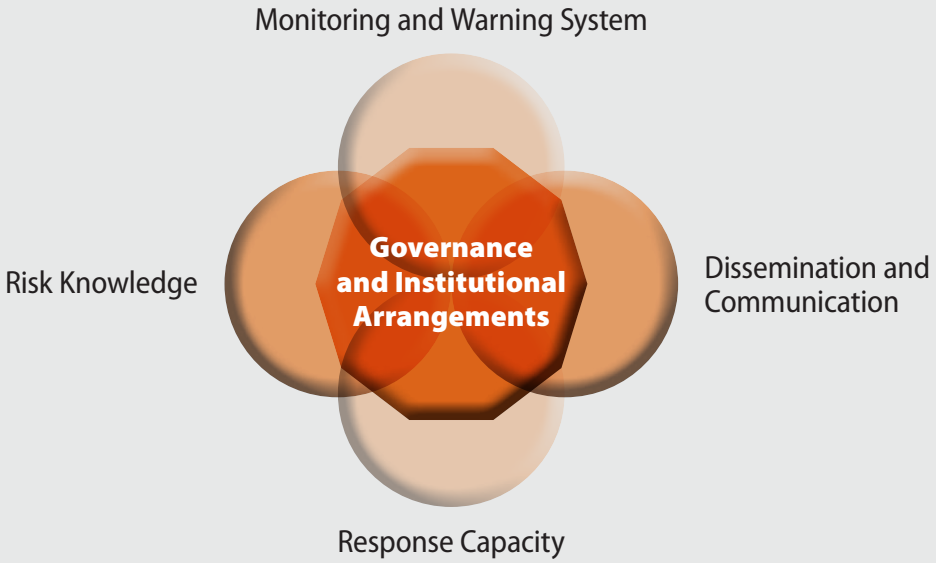
3. Monitoring and Warning System – The aim is to establish an effective hazard monitoring and warning system with a sound scientific and technological basis.

4. Dissemination and Communication – The aim is to develop systems to ensure local, national and regional coordination and information exchange.

5. Response Capacity – The aim is to strengthen the ability of communities to respond to natural disasters through enhanced education of natural hazard risks, community participation and disaster preparedness.[4]

4 UN/ISDR, *Developing Early Warning Systems: A Checklist*, An outcome of the Third International Conference on Early Warning hosted by the Government of Germany in Bonn, 27–29 March 2006.

Figure 1: EWS and Governance / ILS



1.4 Indicators of Good Practice in ILS for EWS

ILS for EWS should be guided by the same basic principles as good or democratic governance (see Box 1). Some indicators of progress that guide the analysis in this review are the following:

1. **Gender equality.** The degree to which countries have been able to influence the way that DRR measures consider the needs of women and men, girls and boys and protect the most vulnerable groups.
2. **Policy priorities and commitment.** National policies assign clear mandates to government and civil society to undertake early warning activities that are underpinned by sufficient commitment and resources. Evidence of commitment may entail the drafting and legalization of an early warning policy and/or the inclusion and resourcing of early warning elements in DRR frameworks and plans. This may include, for example, institutional capacity development, incorporating early warning education and training as part of school curricula, and the continuous maintenance and improvement of early warning assets such as monitoring and warning equipment.
3. **Multi-sector responsibility.** Rather than a separate activity, the EWS is shared across all levels of governance and society and must address all of the hazards that threaten the population. Many actors are likely to be responsible, each supporting a part of the system, and all must ensure that their plans and actions are synchronized. Planning has to include the ministries and departments involved in hazard monitoring, communicating warnings, and responding to warning messages, as well as schools, communities, civil society and the private sector. EWS must be institutionalized and appropriate mechanisms created to promote inter-agency and inter-sectoral cooperation at all levels of administration.
4. **Accountability for warning.** Resources for effective EWS should be adequate and placed by priority in those areas most vulnerable to disaster to address the needs of the most vulnerable groups. Good governance will help to ensure that actors are empowered to undertake their roles in the EWS to help save lives and livelihoods. The government should coordinate the resources of all actors and enlist cooperation from the private sector and civil society to create a greater impact of the EWS. Continuous improvement based on feedback and evaluation of the system is critical.
5. **Resources.** Among the most telling indicators of political commitment for EWS are the level of resources allocated and the efficiency of the use of available resources by governments, civil society and the private sector. Do resources address the most threatening hazards and the most vulnerable populations by priority? Are resources placed on addressing most urgent capacity needs in the system and based on multi-actor assessments? Are actors working together to optimize resource use to cover gaps rather than taking a fragmented or duplicative approach? Are the resources moving effectively to strengthen the impact of the EWS in communities?
6. **Application.** Ideally, the EWS functions as part of a DRR system that is incorporated into longer term development planning and practice. Important components are risk and impact assessments, public awareness, education and training, information management and research, in addition to environmental and natural resource management, sustainable social and economic development practices, physical and technical measures, and preparedness and emergency management. These tools and approaches serve to effect behaviour changes where people recognize their own responsibilities as well as that of the government and participate in EWS, make their own plans to respond to early warning messages, and protect themselves and their families.
7. **Civil society and private sector participation.** While it is recognized that the government bears prime responsibility for early warning, the roles of civil society and the private sector are critical for success. Civil society actors can promote participatory processes to ensure that the needs and priorities of vulnerable and marginalized populations are met. Vulnerable communities can effectively use local knowledge of hazards, vulnerabilities and coping capacities while complemented by technical and scientific solutions. The inclusion of the private sector will ensure discussions to address possible conflicts between public and private interests. Such interactions are important to protect local economic enterprises such as tourism and fisheries, which are safer when effective EWS are in place.
8. **Decentralization of EWS** is an important vehicle for the sharing of responsibilities between central, regional and local levels and for fostering participation. However, it is not an end in itself, but only valuable if it ensures that adequate government interventions in early warning reach communities more effectively. An important indicator is the degree to which resources are decentralized to support early warning activities. Another is the degree to which decision-making is decentralized and local actors have the necessary knowledge and tools to carry out their roles in EWS.

2 Gender and Institutional and Legislative Systems for Early Warning

Making gender equality a reality is a core commitment of UNDP.[5] As a crosscutting issue, gender must be addressed in everything the organization does. Why? Because equality between women and men is just, fair and right – it is a worthy goal in and of itself, one that lies at the heart of human development and human rights. In addition, gender inequality is an obstacle to progress, a roadblock on the path to human development. When development is not 'en-gendered' it is 'endangered'.

Box 2: Key Provisions of CEDAW

The ***Convention on the Elimination of All Forms of Discrimination Against Women,*** commonly referred to as CEDAW, is an international convention that was adopted by the United Nations General Assembly in 1979 and came into force in 1981. The Convention requires States Parties to:

- Pursue a policy of eliminating discrimination against women by all appropriate means and without delay [article 2];
- Reaffirm the equality of human rights for women in society and the family [article 1]; and
- Remove laws, stereotypes, practices and prejudices that impair women's well-being [article 2 (f) and (g), and article 5 (b)].

The international community made strong commitments for women's equality and empowerment at the world summits and global conferences of the 1990s. UNDP helps countries to translate these commitments into practical realities. UNDP contributes in expressing the goals set forth in the CEDAW and the Millennium Development Goals (MDGs) into specific policy reforms and operational programmes that make a difference for women, poor women in particular. The degree to which countries have made progress on the MDGs, particularly MDG 3 (aiming to eliminate gender disparity in primary education by 2005 and in all other levels by 2015) and are realizing the rights accorded through instruments such as the CEDAW and the Convention on the Rights of the Child, determines to a large extent how countries will incorporate gender concerns in DRR and EWS.

2.1 The Gender Experience of the 2004 Tsunami

Whether natural or human made, the impact of a disaster on people is always influenced by the political, economic and social-cultural contexts. Weaknesses in pre-existing institutional structures and legal protection arrangements will often result in some members of the community paying a higher price than others. Among the most important differences that determine how people are affected by disasters is that of gender.[6] Shortly after the 2004 tsunami, OXFAM issued a briefing note that captured the disproportionate impact of the disaster on women.[7] However, women do not only have specific vulnerabilities but also specific capacities that are often untapped in post crisis situations. The portrayal of women mainly as victims of disaster is still rife in legal language and in organizational practice.

Due to the gender division of labour in daily life, women and men possess specialized skills and strengths to cope with crisis. Yet, women's roles in mitigating and preparing for disasters, and in managing emergencies, go unheralded and unrecognized, even though their skills and contributions both at the household and community levels, are crucial.[8]

5 See UNDP Practice Note on Gender, November 2002.

6 Gender refers to the social construction of roles of women and men and the resultant role-perceptions about women and men. Gender relations can be described to be unequal power relations between women and men and manifested in the marginalization of women or men in social, economic, political and cultural spheres of life. Women's role in many societies has been restricted to certain tasks and spheres; e.g. household-related duties, reproductive process, child and family care, etc. Opportunities and access to material and non-material resources – land ownership, inheritance, education, training, has been restricted for women in many cases. Gender relations are also affected by other determinants like religion, culture, class, caste or age. (Source: Imelda Abarquez and Zubair Murshed, *Community Based Disaster Risk Management, Field Practitioners Handbook*, ADPC, 2004).

7 The OXFAM Briefing Note, *The tsunami's impact on women*, 2005. This report highlighted the high number of deaths and casualties among females and the possible repercussions on society.

8 Madhavi Ariyabandu, *Women: the risk managers in natural disasters*, Intermediate Technology Development Group South Asia, 2003, page 7.

After the tsunami, many agencies have attempted to include women in recovery planning and to study the gender aspects of disaster response, among both women and men. A more active participation of women in EWS is yet to be achieved. The efficacy of EWS will depend on the extent to which people take responsibility to gain access to disaster risk information and warning messages, and can take rapid and appropriate action to protect themselves and their families. This cannot be left to men alone, but requires the active participation of women. Using the EWS as a preventive measure, both women and men can better prepare themselves to lessen the negative impacts of disasters on livelihoods and households.

2.2 Observations on Gender and DRR in the Region

UN/ISDR describes the progress of promoting gender-inclusive DRR as follows:

> *Successful implementation of the Hyogo Framework for Action requires the full, active and balanced participation of women and men, girls and boys. Yet gender issues have been long overlooked. They have received little attention because of poor understanding of gendered vulnerabilities and risks to disasters. Serious action needs to be taken and more effort needs to be made to promote gender-inclusive disaster risk reduction.*[9]

The Asian Forum on Women in Disasters[10] met in December 2006 to review results of a *Survey of Women's Human Rights Violations* undertaken in the aftermath of the tsunami and the October 2005 earthquake in Pakistan. The review presented a picture of disturbing rights violations that included examples of the following:

- Women's right to adequate housing is violated.
- Women's right to work and employment is restrained by inappropriate assistance for livelihoods that remove women from their traditional occupation.
- Violence against women has been increasing in temporary shelters.
- Women's ownership right to land and property is violated.
- Discrimination based on caste, ethnicity, migrant status, occupation, religion and political affiliation exacerbates sufferings of women tsunami survivors.
- The armed conflict situation in Sri Lanka and (formerly) Aceh exacerbates the sufferings of the tsunami affected communities and inhibits the reconstruction process.

It is clear that the elimination of these violations in future disasters requires coordinated preparedness measures and strong legal bodies to monitor follow-up for the realization of rights. The Asia Pacific Forum on Women, Law and Development has created *Guidelines for Gender Sensitive Disaster Management*. While extremely important, the guidelines are all related to disaster response, or actions to be taken once a disaster has occurred. The reduction of the actual impact of the disasters and thus, a possible reduction in the extent of violations of women's rights could be achieved through effective EWS. EWS should therefore themselves be targeted to reduce these violations.

The Gender Equality and Disaster Risk Reduction Workshop that took place in 2004, in Honolulu, Hawaii issued a call to action that recognized the importance of institutions and institutional structures in providing the framework for policy and action in DRR. The attendees pledged attention to the following recommended follow-up activities:

- Develop legislation ensuring DRR is gender sensitive and addresses social equity.
- Ensure that gender issues and social equity become part of DRR agendas at international and national levels.
- Develop a global legal framework for ensuring that DRR is gender sensitive.
- Improve structural arguments in national governments, local governments and in non-governmental organizations (NGOs) that link gender, social equity, and DRR.
- Institute a Global Fund for Gender-specific Disaster Risk Reduction (GDRR) (in all phases of Disaster Management) with national commitment and membership prerequisites to ensure resource allocation.
- Establish mechanisms for gathering and distributing information related to gender mainstreaming in disaster risk management.

9 UN/ISDR, *Gender Perspective: Working Together for Disaster Risk Reduction – Good Practices and Lessons Learned*, June 2007.

10 The Forum is composed of 60 representatives of government, NGOs and aid agencies involved in the tsunami reconstruction efforts from India, Indonesia, Sri Lanka and Thailand.

2.3 UNDP's Eight-point Agenda on Gender Equality in Crisis and EWS

The Hyogo Framework for Action states, as part of the cross-cutting principles, that:

A 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.

With the help of a group of world-class experts, UNDP has developed an eight-point agenda to ensure gender equality in crisis prevention and recovery.[11] The following four points are particularly applicable to EWS.

1. Strengthen women's security in crisis

In crisis and post-crisis situations women are often particularly vulnerable to personal and institutional violence. EWS can address the specific security needs of women and girls by improving the gender safety of evacuation routes, centres and shelters, so women are less exposed to the risk of being attacked. The operators of early warning schemes require sensitization to understand the specific needs of women and girls in crisis situations.

2. Support women and men to build back better

Women have unique requirements in the context of natural disasters that needs to guide the design of EWS. These needs can be addressed by ensuring that women are included in any analyses of disaster risk and in reviews or planning processes that inform the improvement of EWS.

3. Expand women's citizenship, participation and leadership

Women are not only particularly vulnerable to natural disasters but they also have specific capacities to reduce risks from natural disasters. There is ample room to support the representation and participation of women in EWS and to promote them as local leaders in DRR. This can be achieved by building women's skills and confidence, supporting women's representation in the social, political and economic spheres, and developing women's networks and institutions.

4. Transform government to deliver for women

By enhancing capacities and promoting accountability within government institutions in charge of EWS, by engaging women and men to foster gender-equitable relations in DRR, and by ensuring gender sensitive resource mobilization, aid coordination, budgeting and funds allocation, EWS can become a vehicle to promote government that is more responsive to the needs of women.

11 See Kathleen Cravero, Address to the Women's Foreign Policy Group: The Critical Role Played by Women in Rebuilding Society after Crises, 1 May 2008.

3 Country Background[12]

The Democratic Socialist Republic of Sri Lanka is a tropical island and home to over 20 million people. Population density is the greatest in the western part of the island, especially in and around the capital, Colombo, although 70–80 percent of inhabitants live in rural areas. The population is composed of Sinhalese (74 percent), Ceylon Tamils (12 percent), Indian Tamils (5 percent),[13] Moors (7.2 percent), and smaller ethnic groups such as the Burghers (of mixed European descent) and Malays. The religious composition is Buddhist 69.1 percent, Muslim 7.6 percent, Hindu 7.1 percent, Christian 6.2 percent, and 10 percent unspecified. Sinhalese and Tamil are the two official languages and English, spoken by approximately 10 percent, is used in government and for education, scientific and commercial purposes.

Sri Lanka's literacy rate is the highest in South Asia with estimates ranging from 92.3–96.0 percent (male: 94.8 percent; female: 90 percent in 2003). Approximately 66 percent of the population complete secondary education and nine years of compulsory schooling is achieved by 90 percent of the students entering the first grade. The infant mortality rate is 13.97 deaths/1,000 live births. Sri Lanka is likely to achieve several of the MDGs, particularly in health and education. However, there are deep regional disparities that belie the national averages – approximately 23 percent live below the official national poverty line. Nearly one third of the children are underweight.[14] The legacy of civil conflict, falling agricultural labour productivity, lack of income-earning opportunities for the rural population, and very poor infrastructure outside Colombo are the key impediments to poverty reduction. Although it was the first country to elect a woman prime minister in 1960, Sri Lanka ranks relatively low globally in terms of women's empowerment.[15]

Tensions between the Sinhalese majority and Tamil separatists erupted into war in 1983 and tens of thousands have died in this conflict. In February 2002, the government and the Liberation Tigers of Tamil Eelam (LTTE) formalized a ceasefire that enabled hundreds of thousands of people to return to their homes. From March 2004 onwards, the LTTE split into two actively warring factions in the eastern province. Violence between the LTTE and government forces intensified as of 2006. Thousands fled from fighting in the eastern areas resulting in increases in the number of camps for internally displaced person (IDP); over 200,000 newly displaced IDPs were reported in March 2007, in addition to over 200,000 who have been displaced for many years. Since May 2007, some have returned home.[16]

Despite the war, economic growth averaged around 4.5 percent from 1991–2001. Following the 2002 ceasefire and subsequent economic reforms, record growth rates of 6.0 percent were achieved in 2003 and 5.4 percent in 2004. The 2004 tsunami, caused an estimated $1 billion in damage, nevertheless, the economy grew by 6 percent in 2005 as the negative impact on the gross domestic product (GDP) was offset by the reconstruction effort. GDP grew by 8 percent in the first half of 2006. Of the US$3 billion pledged for tsunami recovery, approximately $1.6 billion has been disbursed. Of the total, a mere $11 million was devoted to DRR.[17]

3.1 Governance in Sri Lanka

Under the 1978 constitution, the president of the republic, elected for a six-year term, is chief of state, head of government and commander-in-chief of the armed forces. The president is responsible to the parliament, a unicameral 225-member legislature, which reserves the power to make all laws. In November 2005, Sri Lankans elected a new president and prime minister.

The constitution vests the management of public officers with the Cabinet of Ministers and some powers are delegated to the Public Services Commission and relevant ministries. The public service is managed through an extensive

12 Derived mainly from NDMC, *National Report and Information on Disaster Reduction in Sri Lanka*, 2005; Wikipedia, CIA World Factbook, US State Department Country Briefs.

13 Ceylon Tamils are citizens whose South Indian ancestors have lived on the island for centuries predominantly in the north and east. Indian Tamils were brought to Sri Lanka by the British in the 19th century as tea and rubber plantation workers in south-central Sri Lanka; thousands were granted citizenship in 2003 by an act of Parliament.

14 UNDP Sri Lanka, *Summary of Progress on the MDGs*, 2007.

15 Sri Lanka ranks 69th out of 75 countries in the Gender Empowerment Measures, with a value of 0.372 (UNDP Human Development Report, 2006).

16 Inter-Agency Standing Committee Country Team Fact Sheet, March 2007; and UNHCR website.

17 Development Assistance Database (DAD), RATA, Sri Lanka.

administrative network covering the entire country through District Secretaries, Divisional Secretaries and affiliated staff.[18]

Sri Lanka is divided into nine provinces – Central, North Central, Northern, Eastern, North-Western, Sabaragamuwa, Southern, Uva, and Western[19] – and 25 districts. Under the Indo-Sri Lankan Accord of July 1987 and the resulting 13th amendment to the constitution, significant authority was devolved to the provinces.[20] The 13th amendment provided the constitutional provision to establish the Provincial Councils, which were given certain powers and functions. Provincial Councils are directly elected for five-year terms. The leader of the council majority serves as the province's chief minister; a provincial governor is appointed by the president. The councils possess limited powers in education, health, rural development, social services, agriculture, security and local taxation. Many of these powers are shared or subject to central government oversight. Predating the accord are municipal, urban and rural councils with limited powers. The Commission of Enquiry on Local Government Reforms in 1999 recommended a new development vision for local government that included greater responsiveness to local needs, enhanced community participation and promotion of a 'local development' culture.

The nature of relationships between the parallel structures of central and provincial governments matters greatly to the strengthening of effective DRR. The 25 districts, 300 divisions and 14,000 Grama Niladharis (GNs)[21] represent the central government. At the district level, the District Development Committee (DDC)[22] and the District Coordinating Council (DCC)[23] prepare the annual development budget and manage development activities through periodical multi-sectoral coordination and supervisory meetings. Operating adjacent to the centrally controlled system, the Pradeshiya Sabha,[24] Urban Council and the Municipal Councils form the local governance structure in Sri Lanka. These bodies are supervised by the Provincial Councils. There are 258 Pradeshiya Sabhas, 39 Urban Councils and 12 Municipal Councils.

The Provincial Councils exercise legislative and judicial powers in the areas of planning, rural development, land use and land development, agriculture and agrarian services, local government, police and public order, social services, housing, roads and bridges, and transport, among others, and are responsible for all matters relating to the supervision and administration of local authorities. The Provincial Councils generate local funds from taxes and grants, and receive loans from the central government. The Pradeshiya Sabhas and the Municipal and Urban Councils, using funds from rates, taxes, duties and fees, administrate all matters relating to public health, public utility services, and public thoroughfares, and generally protect and promote the welfare of the people. Their functions include: mobilization of the local public for development; formulation of ward level development plans and their integration with division development plans; formulation and implementation of locally funded projects; and development of programmes and projects with the participation from youth, women and disadvantaged groups.

3.2 Judicial and Legal Systems

Sri Lanka's judiciary consists of a Supreme Court, Court of Appeals, High Court and a number of subordinate courts. The judges for both the Supreme Court and the Court of Appeals are appointed by the president. Sri Lanka's legal system reflects diverse cultural influences: criminal law is fundamentally British, basic civil law is Roman-Dutch, and laws pertaining to marriage, divorce, and inheritance are communal. Sri Lanka has not accepted compulsory International Court of Justice jurisdiction. On several occasions in 2006, international concern has been expressed about alleged impunity concerning human rights abuses by all sides of the conflict.

18 Shamalie Gunawardana, "Legal and Governance Issues of the Tsunami Disaster: The Sri Lankan Experience," in *Tsunami and Disaster Management: Law and Governance*, edited by C. Raj Kumar and D. K. Srivastava, Thomson, Sweet and Maxwell Asia, 2006, page 229.

19 In October 2006, the Sri Lankan Supreme Court voided a presidential directive merging the northern and eastern provinces; many have defended the merger as a prerequisite for a negotiated settlement to the ethnic conflict; a parliamentary decision on the issue is pending.

20 Under the 29 July 1987 Indo-Lanka Accord, the government made a number of concessions to Tamil demands, which included devolution of power to the provinces, merger – subject to later referendum – of the northern and eastern provinces, and official status for the Tamil language.

21 Grama Niladhari is a government officer responsible for handling affairs of central government and whose jurisdiction is generally a few villages.

22 The DDC includes the District Secretary (this position is popularly termed Government Agent or GA) and Assistant District Secretary and Line Ministries; it receives funds from the Ministry of Finance/Planning for the annual development plan, and can incorporate DRR issues particularly since 90 percent of the development funds are generally allocated for infrastructure development, which creates opportunities for mitigation measures; only 10 percent can be used for software support; e.g. training and awareness raising.

23 The DCC includes the Chief Minister of the Province (Co-Chair), Political Chief of the District (Co-Chair), MPs from the area, Provincial MPs from the area, District Secretary and Assistant District Secretary and all line ministries.

24 Pradeshiya Sabha, Urban Council and Municipal Councils are elected bodies. They are elected every four years. Pradeshiya Sabha is the local government body for the rural areas. A Pradeshiya Sabha is comprised of the elected representatives of few villages (8–10), who are supported by civil servants.

3.3 Natural and Human-made Hazards in Sri Lanka

Natural and human-made disasters in Sri Lanka have increased in the past two decades and are expected to increase further due to changing demographics, development patterns and climate change. Most natural hazards affecting Sri Lanka can be forecasted and early warnings can be issued. When comparing Sri Lanka with the rest of the world, mortality-weighted multi-hazard maps reflect significant risks from natural hazards. These risks are especially high in Sri Lanka's south-western and north-eastern regions.[25] Floods are the primary hazard ranking in high deciles when weighted by both mortality and effects on GDP. Cyclones affect the northern region of the country but translate into a moderate to minor risk when weighted by mortality.[26] Summaries of disasters from 1957 to 2006 indicate that floods affect the largest number of people followed by drought and wind storms. Outside of the unique tsunami event of 2004, drought affects the largest average number of people per event, followed by windstorms and floods. Floods and windstorms inflict the greatest amount of loss and damage.[27]

In May 2003 during the monsoon season, flash floods and landslides struck villages in the south and south-west affecting 146,000 families and killing 250 people, necessitating a large emergency relief and recovery operation with international assistance. In January 2007, at least 13 persons were killed and more than 100,000 persons were displaced due to flash floods and landslides triggered by heavy rains in six districts in central and southern Sri Lanka. The deaths were caused by landslides in the Central province – Walapane area, 180 kilometres east of the capital, where more than 450 houses were damaged or destroyed. A massive landslide ripped through Walapane again in July 2007, killing more than 20 and leaving 12,500 people homeless.

Sri Lanka faced exceptionally low rainfall from September to December 2003, which led to severe crop failure and drought conditions in the districts of Hambantota, Monaragala, Kurunegala, Puttalum, Anuradhapura and Mannar. In August 2004 the drought had progressed to the point where livestock were dying and people were selling off their goods due to lack of income from serious crop failure; water powered electricity generation was also affected. International assistance was received to supplement government assistance for 650,000 affected families.

On 26 December 2004, an earthquake, measuring between 9.1 and 9.3 on the Richter scale[28] occurred 150 miles off the coast of Sumatra, Indonesia. The generated tsunami struck Sri Lanka at around 8:30 a.m. Sri Lanka suffered serious loss of life and substantial damage. The tsunami devastated large parts of the northern and eastern coastal areas and affected 13 districts. Over 35,000[29] (one in 500 Sri Lankans) died and damages were estimated to be over $900 million. Over 100,000 houses were lost. A million people were displaced, adding a new IDP crisis to the one caused by the long-running civil war. As of mid-2005, some 800,000 people remained displaced. Of the 516,000 tsunami IDPs, 64,500 were reported to be living in welfare centres as of June 2005, the remainder living with relatives and friends.

The escalation of the conflict in 2006–2007 threatens to weaken efforts to reduce vulnerability to multiple hazards as national and international actors focus attention and resources on the effects of the conflict. In addition to civil conflict the country suffers from many other human-made hazards including soil erosion caused by deforestation, coastal degradation, pollution of freshwater resources by industrial wastes and sewage runoff, and air pollution in Colombo. Transportation accidents are a leading cause of mortality in Sri Lanka.

Epidemics that have occurred during the past 50 years include malaria, cholera, encephalitis, measles and dengue fever. The HIV prevalence in Sri Lanka remains very low compared to the rest of South Asia; the infection rate for people aged 15–49 is currently estimated at less than 0.1 percent. The Ministry of Health is proactive in prevention and instituted a National Sexually Transmitted Diseases/AIDS Control Programme.

The country is party to the following international treaties and conventions: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Ship Pollution, and Wetlands. The Marine Life Conservation instrument is signed but not ratified. Sri Lanka's use of natural resources remains unsustainable in many parts of the country.

25 Two distinct regions have higher risk for hazards: one is the south-western hill slopes region, and the other is the north-eastern coastal region. Kegalle, Ratnapura, Batticaloa, Ampara, Galle and Mullaitivu Districts are prone to the highest risk. In the north-eastern region, the eastern coastal belt along with Anuradhapura, Mannar and Vavuniya Districts show higher risk, albeit less than the western slopes. In addition, the southern districts of Hambantota and the north-central district of Puttalam are also at risk from multiple hazards. Source: International Research Institute for Climate and Society.

26 Center for Hazards and Risk Research, Columbia University, 2005.

27 EM-DAT: The OFDA/CRED International Disaster Database; Created on 16 March 2007.

28 The magnitude of the earthquake was originally recorded as 9.0 on the Richter scale, but has been upgraded to between 9.1 and 9.3. At this magnitude, it is the second largest earthquake ever recorded on a seismograph and is reported to be the longest duration of faulting ever observed, lasting between 500 and 600 seconds (8.3 to 10 minutes). Source: Wikipedia.

29 UN Tsunami Special Envoy, quoting GoSL.

3.4 National Disaster Management Legislation

The enormous scale of the 2004 tsunami strained the disaster management resources of the country and recovery efforts were plagued with legal issues affecting various stakeholders. Even though one and a half to two hours elapsed between the earthquake off the Indonesian coast and the landfall of the tsunami in Sri Lanka, international, regional and national communications did not effectively disseminate early warning to the vulnerable areas.[30] Given the substantial logistical difficulties, the immediate response by communities, district secretariats and humanitarian organizations was largely considered to be effective.

At the time of the tsunami disaster, efforts had been underway for years to develop and adopt new disaster management legislation, plans and policies. In fact, as early as 1991, a Cabinet sub-committee was appointed to prepare a disaster mitigation plan and in 2000, a National Plan for Disaster Management was developed by the former National Disaster Management Centre (NDMC, now the National Disaster Relief Services Centre) but it did not receive the necessary attention and support. A National Disaster Countermeasures Bill, developed in 2002 was stuck in legislative queue for a number of years.

The relevant disaster legislation at the time of the tsunami was the 13th amendment to the constitution of 1987 that devolved disaster management and preparedness responsibilities to the provinces. Notably, some districts (Hambantota, Ratnapura, Matara and Galle) had developed disaster management plans largely focused on flooding and on response. The National Disaster Relief Services Centre was established in July 1996 but lacked the institutional authority and capacity to respond to a large-scale disaster and coordinate humanitarian assistance. Consequently, the Government of Sri Lanka (GoSL) required more than a week to ascertain the extent of the damage and form a regulatory structure.[31]

Following the tsunami disaster, a series of important legal and institutional mechanisms were developed. The GoSL constituted the Parliament Select Committee on Natural Disasters, an interim bi-partisan committee that helped guide policy and legislative efforts. This resulted in the drafting and enactment of the Sri Lanka Disaster Management Act No. 13 of 2005 that established a National Council for Disaster Management (NCDM), a high level body chaired by the President. The Act paved the way for the establishment of the Ministry of Disaster Management and Human Rights, which assumed the lead role in DRR overseeing a new Disaster Management Centre (DMC). The Act also supports development of Technical Committees. The Parliament Select Committee issued a study report in mid-2005 that sets out 13 core recommendations for a five-year programme to strengthen the disaster risk management system, including establishment of a countrywide EWS. An Interim Committee on Early Warning was headed by the Department of Meteorology (DOM).

The draft National Disaster Management Plan (NDMP) updated and streamlined in 2006 and 2007, elaborates the Act using an integrated approach termed the 'Total Disaster Risk Management System'. A gazette announcement of February 2006 provided legal notification for development and implementation of the Plan. The execution of the Plan will be overseen by the NCDM, the Ministry of Disaster Management and Human Rights and DMC.

In late 2005 to early 2006, DMC and the Ministry coordinated consultations and formulated a Road Map for a Safer Sri Lanka that contains 109 proposals in seven thematic areas including EWS. At the same time, a National Disaster Management Policy was created with the intention of intensifying support to provinces and local administrations. The policy was a collaborative effort taking in the opinions of numerous ministries, NGOs and local actors, and its approval is eagerly awaited by both government and non-government actors. Other planning is underway such as an emergency response plan for Colombo and a hospital emergency preparedness plan by the Ministry of Health.

3.5 National DRR Institutions

Brief descriptions of key government organizations in EWS and DRR are given below with more analysis of institutional capacity for EWS in the following sections of this report. The roles of the institutions are highlighted in the NDMP and in other public documents.[32] Key DRR actors involve approximately 20 ministries.[33]

National **inter-ministerial and inter-agency** mechanisms include the following:

30 The Pacific Tsunami Warning Center in Hawaii issued a warning slightly over an hour after the earthquake and the tsunami effects occurred over a period of four hours in Sri Lanka, however, few warning communications were undertaken by Sri Lankan authorities.

31 IFRC, "Legal issues in the international response to the tsunami in Sri Lanka," An International Disaster Response Laws, Rules and Principles (IDRL) Programme Case Study, June 2006, page 4.

32 ADPC, *Assessment of Early Warning Systems in Sri Lanka*, September 2005; NDMC and UNDP, *Stocktaking: Disaster Management in Sri Lanka*, Ministry of Women's Empowerment and Social Welfare, April 2005.

33 There are 52 Cabinet Ministers and 33 non-Cabinet Ministers (GoSL website).

The **National Council for Disaster Management**[34] monitors the implementation of the NDMP and the National Emergency Operations Plan (not yet formulated). It assigns responsibilities to DMC and directs its activities. The NCDM was created to oversee all aspects of DRR, advising the Cabinet of Ministers on potential and actual disasters, and recommending allocation of funds from the Reconstruction and Rehabilitation Fund, among others. It was intended to promote local and community self reliance as well as liaise with organizations and persons pursuing research on hazards.

The **Disaster Management Centre**, of the newly formed Ministry of Disaster Management and Human Rights, assists the NCDM with planning and, importantly, ensures that disaster management plans prepared by ministries, government departments, or public corporations conform to the NDMP. The DMC coordinates with government, NGOs, district and division secretaries, issuing instructions and guidelines on disaster management activities and their implementation. The DMC is also tasked with promotion of disaster management research and development programmes, and setting up and maintaining a disaster management database. The DMC, by virtue of the draft policy and National Plan, will be housed with the Early Warning Centres and be responsible for them.

The **National Disaster Relief Services Centre** (formerly NDMC) was established in 1996 to coordinate the country's disaster management activities. Several years ago, the National Disaster Relief Services Centre was destined to be restructured to form an outfit similar to the current DMC but this did not occur. Instead, the National Disaster Relief Services Centre (renamed in 2007) functions under the Ministry of Disaster Relief and focuses its efforts on the response domain while still managing its transfer from the Ministry of Social Services and Social Welfare. The National Disaster Relief Services Centre implements programmes in the district and division administrative units with support from various donors.

The **Human Disaster Management Council** was established under the Presidential Secretariat to provide policy guidance, coordinate, facilitate and monitor the implementation of the National Programme on Human Disaster Management. Its activities include provision of assistance and rehabilitation services to people disabled from armed conflict, provision of assistance to victims of natural disasters and the establishment of Disaster Mitigation (Youth) Volunteer Groups that assume task force functions during emergencies.

The **Reconstruction and Development Authority (RADA)**, mandated by the President, focuses on coordinating efforts for tsunami disaster recovery, especially housing and livelihood recovery but its mandate is not clearly set out in any legislation. RADA houses the Development Assistance Database (DAD) that tracks tsunami-related funding. RADA is part of the Technical Advisory Committee of the DMC.

Other institutions supporting monitoring and early warning dissemination and communication include the following:

The **Department of Meteorology** has been designated as the lead agency for tsunami early warning and works under the Ministry of Disaster Management and Human Rights. The DOM was first established in 1948 under the Ministry of Science and Technology and its current activities include provision of meteorological, hydro-meteorological, agro-meteorological, climatological, and astronomical (limited) services as well as related research. The DOM provides information, forecasts, advisories, and warnings on floods, tropical cyclones, and drought.

The **Irrigation Department**, under the Ministry of Agriculture, Livestock, Lands and Irrigation, is responsible for flood forecasting, monitoring, warning and control. The Irrigation Department ensures sustainable utilization of water resources in consideration of catchment area conservation needs and competing water demands. It monitors river levels and provides warning on the flooding potential on the Kelani, Kalu, Gin, Nilwala, and Mahaweli rivers and 103 smaller rivers. Its activities also include maintenance of river level data. Other institutions responsible for monitoring and mapping flood prone areas downstream of reservoirs and dams are the Mahaweli Authority of Sri Lanka (MASL), the Ceylon Electricity Board and the National Water Supply and Drainage Board.

The **National Building Research Organization (NBRO)**, a quasi-governmental body, is the lead agency for landslide risk identification and mitigation. The NBRO identifies landslide-prone areas, conducts mapping, develops and trains on guidelines and engineering practices for landslide mitigation, and promotes public awareness of landslide risk and vulnerability.

The **Geological Survey and Mines Bureau (GSMB)**, formerly the Geological Survey Department, promotes and manages mineral resources. Its functions include geological mapping (geology, tectonics, mineral resources and metamorphic geology).

34 The NCDM is comprised of the President as the Chairman; the Prime Minister as Vice-Chairman; the Leader of the Opposition; the Ministers of Social Welfare, Rehabilitation and Construction, Environment, Home Affairs, Health, Science and Technology, Housing, Coast Conservation, Irrigation, Power, Defense, Police, Finance, Land, Fisheries and Aquatic Resources, Foreign Affairs, Water Supply, Highways, Urban Development, and Education; Chief Ministers of Provincial Councils; and other opposition Members of Parliament.

The **National Aquatic Resources Research and Development Agency (NARA)**, established in 1981, promotes and conducts research in oceanography, hydrography, marine biological resources, inland aquatic resources and aquaculture, fishing technology and environmental science. Its Geographic Information System (GIS) and remote sensing, and extension divisions provide support.

The **Ministry of Fisheries and Aquatic Resources** operates a warning dissemination system in all fishery harbours. Within the Ministry, the **Coast Conservation Department** develops the coastal management plan, and regulates and oversees all development activities in the coastal zone.

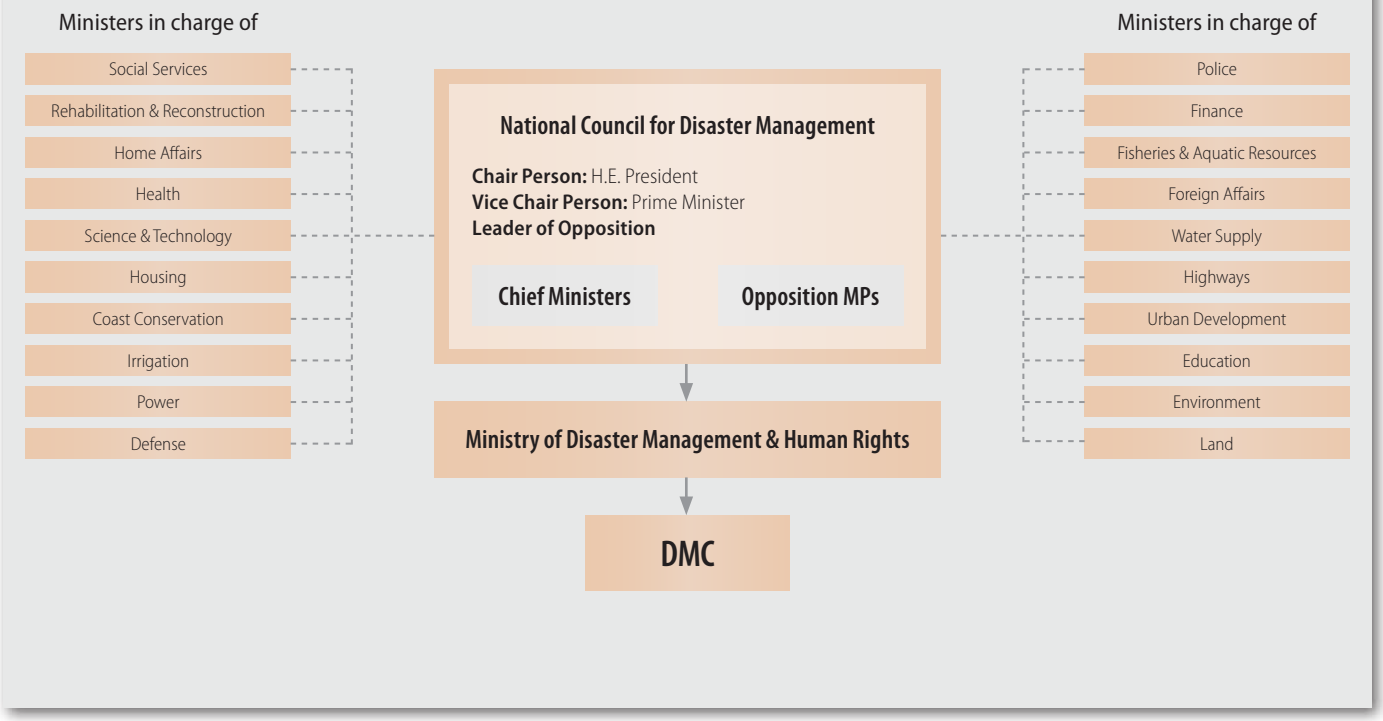
The **Centre for Housing Planning and Building (CHPB)** in the Ministry of Housing and Construction Industry conducts disaster mitigation training for government and other actors. The CHPB has developed emergency management and response plans for Ratnapura and Kandy Municipal Councils, and local authorities along the Kelani River from Awisawella to Colombo. Under the Ministry of Urban Development and Water Supply, the **National Physical Planning Department** integrates information on natural disaster prone areas and disaster mitigation aspects into the planning process. It works with government agencies and local government bodies under the Town and Country Planning Ordinance No. 13. The **Urban Development Authority (UDA)** promotes sustainable urban development through formulation of urban land use policy.

The **National Science Foundation (NSF)**, under the Ministry of Science and Technology, coordinates research and public awareness through its Committee for Science and Technology Initiatives for Disaster Mitigation and Management, as identified by the Interim Committee for Disaster Early Warning and Mitigation.

The **Ministry of Health** has a well established epidemiological surveillance network with well developed response plans to potential epidemics. The **Ministry of Social Welfare** is responsible for providing psychosocial counseling to disaster affected people.

Other key actors include the **Survey Department** that produces print and digital maps and aerial photographs; the **Police Department** serving as a channel for warning dissemination, utilizing a high frequency radio system; the **Sri Lanka Navy** providing decision-making support, coordination and information dissemination for tsunami early

Figure 2: DRR Institutional Framework in Sri Lanka



warning; and the **Information Department** that publicizes government policies and stimulates public participation.

3.6 Regional DRR Cooperation

Sri Lanka's foreign policy supports the South Asian Association for Regional Cooperation (SAARC) that was established in 1985. Other members include Bangladesh, Bhutan, India, Maldives, Nepal and Pakistan. The SAARC convened a special session in 2005 to discuss the tsunami EWS and urged member states to share information regarding early warning capacities. The SAARC is working in partnership with the UN/ISDR Secretariat to achieve the Hyogo Framework objectives. Important areas for regional cooperation in DRR include monitoring and prediction of weather conditions to lessen possible adverse impact on socio-economic development. The SAARC has initiated studies that would promote an action plan for protection of the environment and reduction of deforestation.

Sri Lanka is also a member of the **Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)**, formed in 1997, that includes Bangladesh, Bhutan, India, Myanmar and Thailand. BIMSTEC sponsored a workshop in October 2006 that included discussion of regional cooperation for early warning and community-based early warning. A decision was made to establish a BIMSTEC Centre for Weather and Climate and provide training in the area of remote sensing for environment and disaster management applications. BIMSTEC plans to strengthen emergency preparedness for natural disasters, especially through EWS and networking with ADPC and SAARC.

4 Governance and Institutional Arrangements for Early Warning

In the aftermath of the December 2004 tsunami disaster, the GoSL finally formalized a commitment to DRR through the passage of the Disaster Management Act No. 13 of 2005. The passage of the Act represented a breakthrough in terms of modernizing government legislation and supporting the establishment and development of the DMC, which should figure prominently in the promotion of an integrated EWS. The benefits of early warning were clearly illustrated in the tsunami disaster – many lives would have been saved had warnings been disseminated effectively and reached coastal dwellers in time. Attention has also been brought to the fact that liability may result from failure to establish or properly utilize EWS, in terms of responsibility to warn tourists and other countries when a potentially disastrous event is predicted.[35]

The gaps in the DRR system were systematically identified through development of the *Road Map for Disaster Risk Management, Volumes I and II*, which includes suggested projects to support tsunami and multi-hazard EWS. Approximately $609 million is required to fund Road Map projects but a large proportion of the proposals have not yet received support.[36]

The following were identified as major issues in governance and institutional arrangements to support EWS:[37]

- Roles and responsibilities of organizational stakeholders (government and non-government) in an end-to-end EWS are still not clear.
- The Road Map has not been vetted adequately against its objective to serve as the master plan for strengthening DRR capacity. It requires better analysis of the capacities and needs of individual organizations versus their role in DRR to make it more appealing to funding and implementing agencies. The Road Map does not specifically address community needs for EWS.
- Government commitment to DRR and EWS reached its peak with the passage of the Disaster Management Act and development of the Road Map but is now stalled in terms of ministerial approval of the National Policy.
- Guidance for a multi-hazard EWS exists, but is not consolidated in any single document approved by government. The nationwide institutional and legislative EWS linkages between administrative bodies from the centre to community are not well defined and/or formalized and are being developed piecemeal. Activities carried on by dedicated professionals have strengthened components but these are not tied together through officially recognized parameters that form a legacy for EWS outside of current individual efforts.
- There is a focus on response mechanisms in official documents, an emphasis that might shortchange the power of early warning as a preventive measure.[38]

4.1 Policy, Planning and Legal Frameworks to Support Early Warning

Sri Lanka's main disaster-related legislation, the Disaster Management Act No. 13 of 2005, recognizes the spectrum of DRR, including early warning, and legalizes the DMC. The Act relies on further elaboration through the NDMP. The main portion of the text focuses on preparedness for response and response mechanisms. References to warning are limited to implications under mitigation and preparedness; early warning, EWS and preventive effects of such systems are not specifically referred to. The Act established the NCDM, which has met very infrequently (rather than every three months as stipulated in the Act), and thus its role in gathering inter-ministerial oversight and support for the DMC has been considerably diluted.

Details regarding institutional roles in an end to end EWS are found in various documents, notably the National Disaster Management Policy (April 2006), the draft NDMP (March 2007)

35 Customary international law includes the duty to alert another nation of an identified threat. William C. Nicholson, "Legal Issues: Warning Systems," in *Early Warning Systems: A Public Risk Institute Symposium*, 2005, pages 1 and 2.

36 UN/ISDR, UNDP and DMC, "Progress and Future Initiatives on DRR in Sri Lanka: National Progress on the Hyogo Framework for Action," presentation made at the National Consultative Meeting, 25 April 2007.

37 Based on interviews conducted through the UNDP ILS for EWS study and shared data with USAID IOTWS, both collected in 2006, as well as publications and documents.

38 Different tools and approaches may be needed for prevention/mitigation through early warning and prevention/mitigation through response. For example, training volunteers in search and rescue requires substantial resources as does training them to monitor potential disasters and manage evacuations. Thus, the focus of plans becomes a critical issue when resources are limited.

and the Road Map (2006) as well as individual organizational mandates. These documents describe organizational structures and relationships, providing guidance to relevant actors who are critical in supporting early warning, but their roles in EWS are often not synchronized or permanently assigned by laws or regulations.

The draft National Disaster Management Policy provides guidance on roles and responsibilities of the Early Warning Centres for tsunamis and multi-hazards, capacity development for these centres, and guiding principles on the dissemination and communication of warnings. The Policy sets out the roles of the Emergency Operation Centres (EOCs) that can simultaneously serve as Early Warning Centres.[39] The Policy seeks to provide or strengthen the legal mandates of organizations involved in coordinating, monitoring and/or issuing warnings on specific hazards. It deems that "with respect to a given disaster, only one designated responsible agency will issue the early warning and no other agencies will issue any warning." The Policy is not approved yet by Parliament and the development of an Early Warning Unit that will coordinate EWS as part of the DMC is just getting started. Lack of approval of the Policy will hamper critical progress, leaving outdated policies in place instead.[40]

The NDMP describes the needed components of the total system and refers to the Road Map for further elaboration on gaps. The Plan is in advanced stages of development and the final draft is scheduled to be completed by the end of July 2007. It was meant to be accompanied by an Emergency Operations Plan that is yet to be developed. The NDMP describes mechanisms for early warning including the establishment of the Early Warning Unit within DMC, and also specifies the roles of the UN agencies in DRR. The Plan also devotes attention to the relationships and partnerships among actors describing mechanisms for communication and coordination. As an overview document listing basic planning steps and requirements, the Plan contributes significantly to the vision of an all encompassing system.

In many DRR systems there is a tendency to place the greatest emphasis and resources on response planning and systems – some plans omit early warning completely. The Sri Lanka Plan, while being much more holistic, mentions mitigation as a preventive measure but underutilizes the concept of early warning as a component. It is important to link concepts of early warning with other components, such as risk knowledge, monitoring and dissemination and communication, as well as response and recovery. A stronger vision would seek to forge linkages between organizations monitoring various hazards to achieve an integrated warning system that is user friendly for community members. A goal may be to feed the continuously accumulating knowledge of risks into warning systems to allow the systematic prioritization of hazards and geographic areas. It appears that a separate and detailed plan for EWS should be developed or, preferably, EWS should be integrated more effectively within the Disaster Management Plan.

The development of the Road Map in line with the Hyogo Framework for Action 2005–2015 was a significant accomplishment in terms of institutional consultation and coordination. It is an ambitious plan that provides seed ideas for projects to strengthen various aspects of DRR, among them EWS, based on needs agreed upon among stakeholders. However, these projects require substantial additional planning as well as funding. While the Road Map is well regarded by national and international assistance and development actors who have read the plan the following issues are noted:[41]

- There is confusion regarding the objectives of the Road Map vis a vis a national policy.
- It is unclear which projects should enjoy priority i.e. which will be the most cost effective and result in greater impact on lives and livelihoods.
- Some actors are unfamiliar with the Road Map.
- Road Map suggestions have received weak funding support perhaps because the plans are not integrated into organizational contexts, budgets and programmes.
- The contents, while generally strong, do not stress prevention enough.
- Chapter 4 on early warning focuses on technical inputs and does not address the community role in EWS.
- There is no obvious way to track what is being covered and not being covered.

The Road Map identifies gaps and weaknesses in EWS that were relevant in early 2006 and are still not fully addressed. These include:

- Integration of the tsunami EWS with existing EWS for a multi-hazard approach
- Intensification of efforts for improving early warning capacities for hydro-meteorological hazards such as floods, droughts, wind storms and cyclones that cause the most losses over time
- Strengthening of linkages between hazard monitoring and warning communication with feedback loops to ensure post-event assessments

39 The function and design of the EOCs (central and nationwide) were elaborated through a consultancy to the DMC supported by UNDP.

40 USAID IOTWS, *Review of Policies and Institutional Capacity for Early Warning and Disaster Management in Sri Lanka* (Draft), January 2007, page 4.

41 Workshop on Disaster Management Policy and Practice: Sharing Lessons between Government, Civil Society and Private Sector, 28 September 2006, organized by Institute of Policy Studies of Sri Lanka with Oxfam America, discussions.

- Strengthening of partnerships between agencies responsible for various components and hazard-specific activities of the EWS
- Improvement of infrastructure, such as increasing the number of communications lines

The Ministry of Disaster Management and Human Rights has asked all districts to create District and Divisional Disaster Management Committees, chaired by the District Secretary (or Government Agent) and Divisional Secretary including the Pradeshiya Sabha. The National Plan sets out a template for creating district and provincial mitigation and preparedness plans that include substantial attention to EWS, including family preparedness, evacuation drills and simulations, mechanisms for disseminating early warning information to all areas (including isolated ones) and identifying evacuation centres. The DMC and UNDP estimate that 60 percent of the planning in the most vulnerable districts will have been completed by December 2006. Provincial level DRR activities are less developed due to need for more capacity and funding for relevant actors such as the Pradeshiya Sabha.

4.2 Roles and Responsibilities of Actors in the EWS

Most national and international institutions intensified development of the EWS after the tsunami. Activities are undertaken by many actors[42] some with direct objectives to strengthen EWS and others who focus on general DRR, preparedness and response. There is some overlap and duplication among them, particularly in the tsunami affected areas, as well as scattered efforts to support community-based EWS. A cohesive and coordinated approach as well as public acceptance of the roles and responsibilities of all actors will be essential for the EWS to succeed.

4.2.1 Government and Local Administrative Actors

Despite the gains made in legislation and planning, there remains an undercurrent of ambiguity among national actors, over roles, authorities and how coordinated multi-hazard coverage EWS will be achieved. This confusion is a result of changes in institutional roles and lack of time for the DMC to develop authority and influence. There also has not been enough time yet to achieve clarity in the policy domain, starting with the approval of the National Policy. Although government and local administration staff work hard to coordinate and collaborate, and many joint workshops have been held, it has been difficult in some cases to break through inter-institutional barriers and secure official delineation of roles.

While the GoSL has long supported mitigation efforts through institutions such as CHPB and NBRO, the connection of these efforts to EWS were not brought out strongly. This was not for lack of trying but rather because focus on individual institutions prevented the connection in one fluid system, and also due to inadequate or discontinued funding for some efforts.[43]

The trend toward decentralization offers an opportunity to strengthen EWS closer to communities as work progresses by some agencies on community level EWS and enhancement of traditional and technical systems for warning. Although Sri Lanka has a well established legal system of local governments at the provincial and sub-provincial level, years of conflict halted the decentralization process. Challenges with regard to decentralization include: 1) limited administrative decentralization with control by the centre over functions; 2) additional layers of administration and overlapping responsibilities; 3) budgetary restrictions due to the country's turmoil; and 4) ineffectiveness of the Provincial Councils in public service delivery.[44]

At the district level, coordination needs to be strengthened and trust transferred from the centre to these authorities, such that central level authority and leadership are firmly connected to confident leadership at district level. Plans to uphold district authority should be clear and in written form such as SOP, which are soon to be developed. Provincial actors need to be drawn into planning and community empowerment as per their mandates. Coordination at district level is also critical to draw in all actors who have typically focused upon their own systems, such as the health system that has well-developed surveillance, yet did not appreciate the need for effective coordination with other actors. The DMC is working to include all actors in its consultative efforts in meetings and workshops.[45]

The Sri Lanka EWS involves a large number of institutional actors. When the Sri Lanka EWS Institutional Roles and Responsibilities Chart is compared with that of Thailand, for example, there are approximately one third more government institutions involved, particularly in risk knowledge, monitoring and warning. This observation may be useful in terms of analysing ways to focus efforts and resources to achieve the end-to-end multi-hazard EWS.

What will constitute the most cost efficient means to approach its development and how will impact be effectively

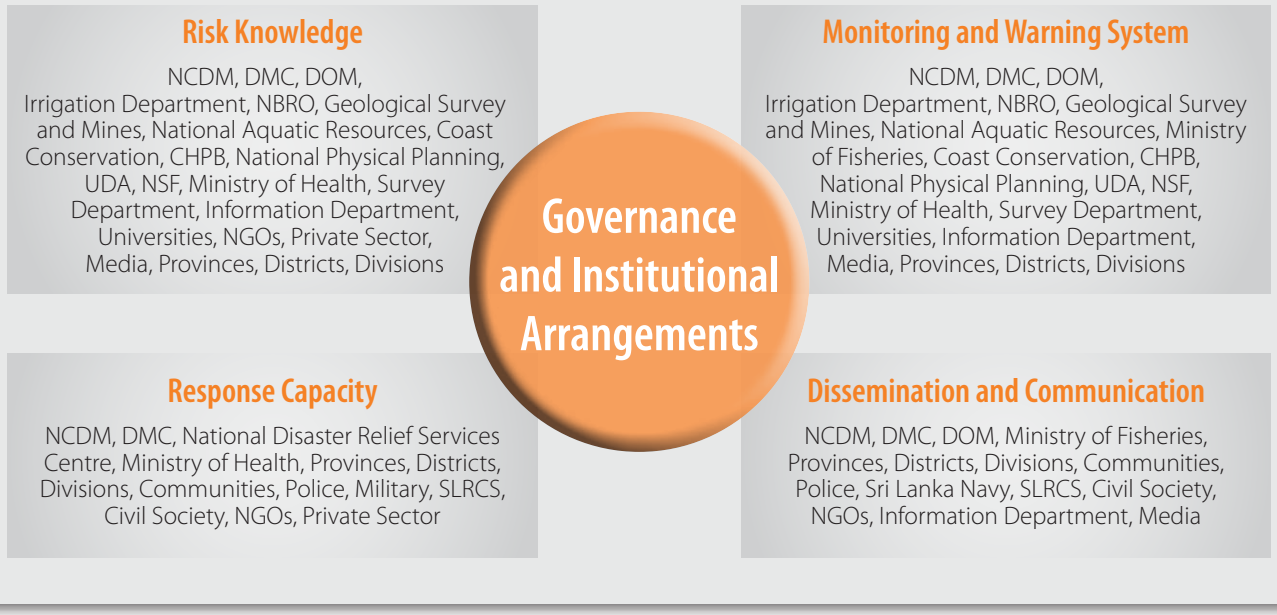
42 See list of relevant actors in the annexes.

43 A Global Review: UNDP Support for Institutional and Legislative Systems for Disaster Risk Management, Executive Summary, 2004; Sri Lanka Report, 2004.

44 World Bank Group, 2007.

45 The National Workshop on Disaster Risk Communication, Hikkaduwa, Sri Lanka, 21–22 September 2006, included the Ministry of Health personnel not formerly involved in discussions regarding the DRR system.

Figure 3: Institutional Roles and Responsibilities in the Sri Lanka EWS

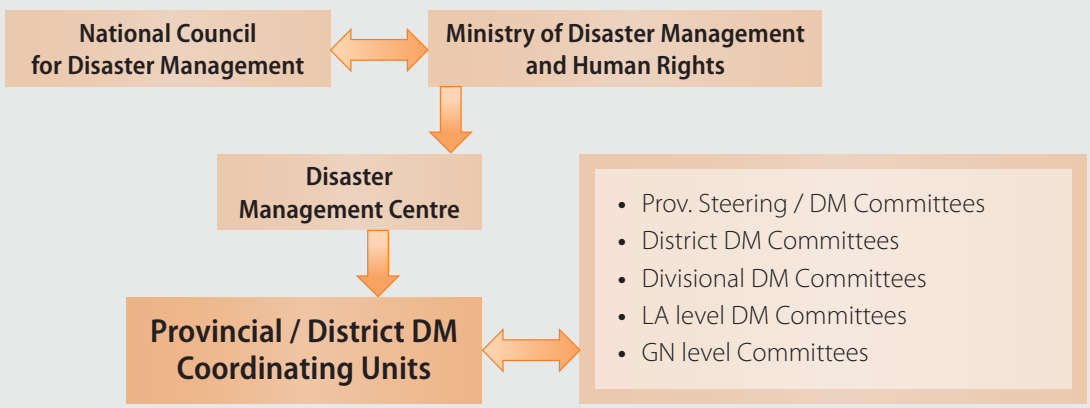


achieved? Involving line ministries is technically important and helpful in mainstreaming DRR and EWS. However, it is far more challenging to ensure leadership, coordination and structured relationships, when dealing with a high number of actors, who are more likely to have inter-institutional issues that may cause confusion, particularly at the local level. For example, there is confusion among assistance actors regarding the roles of DMC, which currently has the lead role in DRR, and the National Disaster Relief Services Centre, the previous lead agency, and some efforts by these two institutions are seen to be duplicative. Further, organizations want clarification on who is ultimately responsible for early warning messages, i.e. the 'button-pusher'.[46]

The **DMC** is a young institution tasked with development of five divisions (and numerous sub-divisions) including: Disaster Management Technology, Long-term Mitigation and DRR, Forecasting, Early Warning and Dissemination, Preparedness Planning (national and other levels), Training,

46 Workshop on Disaster Management Policy and Practice: Sharing Lessons between Government, Civil Society and Private Sector, 28 September 2006, organized by Institute of Policy Studies of Sri Lanka with Oxfam America, discussions.

Figure 4: Coordination of DM Committees at Different Levels by the DMC and District DM Coordinating Units



Education and Public Awareness, National Emergency Operations, and External and Internal Relations and Media. The DMC has established the following functioning Technical Advisory Committees:

National Level Committees – National Disaster Management Advisory Committee, chaired by the Minister of Disaster Management and Human Rights; Flood Response Committee, chaired by the Ministry Secretary; and the National Emergency Operations Committee, chaired by the Director General of the DMC.

Disaster Safety Day Committees – Committee on National Disaster Safety Day, chaired by the Ministry Secretary; and Committee on National Disaster Safety Day at DMC level, chaired by the Director of Training, Education and Public Awareness of DMC.

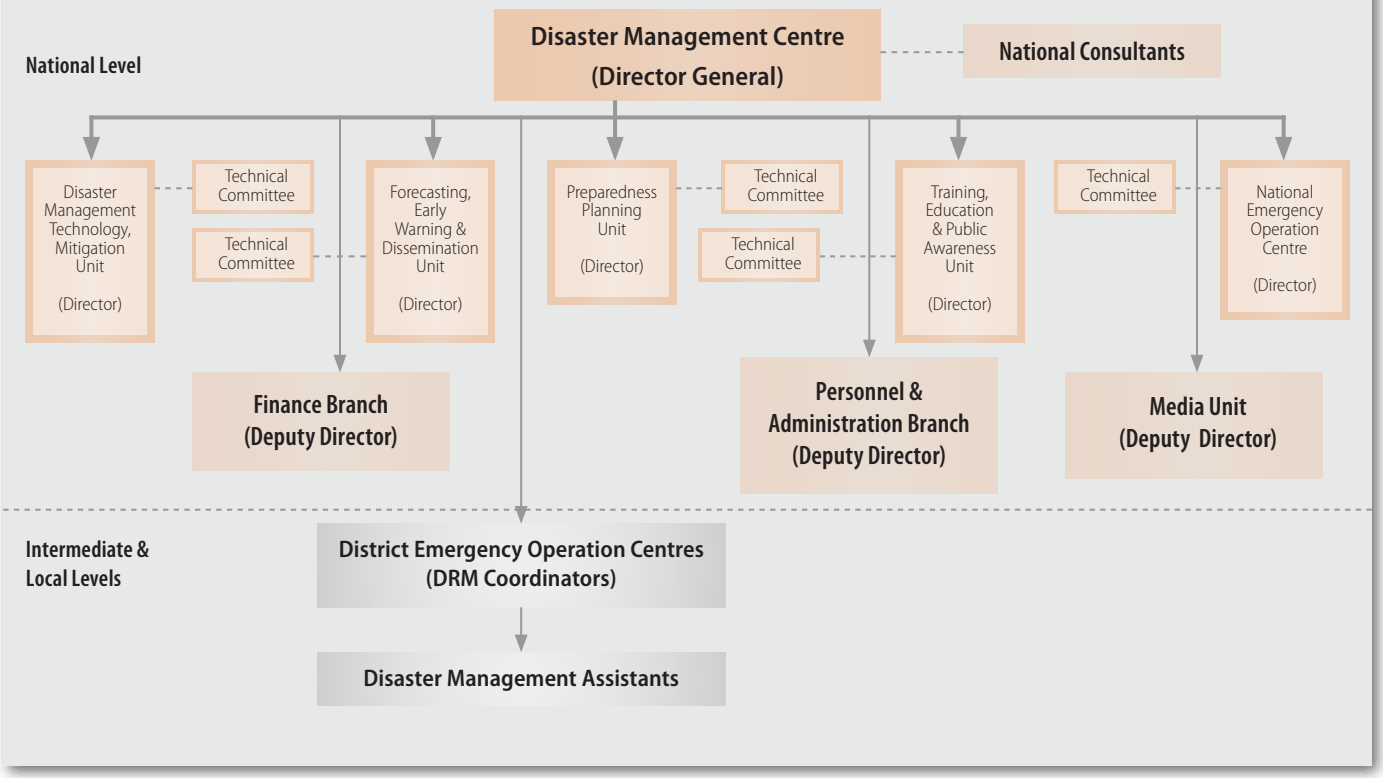
Other Committees – Building Guidelines Committee; Hazard Mapping Committee; and Colombo Flood Committee.

The DMC has made significant accomplishments in its short lifespan, given the need to establish its administrative structure and relationships. Under the Preparatory Assistance Project, the DMC receives technical support from UNDP, and funds for capacity development activities through the UNDP Bureau for Crisis Prevention and Recovery and the Swedish International Development Cooperation Agency. The implementation of these projects is supported by the United Nations Volunteer Programme starting in April 2006.

Notably, the DMC has achieved success in reaching the provinces and districts through, among others, deploying hundreds of previously trained resource people to at least nine districts to conduct awareness programmes and community-based DRR activities, which included work on evacuation plans and drills in villages, and formation of village volunteer groups. Considerable progress has been made in development of disaster preparedness and response plans (district and divisional) in the districts of Kalutara, Galle, Matara, Hambatota, Ratnapura, Ampara and Batticaloa.

The DMC is well regarded by national and international actors who are generally pleased with its progress and show understanding regarding its current constraints. Importantly, most other key institutions in EWS recognize the coordinating role of the DMC. The DMC holds regular meetings for all stakeholders and special meetings in technical sectors. However, the DMC requires stronger and more proactive cooperation and information sharing with donors, NGOs and other members of civil society. Towards this end, it has already started a newsletter and has made

Figure 5: Organizational Structure of the Disaster Management Centre



improvements to its website that includes up-to-date listings of events, such as workshops.

Possibly the greatest challenge facing the DMC is staffing. The DMC staff members and advisors, while highly qualified, have been over-extenuated, and the institution has been understaffed in all of its components since its establishment. It has received considerable capacity development support from UNDP, in terms of human and programme resources support, but the vast extent of activities and geographic areas that need to be covered has overwhelmed the staff of both organizations. The strategic hiring of 17 more employees is expected to relieve the pressure and promote a sustained and realistic effort to achieve the planned goals. The DMC also receives support from other donors (such as France and Japan) and is slated to receive a substantial budget from government resources. The constraint is therefore not the lack of support but finding ways to properly utilize it.

UNDP has supported hiring of approximately 30 UNDP staff members, who are positioned in the districts to collaborate with the DMC District Coordinators on planning. This is a good investment since the districts and divisions have a functional system in terms of securing funding during disasters.

The functioning of the DMC needs to be examined in light of contributions from other organizations, which will add to the success of the National Plan and enhance DMC's position as the focal point for coordination of EWS. The driving force in the Early Warning Unit is the DOM. However a strong DMC effort will be needed to coordinate the other actors in the EWS for the multi-hazard approach and to mainstream EWS into other DMC components. The DMC relies on other institutions for mapping and assessments, as well as for technical expertise. The EWS should not be seen as a late add-on to the DRR efforts but rather as a critical part of DRR planning and promotion. As such it requires a master schema to indicate to all involved actors how the different pieces will form a unified EWS and who is responsible for each single component. Such a schema should reflect the views and capacities of all of the actors that are expected to act on it.

The **DOM** has almost 60 years of long standing relations with the public. The DOM has been active in the development of the EWS since the tsunami disaster, heading the Interim Committee on Early Warning that focused on tsunami warning, and coordinating the development of the "Tsunami and Multi-Hazard Early Warning System" chapter of the Road Map Volume II. The DOM was moved to the Ministry of Disaster Management and Human Rights and is the key actor in the DMC's Early Warning Unit. The DOM has built its capacity in recent years. It operates 24/7 and much of the weather data collection that will serve the multi-hazard system originates with the DOM. The DOM is a key actor in collaborating with the Intergovernmental Oceanographic Commission (IOC) and projects for tsunami early warning.

4.2.2 Partners for EWS Outside Government and Administration

Community members constitute the critical audience for early warning and each essentially requires his/her own personal and family plans for response to early warning messages. Communities in Sri Lanka are already organized into numerous groupings some of which are being used to develop the EWS; however, most efforts are concentrated at the district/divisional/provincial level. Some assistance actors working with communities foresee a period of two years of efforts before all communities have the capacity to adequately react to warning messages and protect their lives and livelihoods. Some believe that there might be panic and chaos in a major disaster. The combined and synchronized efforts of all actors is therefore critical for supporting communities with the appropriate breadth and depth of preparedness activities and for warning them in a timely and effective manner.

An estimated 2–3 million[47] of people in Sri Lanka are living outside of communications loops or may lack the resources to prepare themselves adequately. People outside the system may include those who do not own land and/or are not accounted for in official censuses, therefore the numbers are likely to be underestimated. Community members may lack basic information on local hazards and disaster preparedness, especially in rural areas. Localized flood and landslide disasters in January 2007 indicate that communities need more capacity to prevent death and destruction. Interviewees noted the following needs for building EWS community capacity:

- More collective work at the community level
- Increase focus on preventing effects of slow onset disasters. Before the tsunami, few communities received livelihood support, for example, during drought
- Conduct comprehensive vulnerability studies with regard to DRR and EWS
- Create a comprehensive map or list that would indicate coverage of vulnerable areas and groups of people with EWS

Private sector collaboration on EWS is improving. The tourist industry serves over 600,000 tourists per year and some measures have been taken by hotel owners after the tsunami (supported by the Ministry of Tourism and the Tourist Police) to improve tourist safety and encourage tourist confidence. Insurance company representatives are becoming active in attending DRR workshops. However, only 1.7 percent of

47 TVE Asia Pacific, LIRNEasia.

Sri Lankans own insurance.[48] The RADA is engaging with companies to insure tsunami recovery housing in some areas. Private sector partnerships are cultivated by UNDP to support tsunami recovery projects; one such effort will provide mobile phones to community-based organizations (CBOs).

The **media** in Sri Lanka has the potential to provide substantial support for EWS. Radio is received by about 90 percent of the population, coverage for TV amounts to about 70 percent, and mobile phone coverage is also about 70 percent. The national radio station, Radio Ceylon, is not only the oldest-running radio station in Asia (established in 1923) but also one of the most popular stations with programming in four languages that reaches neighbouring countries. Since the 1980s, a large number of private radio stations have gained commercial popularity and success. There are numerous private television networks, global television networks, and cable and satellite television is gaining popularity with Sri Lanka's middle-class. Popular publications are produced daily in three languages. The media performed fairly well after the tsunami in terms of disseminating DRR information – these gains could be consolidated, and efforts to build capacity of the media should include local media as well as larger media organizations.

Sri Lanka has an extensive network of **international and national NGOs**. Many NGOs came to the country or expanded their in-country programmes in response to the tsunami disaster, and NGO resources are still focused in the tsunami affected areas. It is estimated that over 2,000 NGOs operated in response to the tsunami disaster but only a small fraction of newly established NGOs completed a registration process. Registration is now being handled by the DMC and some districts have appointed staff to coordinate NGOs. Due to a quasi-legal status, some NGO programmes may be put at risk and those that are unregistered cannot receive funding from UN organizations, although most are still able to carry out their programmes.[49]

The Consortium for Humanitarian Agencies faces issues in the conflict area where respect for humanitarian law may be compromised and NGO efforts hampered by tensions,[50] potentially leaving communities more vulnerable to disasters. Additionally, some NGOs are seen as controversial and their contributions to the EWS may be marginalized as a result. These two problems, if not productively and transparently addressed, may affect linkages between NGOs and government thereby limiting sustainability, efficiency and coverage of efforts to improve early warning.

Some organizations active in DRR include the following:

The **Sri Lanka Red Cross Society** (SLRCS) is supporting early warning dissemination to communities through its 26 branches and volunteer network. Approximately 60 percent of the SLRCS budget is devoted to risk reduction, which has been partially dedicated to training Red Cross staff as trainers for disaster management and conducting Vulnerability and Capacity Analysis at the community level. The SLRCS supports a course to form a National Response Team, which may reduce the need to call in external expertise in handling larger disaster response operations.

Practical Action, formerly the Intermediate Technology Development Group, has compiled data on community-based systems in Sri Lanka and is working in 31 divisions. Its practical technological solutions include rain water harvesting in drought prone areas that have strengthened local capacity for mitigation. Practical Action operates internationally and regionally and published a *South Asia Disaster Report 2005*.

LIRNEasia and Sarvodaya. These organizations are working to test various information and communications technologies (ICTs) for disaster warning dissemination. LIRNEasia, a regional ICT policy and regulation capacity-building organization, has a disaster warning and ICT programme, and Sarvodaya, has established Community Disaster Management Centres in its target villages.

4.2.3 UN, Donors and Regional Partners

The UNDP Country Programme for Sri Lanka (2008–2012) has been developed in alignment with the priorities of the Sri Lanka UN Development Assistance Framework (UNDAF, 2006–2016). Achieving peace, as well the achievement of the MDGs and democratic governance, are at the centre of both UNDP and UNDAF development efforts. Disaster risk management is one area of focus for UNDP that emphasizes the development of DRR capacity, the establishment of EOCs and the nationwide EWS. The UN Country Team has not yet formed a UN Disaster Management Team or developed an integrated multi-agency DRR plan in Sri Lanka. This effort is expected to be led by UNDP.

The UNDP has been providing assistance to good governance and institutional development as a basis for disaster risk management for more than 20 years in Sri Lanka. Based on recommendations from a global review conducted in 2004[51] of its history of DRR activities, UNDP is mainstreaming DRR among its own staff and other UN staff.[52] The study

48 Ceylinco Insurance Company.

49 IFRC, "Legal issues in the international response to the tsunami in Sri Lanka," An International Disaster Response Laws, Rules and Principles (IDRL) Programme Case Study, June 2006.

50 In August 2006, 17 Action Contre la Faim workers were killed.

51 A Global Review: UNDP Support for Institutional and Legislative Systems for Disaster Risk Management, Executive Summary, 2004; See also the introduction to this series of UNDP ILS EWS reports listing the specific objectives of DRR that reflect principles of good governance.

52 UNDP Regional Disaster Risk Reduction Workshop, Bangkok, June 2006.

found that mitigation and preparedness often enjoyed a low priority for UNDP and its partner governments, and that risk reduction was not recognized as intrinsic to the success and sustainability of development programmes in high risk countries. It is hoped that UNDP staff and staff of other UN organizations in Sri Lanka will incorporate DRR including early warning concepts into their own work plans, providing a role model for government, and build on the strengths of government and community support groups already formed in the country. The engagement of UN Volunteers has already helped considerably to bolster national disaster management, including response to the 2003 floods and in subsequent DRR planning and capacity development.

Regional programmes such as USAID's IOTWS, IOC/UNESCO, UNDP's Regional Programme for Capacity Building and the support from UN/ISDR, German Technical Cooperation Agency (GTZ), ADPC and the Asian Disaster Reduction Center, among others, for EWS and DRR have helped to promote progress through coaching and skill transfer, and generating outputs such as action plans, assessments, guidelines and manuals. These activities have served to clarify government roles and capacity needs, and build community preparedness.

Donors, regional actors and NGOs, while not usually working at cross purposes, often pursue similar objectives independently, limiting the potential impact of funds invested. There are a number of closely related initiatives regarding the EWS, including this UNDP study that was coordinated with a parallel IOTWS report,[53] both part of regional efforts. An ongoing study by the Japan International Cooperation Agency pursues the interrelated objectives of formulating integrated flood management plans and early warning and evacuation systems, as well as supporting community-based disaster management activities. A well publicized master plan is needed to illustrate how each of these initiatives contributes to the overall EWS development in Sri Lanka.

4.3 Assessment of Institutional Capacities

Considerable work has been done by UNDP and other organizations to extract lessons from the 2003 flood response and the 2004–2005 tsunami response. The tsunami response operation in Sri Lanka was evaluated by many large organizations and the Tsunami Evaluation Coalition. Back in 2004, UNDP had produced dedicated reports reviewing disaster risk management in Sri Lanka.[54] A number of additional assessments and studies on institutional capacity have been carried out after the tsunami. These include:

- IOC/UNESCO's multi-country assessment, including Sri Lanka, of the preparedness, assessment and warning capacity for tsunamis in 2005.
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) assessment of socio-economic impacts of hydro-meteorological hazards in South-East Asia, including Sri Lanka in 2005.
- UNDP and ADPC, *Assessment of Early Warning Systems in Sri Lanka*, 2005.
- United Nations University with the University of Colombo, *Measuring Revealed Vulnerability in Sri Lanka at the Local Level* (studies of tsunami response in Galle and Batticaloa), 2006.
- Institute of Policy Studies in Sri Lanka, *Review of Disaster Management*, 2006.

Summary of Main Points

1. The passage of the Disaster Management Act No. 13 of 2005 supports the development of the DMC. The NCDM acts as an inter-ministerial oversight body but is not yet functioning as stipulated in the Act.
2. The NDMP elaborates the Act including the establishment of an Early Warning Unit in the DMC but lacks a stronger vision that would tie early warning more effectively with other components of risk management such as preparedness, mitigation and prevention. The National Policy that sets out guidelines for EWS has not been approved yet by Parliament.
3. The *Road Map for Disaster Risk Management, Volumes I and II*, includes suggested projects to support "Tsunami and Multi-hazard Early Warning Systems." The Road Map has not been able to attract appropriate levels of funding, thus gaps identified in early 2006 are not fully addressed.
4. There is progress toward decentralization but administration is still oriented towards the centre and consists of several, sometimes overlapping layers. Provincial Councils do not yet perform effectively. The centre needs to focus on its coordination role, and more trust and authority needs to be transferred to districts and provinces along with official SOP. Progress has been made in developing district disaster management plans and committees. The DMC and UNDP have positioned 30 staff in the districts to support DMC District Coordinators.
5. An undercurrent of ambiguity over roles, authorities and how coordinated multi-hazard EWS will be achieved remains among national actors. This is partly due to time needed for the DMC to develop authority, and a lack of

53 USAID IOTWS, Review of Policies and Institutional Capacity for Early Warning and Disaster Management in Sri Lanka (Draft), January 2007.

54 A Global Review: UNDP Support for Institutional and Legislative Systems for Disaster Risk Management – Sri Lanka Report; Local Level Risk Management in Sri Lanka.

strong linkages among actors responsible for various components of warning.

6. Numerous actors and ministries in the Sri Lanka EWS indicate need for tight coordination. The DMC is improving its coordination function through more frequent meetings and communications. The Early Warning Unit is not fully functional and warnings are mainly managed by the DOM; a clear agreement and schema of the multi-hazard system would be useful.
7. Approximately 10 percent of the population may be living outside communications loops; community capacity to respond to prevent disaster could be years away. More collective community work is needed, underpinned with vulnerability studies and mapping, and more attention given to slow onset disasters.
8. Private sector collaboration on EWS is improving through the tourist and insurance industries. The media potential, both national and local, could be tapped more effectively.
9. The NGO network has extensive resources that can support EWS and help to reduce risk, but experiences some problems of its own related to registration issues, lack of respect for humanitarian law, and the marginalization of some groups who are controversial.
10. UNDP and UNDAF strategies focus on attainment of peace; UNDP is committed to supporting DRR in Sri Lanka, however the UN Country Team has not yet formed its own integrated DRR plan. International and regional organizations have contributed to the EWS but there is some overlap of activities, signaling a need for more coordination and cooperation.
11. Considerable work has been done in Sri Lanka to amass lessons learned and assess capacity.

Recommendations for Stakeholders[55]

- Establish a strategy to secure passage of the National Disaster Management Policy, resolving issues that are currently preventing its approval, so that development of the EWS is more completely secured as a national priority.
- Integrate the concepts and activities of early warning (including an explanation of the system and its significance for disaster mitigation/prevention) into the National Plan and ensure that provincial and district plans do the same.
- Continue to support the DMC and elevate the development of the Early Warning Unit to a higher priority.
- Develop a master plan and schema for the end-to-end multi-hazard EWS together with the identification of all actors and their roles as well as how funded projects contribute.
- Publicize the activities of the Early Warning Unit and the schema on the DMC website that is updated regularly and accessible to the public.
- Highlight the Road Map as a useful consultative assessment and capacity development tool for coverage of DRR and EWS needs by:
  - Vetting the contents with stakeholders as a means of communicating its ideas and updating it, and explaining its relationship to laws, plans and policies (possibly done by dedicating a chapter in the NDMP)
  - Prioritizing projects by their potential impact on preventing disasters
  - Maintaining a public website to track issues and progress that government, donors and NGOs and the public can access
  - Improving efficiency of resource allocation by tracking funding for the proposed projects or parts of the projects, the organizations involved in these projects, and their progress; as well as by identifying remaining gaps. The information should be made available on a website
  - Strengthening the EWS chapter in the Road Map by including a schema that illustrates the flow of warning information to and from communities, and identifying gaps to be covered.
- Ensure feedback into the EWS development process by conducting studies of EWS in the communities and evaluations of EWS activities, and programming follow-up on these and related workshop outputs.

55 These recommendations are a synthesis of those made by interviewees in the UNDP ILS EWS process as well as those mentioned in documents.

5 Risk Knowledge

The 2004 tsunami drew global attention to vulnerability in the coastal areas and has resulted in heightened disaster risk awareness. The organizations responsible for DRR in Sri Lanka have put considerable efforts into strengthening risk knowledge and disseminating this information through training and education. However, the degree of sharing, integration and dissemination of data analysis and its application to EWS at the community level, countrywide and in the region is unclear.

Major issues identified in risk knowledge for EWS include the following:

- National capacity requires strengthening for the systematic collection, sharing and assessment of hazard and vulnerability data, and standardization with regional neighbours.
- It is unclear how much information is available on social, economic and environmental factors that increase vulnerability, and whether vulnerability mapping is taking place with community participation to identify groups that may lack effective connections to the EWS such as rural poor, urban poor, IDPs, ethnic minorities, handicapped persons, elderly, children, and foreigners such as tourists.
- It is unclear whether training and awareness raising efforts are reaching all of the vulnerable population and how much duplication exists. Practical applications of the risk knowledge base require strengthening. Enforcement of zoning and construction laws, regulations and guidelines is weak especially in rural areas.

Chapter 6 of the draft NDMP sets out the institutional roles and responsibilities regarding hazard, vulnerability and risk assessment. The plan contains tables that note the institutions responsible by hazard and type of information, and mentions issues and possible solutions for hazard mapping and integration of the data.

5.1 Assessment of Risks and Vulnerability

Many organizations have carried out long-term assessments of risks and vulnerability in Sri Lanka. Hazard and risk mapping is proceeding through various methods supported by different actors with some examples of integrated risk mapping. The ability of current mapping programmes to help in early warning has yet to reach its potential, particularly at the community level. The DMC is tasked with coordination of the various hazard mapping activities, preparing integrated maps and undertaking the mapping itself if there is no responsible agency. Some issues identified in hazard zonation mapping are:

- The need for a centre for multi-hazard and risk mapping, which has been proposed to reside within the DMC
- Outdated contour maps do not reflect the altered landscapes
- A central location is needed for all base maps
- Urgent need for flood mapping and appointment of a flood mapping committee to address this significant exercise

Examples of risk mapping efforts include the following:

The **NBRO** and its Landslide Hazard Mapping Project undertook landslide mapping from 1991–96 to create a complete set of landslide hazard maps at a scale of 1:10,000 for the districts of Badulla and Nuwara Eliya. Goals included the assessment of the socio-economic impact of landslides, the incorporation of risks into land use planning and the creation of public awareness. This project was largely successful although the maps were not widely used due to lack of awareness of the potential users and lack of regulations imposing their mandatory use in land management and planning.[56] This project established a database and a manual and was extended in 1997–2004 to include Ratnapura, Kegalle, Kandy and Matale. Mapping of Matara, Galle and Hambantota is underway. The maps have been incorporated into the Nation Physical Planning Department's fragile areas guidelines and in the Ministry of Agriculture's draft land use policy.

The **CHPB** managed the Sri Lanka Urban Multi-Hazard Disaster Mitigation Project (SLUMDMP), involving NBRO and UDA as well as the regional ADPC. The project produced digitally integrated multi-hazard maps in three selected localities combining flood mapping, landslide hazard mapping, and disturbance from gem mining overlaid on human settlement and infrastructure maps. An Environmental Map Workbook

56 Geethi Karunaratne, *Sri Lankan experience in Natural Disaster Mitigation*, 2001.

was developed for the purpose of revising the land use plan and contains a database for the targeted areas.

The **DMC's District Management Coordination Units** are using Participatory Rural Appraisal tools for preparing community level risk maps. The maps show evacuation routes, safe areas and temporary shelter sites. This exercise had been positive, starting with training in 2006 that the communities have continued to replicate and build upon.

The **Urban Development Authority** undertakes flood hazard zonation mapping with information provided by the Irrigation Department.

The **National Hydrographic Department** prepares maps of the maritime zones as well as fishing zones for the Ministry of Fisheries.

The **International Research Institute for Climate and Society (IRI)** of Columbia University and the **Foundation for Environment, Climate and Technology Sri Lanka**, developed a mapping collection in high resolution to study the relevance of the global disaster 'hotspots' at local level, and develop methodologies on the use of climate information in disaster management. This project produced maps on climate, drought, landslides and cyclones.

The **UN University's** Environmental and Sustainable Development Programme carried out post-tsunami mapping in Trincomalee, Galle and Hambantota.

The Department of Soil Science, **University of Peradeniya**, is carrying out soil mapping, important for sustainable land management.

Vulnerability mapping and studies are expanding in Sri Lanka; however, the quality of the studies depends on the data quality. Ideally, vulnerability mapping includes social, economic and environmental factors, as well as the perceived risks and concerns of the community and their coping strategies. Some of this information must be collected in a participatory fashion in order to integrate perceptions and traditional knowledge into EWS, promote household level planning and ensure ownership of the system at the local level.

To find the most effective means of providing assistance, organizations need to collect and share information regarding coping strategies, strengths and weaknesses, and identify vulnerable people that require extra protection by society. In addition, different hazard-types and associated vulnerabilities generally require different approaches to mitigation.[57] The **SLRCS** is developing its abilities to conduct hazard, vulnerability and capacity assessments. The World Food Programme conducted vulnerability assessment and mapping (VAM) in Sri Lanka in early 2000s, noting food security issues, and is now mapping the Galle area as well as areas subject to the civil war.

5.1.1 Database Development

There are numerous data collection methodologies used for historical analyses and prediction. An overview of various national, regional and global data collection, storage and analysis methods was presented in a workshop in 2006,[58] including the Centre for Research on the Epidemiology of Disasters (CRED) and the Global Unique Disaster Identifier Number Initiative. The discussion revealed the wide range of tools used in the region.

In addition to the databases created by NBRO and through the SLUMDMP, described above, other multi-hazard DRR databases are held or are being developed by the National Disaster Relief Services Centre, DMC, and National Physical Planning Department. Numerous tsunami-related databases include those developed by RADA, Department of Census, Centre for Policy Analysis, and many universities.

The Sri Lanka Disaster Resource Network is under development to conveniently access and locate available resources for disaster response and contact information. UNICEF with the Department of Census and Statistics promotes the DevInfo database to capture information on schools and hospitals on GIS maps. Other databases are maintained by the Sahana Foundation, which documents information on the situation after a disaster such as relief assistance, temporary camps and missing people. The Humanitarian Information Centre (HIC) for Sri Lanka keeps an extensive database of geographic and thematic maps, including assessment reports, which can be searched by district and by sector. The HIC also has a database of organizations working in Sri Lanka using the basic categories of 'who, what and where' to enable coordination.

5.1.2 DesInventar Methodology

Experience with the DesInventar tool is growing across the region and a UNDP consultant has worked with the DMC to utilize the DesInventar methodology. The DesInventar historical database supports collection of homogeneous data on disasters of all scales, with the information being compiled, processed and referenced to a relatively small geographic unit. There is a need to compile data on recurring small disasters to assess their accumulated impact, which, in some cases, can be of the same magnitude or even exceed

57 Review of Disaster Management Policy and Practice, undertaken by the Institute of Policy Studies in Sri Lanka with Oxfam America, 2006.

58 Workshop to Improve the Compilation of Reliable Data on Disaster Occurrence and Impact, 2–4 April 2006, jointly organized by CRED and UNDP Bangkok. The workshop was an important step in the preparation of a Global Risk Identification Program (GRIP).

that of single large disasters. DesInventar methodological aspects highlight the dependent relationship between small and large disasters in so far as small disasters can indicate where large disasters will occur. Data validation has been completed for nine districts (with work on the remaining 13 districts underway), and district staff has been trained on data entry. Data will be entered using reporting formats included in district and divisional preparedness and response plans.

5.1.3 Database Development Issues

Problems identified with database development in Sri Lanka include: lack of coordination and sharing, duplication of data, political bias and exaggerated data, poor policy direction for use of data, and no common scales and criteria for mapping and data collection.[59] It is thought that the real value of reliable data is not recognized by all actors in Sri Lanka and this weakness has hindered growth. The Road Map (Component 2) identified extensive needs for mapping, modelling and database development to strengthen risk assessment. However, the Road Map does not make strong connections between the collection of data on risks, the prioritization of communities with respect to their vulnerability and the transfer of this knowledge to communities for practical purposes. The following gaps have been identified:

- Landslide zonation maps with increased detail/scale
- Establishment of a GIS-based information system at the DMC
- Flood simulation models and hazard maps
- Coastal vulnerability and tsunami zonation maps indicating physical and socio-economic characteristics
- Drought-prone area maps indicating micro-climates and drought vulnerability
- Dam break flood inundation maps
- Guidelines for local government area mapping
- A compilation of maps related to human settlements (Vulnerability Atlas)
- Zoning maps for areas prone to cyclones and storm surges
- Seismic zonation maps
- Integrated epidemic risk map
- Database for transportation and industrial accidents
- Database on terrorism and human-made disasters

59 P. K. S. Mahanama "National and Sub/national experiences with Disaster Loss Data and Database Development: Sri Lankan Experience," presented at the Workshop to Improve the Compilation of Reliable Data on Disaster Occurrence and Impact, April 2006, Bangkok.

5.2 Risk Communication and Public Awareness

Legal instruments and institutional changes aimed at the enhancement of risk knowledge, while essential, are not sufficient to effect changes in public behaviour and increase safety. The efficacy of EWS depends on communities' knowledge of their vulnerability and their capacity to engage in public discourse on ways to protect themselves and their livelihoods. The Road Map (Component 7) identifies needs to strengthen public awareness, education and training, and Component 6 identifies needs for community-based DRR. While extremely important, risk communication tends to be perceived as a 'top down' exercise related to 'dissemination' from an authoritative source rather than community driven and based on community identified needs.

Many organizations participate in training, education and capacity development, however, the geographical coverage, depth and breadth of the training is unclear. In a survey conducted by the Institute of Policy Studies in Sri Lanka, households in some tsunami affected areas complained that they were receiving multiple training from many groups and many thought funds could be better used.[60] Among the more successful initiatives was the SLUMDMP project that aimed to change the 'reactive' attitude to a 'proactive' one though public awareness programmes targeting many professions and age groups through schools and universities, as well as working with communities. One advisor to the DMC was a former project director of SLUMDMP so lessons and good practices are being transferred to DMC's ongoing training programme.

The **CHPB** is still active in public awareness in its project areas producing printed and audiovisual materials in local language, social marketing and integrating disaster management in school curricula. The CHPB performs as information hubs on disaster management, and promotes information exchange and dissemination. It has active working partnerships with NBRO, UDA and their district level offices, as well as with local NGOs implementing community-based disaster mitigation activities.

After the tsunami, many **universities** in Sri Lanka established disaster mitigation centres to carry out research and assist with policy development. Some created professional development courses and degree programmes in mitigation. Students have been encouraged to select DRR-related themes for their dissertations. Universities working in disaster mitigation have strengthened their regional and international networks. One example is the International Institute for Infrastructure Renewal and Reconstruction, a consortium between three Sri Lankan and Canadian, German

60 Ibid.

and US universities. It is expected that these initiatives will be highly beneficial for long-term DRR.[61]

The DMC is very active in developing and printing **awareness materials** to support community contingency planning. The DMC printed one million leaflets for the promotion of tsunami awareness in the three major languages. Other materials include leaflets and posters on floods, landslides, cyclones and on the DMC itself. The DMC's Technology and Mitigation Division is focusing on public awareness materials on the prevention of avian flu and working on legislation to minimize flood damage in Colombo due to debris in the canals. The Division is linking up with other government institutions to compensate for lack of capacity at the DMC, for instance, the UDA to assist with GIS mapping.

The DMC has promoted a National Safety Day, which took place on the first anniversary of the tsunami in December 2006. In October, a public awareness campaign was launched as a lead up to the day.

5.2.1 Communicating Risks in Schools

A number of various initiatives implemented by the DMC, DOM and several NGOs focus on schools in the tsunami affected area but activities are expanding to other areas and hazards. The Ministry of Education has incorporated disaster mitigation in school curricula with support from GTZ. The NSF's plan for awareness campaigns includes development of human and material resources and identification of a strategy and nationwide programme to reach the grass roots. However, progress has overall been limited.

5.2.2 Promoting Sustainable Tourism

The Phuket Action Plan is a multi-country strategy developed to help tourism recover in the tsunami affected countries. Part of the strategy is to incorporate DRR and environmentally friendly practices into businesses serving tourists, ultimately resulting in sustainable tourism. Another initiative is the Sustainable Coastal Tourism in Asia Program funded by USAID and associated with the IOTWS Coastal Community Resilience Project that aims to build government capacity to manage tourism. For example, the Hikkaduwa area has exceeded the carrying capacity for tourist use of beaches while other potential areas remain underutilized. Tourism is a large contributor to Sri Lanka's GDP and was on the upsurge in the cease fire period; however, unfortunately, the resurgence of violence may continue to negatively impact tourism.

5.2.3 Addressing Conflict-related Risk Knowledge Issues

Various actors are undertaking initiatives to address the causes of conflict and to help IDPs return to their homes. The USAID Office of Transition Initiatives works with Internews Network to manage a regional radio station to bolster dissemination of accurate, balanced information. The Sri Lankan Diaspora, who are important stakeholders in the peace and tsunami recovery and development processes, have access to information on these programmes through the Internet. USAID organized a kite festival for "Peace and Recovery" in March 2007 that attracted 2,000 people in Trincomalee District, a multi-ethnic area affected by both conflict and the tsunami.

5.3 Utilization of Risk Knowledge for Codes and Regulations

A glance at the map of Sri Lanka reveals its extreme vulnerability to coastal threats such as cyclones, storm surges and tsunamis. The coastal road, a legacy of the colonial era, was not built with the safety of citizens in mind but is positioned close to the shore linking coastal towns. While this is not unusual along coastlines globally, Sri Lanka does not have many alternative road systems that could be used for evacuation. High population density – the smallest administrative units sometimes exceed one million people – makes this situation all the more precarious. For EWS to work, particularly response to warning, people need to have family plans for evacuation and be able to locate family members or feel assured that they will be safe. Otherwise, chaos will reign while people use their cars, clogging the roadways to search for family members and evacuate from the coastal area. The National Physical Planning Department takes a long-term perspective on DRR and has plans for a southern expressway with eight or nine interlinks.

The National Physical Planning Department has prepared a National Physical Structure Plan that aims to entice people to move inland but this plan was neither approved by the Inter-ministerial Coordination Committee nor the UN. The plan would require an investment in infrastructure to support the population with water and other services, which would be costly. What seems certain is that some Sri Lankans will wish to move to safer areas once they understand their own vulnerability. A future planning vision is needed to ensure such movements can be managed coherently and sustainably. For example, after the tsunami, people moved in droves to Colombo, which has increased the vulnerability of the city. Ultimately, a good plan would move most people out of harm's way. Those who fish for a living and would stay in coastal areas would be relatively few and could be included in community preparedness and training efforts.

61 A. K. W. Jayawardane, *Disaster Mitigation Initiatives in Sri Lanka*, 2006, page 7.

Box 3: Disaster Risk Reduction and Rebuilding in the Tsunami Affected Areas

In the wake of the tsunami disaster, more than 90,000 families needed houses. Approximately 10,000 families were land squatters, renters and multi-families and did not fit the criteria for receiving new houses, but ultimately most were included. No new zoning and building regulations were established after the tsunami; instead assistance organizations were advised on the application of existing rules and regulations.[62] The Coast Conservation Act of 1981 set the stage for the Coastal Zone Management Plan prepared in 1990 and designated the protected coastal area 'buffer zone' to be within 300 metres of the shoreline. Before allowing reconstruction the government reduced the setback to 200 metres in the north and east, and to 100 metres elsewhere. Fishing villages and the tourist industry exerted considerable pressures, which eventually led to the establishment of a 'reservation zone' of 25–30 metres; if people build inside these parameters, they are not likely to receive funding assistance.

Permits were required from the Coastal Conservation Department for building and local authorities were required to inspect building sites and building designs. The 'codes of practice' for building construction were developed for high winds and cyclone but not for tsunamis. The houses were to be built using design specifications developed by the Urban Housing Authority; however, building programmes by numerous donors resulted in variations. In absence of uniform disaster-resistant housing designs, the buffer zone was the de facto key mitigation measure against tsunamis. The concept of the buffer zones, while having intrinsic merit, would have benefited from a transparent process that clarifies the rationale for protection of the coast and coastal residents, while addressing the concerns of the coastal population. Approaches that utilize both regulations and community-based incentives have been shown to be more effective than relying on legislation alone.[63]

Some mitigation measures were undertaken to protect relocated home owners from risks in the new sites that they were unfamiliar with. UN Habitat took a community approach towards DRR training and carried out an extensive community sensitization process to orient people to their new communities and discuss disaster mitigation needs. The RADA promoted an insurance plan on coverage of homes for two years paid by donors. This plan aimed to share the risk among government, donors and beneficiaries; however, it is not known how many people will be able to continue paying the insurance fees after the two year period. The dearth of 'built-in' protective construction measures for tsunami affected people and businesses highlights the need for an effective EWS to enable communities to evacuate vulnerable areas.

5.3.1 Land Use Planning and Human Settlement Development

There are numerous existing Ordinances, Acts and Laws related to land use planning and human settlements that have a bearing on DRR, however, they are not unified under comprehensive policies.[64] Two important pieces of legislation, the Town and Country Planning Ordinance and its amendment do not mention natural hazards and the mitigation of their impacts. By contrast the Urban Development Authority Law mentions environmental standards and schemes including disaster mitigation and control measures. The flood prone areas and forested areas are protected by specific regulations.[65]

It is unclear who is ultimately responsible for enforcing land use and human settlement development laws and regulations and for making relevant decisions at the local level. In addition to the role of line ministries, Municipal Council and Urban Councils as well as the Pradeshiya Sabhas issue acts and ordinances in relation to land use planning and human settlements development. However, planning is still limited, zoning is not complete at the provincial level and enforcement is weak.

62 World Conservation Union, "After the Tsunami: Knowing about Environmental Policies and Legislation," Information Paper No. 9, Series on Best Practice Guidelines for Sri Lanka.

63 Sisira Jayasuirya, Paul Steele and Dunshi Weerakoon "Post-Tsunami Recovery: Issues and Challenges in Sri Lanka," ADB Institute Research Paper Series No. 71, January 2006, page 48.

64 The main Ordinances, Acts and Laws guiding land use planning and human settlements development in relation to disaster management are: Municipal Council Ordinance (Chapter 252) No. 19 of 1987; Urban Councils Ordinance (Chapter 255) No. 18 of 1987; Pradeshiya Sabhas Act No. 15 of 1987; Town & Country Planning Ordinance No. 13 of 1946 (Chapter 269) reprint 1960 and the Amendment by Act No. 49 of 2000 on the creation of the National Physical Planning Department; Urban Development Authority Law No. 41 of 1978.

The main Legal Enactments relating to land use planning and natural disaster management are: Land Development Ordinance (Chapter 464) as amended by Act No. 60 of 1961 and Act No. 16 of 1969; National Environmental Act No. 47 of 1980; Colombo District (Low Lying Areas) Reclamation and Development Board Act No. 15 of 1968, since superseded by the Sri Lanka Land Reclamation and Development Corporation Act No. 52 of 1982; Coast Conservation Act No. 57 of 1981; Draft National Land Use Policy Paper prepared by the Land Use Planning Division of the Ministry of Agriculture and Lands, 1994.

65 Flood Protection Ordinance No. 4 of 1924 and Act No. 22 of 1955; Irrigation Ordinance No. 32 of 1946, Act No. 1 of 1951, Act No. 48 of 1968, and Law No. 37 of 1973; Forest Ordinance No. 16 of 1907 and amendments by Act No. 56 of 1979 and Act No. 13 of 1982.

Special DRR considerations are required when making zoning decisions. For example, due to recurring droughts and their extreme adverse effects in addition to extended dry periods that cause health and nutrition problems, construction in the dry zones should be limited through regulation. People living in the dry zones should be obliged to take precautions such as rain water harvesting (work is underway to install rainwater harvesting tanks in vulnerable areas).

5.3.2 Water Policy and Dam Safety

The GoSL has been implementing a process to establish a national water sector policy, legal and institutional framework. The World Bank helped to trigger the transformation of the previous lead water development agency, the MASL, to a river basin water management agency.[66] The Cabinet of Ministers approved the National Water Policy and the preparation of the Draft National Water Bill in December 2004. However, there have reportedly been many versions of the policy/bill and it remains controversial due to external pressures for privatization of water resources, which are opposed by some politicians.[67]

The Road Map Volume 2 has proposed a monitoring and EWS for Sri Lanka's dam system that is composed of 320 major and medium dams (80 have been categorized as 'large dams'). These dams are operated by the MASL and the Irrigation Department, among others. The dams have an inherently high risk for failures that may lead to potential loss of life and property. Coordination between dam operators is needed for effective reservoir downstream flood monitoring, and management and operation procedures for safe passage of floodgates need to be updated to the current downstream conditions. In addition, an action plan for dam breach situations or opening of gates during intense rainfall is required for each dam. To facilitate rapid evacuation in case of an emergency, there should be continuous dialogue with District Secretaries, Divisional Secretaries, GNs, and local authorities, etc. of downstream areas, regarding necessary contact information.

5.3.3 Environmental Protection

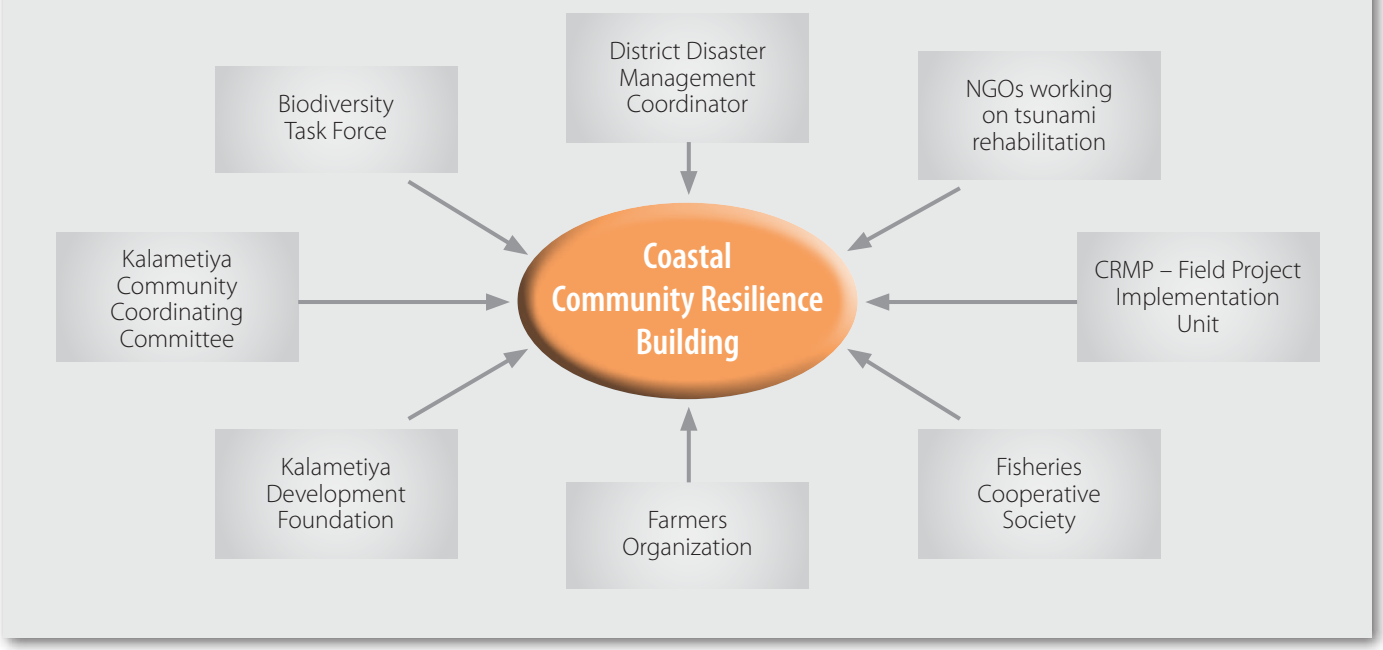
A review of environmental legislation in Sri Lanka, undertaken in 1994, noted the interrelationship between environmental issues and land use planning. A draft National Land Use Policy Paper was prepared for the Ministry of Agriculture and Lands with 10 specific objectives. It elaborated policy on protection, conservation and sustainable use of the land resources of the country, and management of biodiversity. The Ministry of Agriculture is currently working on completing a land use policy.

The Coastal Resources Management Programme has policies protecting coastal resources from human destruction, but none to protect them from natural hazards, such as storms and tsunamis. The Programme will work with the DMC to formulate such policies. Existing Environmental Impact

66 World Bank Project Document, "National Water Management Improvement Project," April 2006.

67 Movement for National Land and Agricultural Reform, *The Authors of Water Policy in Sri Lanka*, November 2006.

Figure 6: Institutional Arrangements for Resilience Building



Assessments do not adequately take disaster hazards into account so procedures to conduct them should be changed.

The USAID IOTWS is implementing a Coastal Community Resilience Initiative to mobilize local preparedness champions, and promote standard guidelines and training tools regionwide (including Sri Lanka) for cities, villages and the tourism industry. The project addresses causes leading to vulnerability such as human-induced changes (i.e. shell mining and destruction of sand dunes and mangrove vegetation) and limited social assets.

5.3.4 Building Codes

Sri Lanka uses the British Codes of Practice and/or reverts to Australian or Indian codes. Anyone wanting to construct a house must submit a building application to obtain approval from a local authority. This procedure does not ensure that buildings are safe, and no building application is required in rural areas outside of the Urban Development Authorities' jurisdiction. While basic safety regulations have not been formalized into Sri Lankan Codes of Practice, a sophisticated building energy efficiency code was established with the aid of the World Bank in 2000. The SLUMDMP project developed *Guidelines for Construction in Disaster Prone Areas*, but it is not known whether organizations applied these to their post-tsunami reconstruction projects. The DMC has appointed a Building Technical Committee to address needs for building codes and code enforcement, and an action plan has been created.

The draft NDMP draws attention to increasing risk of building fires due to rapid development, large multi-storey buildings and low quality materials used to construct dwellings in low income settlements. In addition to setting up appropriate fire response mechanisms, the plan advocates for appointment of a sub-committee to propose recommendations for minimum fire safety requirements in new building approvals.

Summary of Main Points

1. Hazard and risk mapping is conducted by various government actors including the NBRO (landslides), CHPB (integrated), UDA (floods), and DMC (multi-hazard and vulnerability). Other organizations undertaking mapping include IRI (high resolution hazard maps), UN University (post-tsunami), University of Peradeniya (soils), and WFP (VAM).
2. Numerous data collection methodologies are used for historical analyses and prediction, nationally and regionally. Databases on hazards and disasters are held by NBRO, NDMC, DMC, National Physical Planning Department, RADA, Department of Census, Centre for Policy Analysis, HIC and many universities. There are significant problems identified with database development and sharing.
3. Many organizations participate in training, education and capacity development, however, it is unclear to what degree the coverage, depth and breadth of the training is effective in reducing risk. Many universities have established disaster mitigation components.

Box 4: Risk Knowledge and Mitigation in the Road Map

The Road Map (Component 5) identifies extensive needs to use risk knowledge for the mitigation of disaster risk:

1. Landslides – Mitigation measures in 10 districts
2. Floods – Construction of upstream reservoirs
3. Disaster Mitigation Action Plans in local authorities
4. Development of procedure for integration of DRR in the approval process for development projects; mainstreaming DRR
5. Physical planning policy put into place with DRR integrated into plan
6. Integration of DRR into Coastal Zone Management; creation of coastal barrier with trees and vegetation
7. Hazard resistant building codes, revised by-laws for local governments
8. DRR incorporated in planning and construction of housing schemes, industrial estates and tourist hotels, including high voltage and communication towers, new schools and hospitals, chemical storage facilities
9. Minimizing crop failure through drought tolerant agriculture methods, soil rehabilitation, micro-irrigation schemes, improvement in drinking water supplies
10. Improving dam safety through regular monitoring and evaluation
11. Increasing public sector participation in DRR through insurance and incentive schemes
12. Increasing participation of technical and scientific institutions in DRR
13. Reducing health risks due to polluted groundwater in the north-central province

A number of actors are working to communicate risks in schools and DRR has been incorporated in official school curricula.

4. Evacuations from the coasts are likely to be chaotic due to the high population density, close proximity of evacuation routes to the coastline and the lack of alternative roads. The National Physical Planning Department is seeking approval for development plans to encourage people to move away from the vulnerable areas and to increase the road access.
5. There are numerous regulations related to land use planning and human settlements that have a bearing on DRR; however, they are not unified under comprehensive policies. The roles of actors responsible for making decisions and enforcing laws and regulations are unclear, zoning has not been completed at the provincial level and enforcement is weak.
6. Risk knowledge has not been particularly effective in supporting enforcement of codes and regulations. Some post-tsunami housing is located in vulnerable areas due to weak implementation of coastal protection legislation; mitigation and insurance initiatives have been undertaken to raise awareness and protect investments. A draft National Water Bill remains controversial. A land use policy is being prepared by the Ministry of Agriculture and Lands. Sri Lanka does not have its own Code of Practice for building construction but an action plan has been created for UDA jurisdiction.
7. The Road Map (Components 2, 5 and 7) identifies extensive needs for mitigation of disaster risk using risk knowledge.

Recommendations for Stakeholders[68]

- Increase efforts to build capacity for coordination of mapping and database development, database management, sharing of data analysis, and standardization of methodology across the country and in the region. Prioritize Road Map Component 2 projects and modify them to include practical application to EWS for submission to the relevant assistance organizations.
- Promote community-based participatory vulnerability mapping and assessments nationwide using networks of trained volunteers or NGOs to reach groups requiring urgent protection; and include plans for special need groups such as the elderly, handicapped, ill, IDPs, women and children for both warning and evacuation. Base public awareness, education or training on community identified needs.
- Promote the Road Map Components 6 and 7 and modify the projects so that they are more community driven.
- Increase risk knowledge regarding small-scale disasters and their cumulative impact. Modify the mitigation measures so that they are hazard-specific and address anthropogenic causes of 'natural' disasters.
- Strengthen linkages between risk knowledge and its application in terms of housing, building and land use codes, while supporting other needs as mentioned in Road Map Component 5. This effort should include promoting consistency in enforcing laws and regulations, or modifying them to fit the conditions in Sri Lanka.

68 These recommendations are a synthesis of those made by interviewees in the UNDP ILS EWS process as well as those mentioned in documents.

Monitoring and Warning System

6

Sri Lanka has made progress toward strengthening hazard monitoring and warning systems. However, significant work needs to be done to upgrade ICTs in order to improve the quality and lead time of warnings and improve access to real time data. Communication with regional and international monitoring and warning systems also require strengthening.

The Intergovernmental Panel on Climate Change has cautioned that the incidence of extreme hydro-meteorological events such as droughts, cyclones and high rainfall will increase globally, and emphasizes the importance of early warning for hydro-meteorological hazards to protect lives and livelihoods. Among scientists a consensus is also emerging that Sri Lanka may anticipate increasing seismic activities as a result of the fracturing of the tectonic plate, extending from Australia to India, on which it is located. The potential of seismic activity is also increasing in the region and may result in tsunamis that affect Sri Lanka.[69]

Chapter 7 of the draft NDMP sets out responsibilities for the Early Warning Unit of the DMC. These include coordinating early warning information from the institutions responsible for monitoring and disseminating warning messages, as well as initiating awareness on warning among various agencies and the public. The draft plan also lists the technical institutions responsible for forecasting and warning for each hazard.

6.1 Institutional Mechanisms for Monitoring and Warning

A comprehensive analysis of the state of the art of monitoring and forecasting in Sri Lanka was undertaken in 2005 by ADPC and sponsored by UNDP.[70] Some of the findings are summarized here and built upon. The institutions involved in observation, prediction and warning formulation include the DOM, Irrigation Department, GSMB, NARA, Sri Lankan Navy and NBRO.[71]

There are two major overarching issues cited by the draft NDMP: 1) the performance of the responsible institutions is hampered by need for state-of-the-art technology, infrastructure and human resources; and 2) some of the institutions do not have an appropriate legal mandate (with related SOP) to coordinate, monitor or issue technical warnings. In the following we will review performance of all relevant agencies and identify shortcomings.

The **DOM** is the lead institution for tsunami early warning. It also works closely with the Irrigation Department and others on drought and flood warning. The DOM provides forecasts of weather and climate parameters using data from 20 synoptic stations, with daily three-hourly observations of pressure, temperature, humidity, wind, visibility and clouds, transmitted to the National Meteorological Centre in Colombo by telephone. The **National Meteorological Centre** in Colombo operates on a 24/7 basis. Recipients of information are the agriculture, fisheries (for the Fisher Folk Radio Programme), energy, aviation, and shipping sectors, the mass media, and the general public. Weekly rainfall and cumulative rainfall data for the Yala and Maha seasons are sent to the Food and Agricultural Organization (FAO) office in Colombo. Hazards monitored include heavy rainfall events, thunderstorms, tropical cyclones and drought.

The DOM capacity development requirements to improve forecasting include the need to upgrade aging and insufficient observation and data communication facilities and mechanisms. There are an inadequate number of observation stations and the ability to verify forecasts from regional and global sources requires strengthening, such as enhancing data flow with the World Meteorological Organization (WMO). Much communication is still handled manually by post and telephone, and weather stations are generally not automated.

Forecasts of various time scales are available from regional and global climate centres and can be used to predict risk levels of floods, cyclones and landslides a few days in advance, and drought tendencies months in advance. The risk levels of these hazards can be predicted with a degree of confidence so as to be useful for natural resource managers, policy and decision makers. Capabilities to make these forecasts usable for emergency planning, flood management, contingency crop planning and water resource management need to be developed within the DOM.

69 http://www.recoverlanka.net/background/hazards.html.

70 ADPC, *Assessment of Early Warning Systems in Sri Lanka*, September 2005.

71 NDMC and UNDP, *Stocktaking: Disaster Management in Sri Lanka*, Ministry of Women's Empowerment and Social Welfare, April 2005.

The IRI has already undertaken a preliminary downscaling of global climate model seasonal precipitation forecast for Sri Lanka. ADPC partners with IRI in the generation and application of downscaled seasonal climate information in agriculture and water resource management in the region, particularly in Indonesia, Philippines, Sri Lanka and Viet Nam.

Box 5: Forecast Early Warning Applications and Lead Time

- Weather forecast 1–3 days = Securing lives
- Medium range 5–10 days = Emergency planning, early decisions for flood and drought mitigation, preserving livelihoods
- Extended range (sub-seasonal) 2–3 weeks = Planting/ harvesting decisions, storage of water for irrigation, logistics planning for flood management
- Seasonal 1 month and beyond = Long-term agriculture and water management, planning for disaster risk management

6.2 Hazard Forecasting and Warning Systems

Different scientific foundations and technological systems are required for monitoring the major hazards, and some systems have different target populations as discussed below.

6.2.1 Drought Monitoring and Prediction

Drought is a regular occurrence in Sri Lanka but its impact on vulnerable citizens and the economy does not receive the needed attention. However, the DOM, Irrigation Department and DMC among other actors are aware of the need to bring drought to the forefront of DRR discussions and to strengthen drought EWS. Workshops and other activities are now focusing more closely on drought mitigation. The Department of Agriculture (DOA) plays a major role in dissemination of drought warning information.

Drought typically occurs due to failure of the north-east monsoon, or low seasonal rainfall causing water shortages in the south-eastern, north-central, and north-western parts of the country. Droughts in the past 50 years recurred about every 3–4 years, with severe drought episodes almost every 10 years. The incidence of drought in the second half of the 20th century (1950–2000) was much greater than that for the first half (1900–1950). The DOM has noted a significant reduction in the annual average rainfall from 2,005 mm for the period 1931–1960 to 1,861 mm for the period 1961–1990, and an increase in rainfall variability from 12–14 percent in the same period.

Severe droughts impact both agricultural productivity and hydropower generation, which supplies about 70 percent of the country's power needs. Drought conditions affect the Maha crop, a third of which is rain-fed, and the Yala crop that is entirely dependent on irrigation. The Maha crop accounts for about two thirds of the yearly crop production; the remaining third is contributed by the Yala crop. Drought-affected people generally migrate to nearby towns although food is not thought to be a major motivator.[72] Drought is correlated with drinking water shortages, which are underreported and the impact is not fully considered by current drought mitigation planning.

The DOM monitors development of drought conditions using rainfall and El Niño Southern Oscillation (ENSO)[73] data. ENSO is the main driver of climate variability in the tropics and has differing impacts on the seasonal rainfall in the country. The La Niña reduces rainfall during the Maha cropping season by as much as 14 percent, but has a positive impact on rainfall during the Yala cropping season.

Continuing problems with drought prediction have been mentioned at the September 2006 Disaster Risk Communication workshop in Hikkaduwa.[74] Although the DOM can generate seasonal forecasts, the capacity to deliver localized forecasts that meet end user needs (e.g. to guide cropping decisions) is a major constraint. A systematic drought monitoring mechanism has been proposed, including the constitution of a Crop Weather Watch Group headed by the Ministry of Agriculture.

6.2.2 Flood Monitoring and Prediction

Flood monitoring is more standardized than drought monitoring, but floods continue to affect unprepared citizens and wider areas causing excessive damage and loss of life as well as associated disasters such as landslides. The relationships between the major organizations responsible for flood monitoring – the Irrigation Department and DOM – are not always clear in relation to roles in data analysis and warning.

Floods generally occur from excessive monsoonal rainfall. Sri Lanka has two predominant monsoons: the north-east

72 UNDP ILS EWS Interview with Practical Action.

73 The ENSO is warming of surface water off the coast of Central and South America, near Ecuador, Peru and sometimes Chile and has a warm phase (El Nino) and cold phase (La Nina). The ENSO changes the ocean-atmosphere system affecting weather in approximately 75 percent of the earth.

74 National Workshop on Disaster Risk Communication, Hikkaduwa, Sri Lanka, 21–22 September 2006.

monsoon from December to February that affect the eastern, northern, and north-central provinces; and the south-west monsoon from May to September that affect the western, southern, and Sabaragamuwa provinces. Excessive rainfall from the monsoons leads to floods in the floodplains of Kalu Ganga and Kelani Ganga rivers.

The transitions between the monsoons (inter-monsoons) bring convective rains over most parts of the island. Rivers along the western slopes of the hilly central region suffer excessive flows that lead to inundation of the flood plains of Kalu Ganga and Kelani Ganga. Major floods in the Kelani Ganga occur almost every 10 years, while minor floods occur every year. Major floods in the past 50 years occurred in 1957, 1967, 1968, 1978, 1989, 1992 and 2003.

Encroachment of floodplains, conversion of paddy fields that used to hold floodwaters into commercial and residential areas, and inadequate drainage system have contributed to increasing vulnerability to floods. In May 2007, over 120,000 people were affected by flooding in western Sri Lanka, while traffic came to a standstill in Colombo. The principal reason for the flooding was poor drainage resulting from blockage of canals and waterways by garbage and debris.[75]

Flood warning (riverine and dam breach/release of stored water) is the responsibility of the Irrigation Department that has been operating the flood warning system in Colombo for the past 20 years. The system utilizes measurements of river levels, and hourly observations of rainfall and river flow from the Kelani Ganga. Six radio transmitters, located in Hanwella, Kitulgala, Holombuwa, Deraniyagala, Glencourse, and the Head Office in Colombo, are used in river level data transmission. The flood warning system provides 12 hours lead time for Colombo. Out of 123 river basins, 11 have been identified as critically flood-prone. Surveys are now underway to establish flood forecasting systems in five of these critically flood-prone basins.

The May 2003 floods revealed the weaknesses of the flood warning system. The warning system for Kelani Ganga does not provide information of flood levels along the river, and flood warning systems are lacking for the Kalu Ganga (making Ratnapura city highly vulnerable due to a gradient difference between upstream and downstream of Ratnapura) and for other rivers, such as Nilwala, Gin and Mahaweli. Upper basin communities such as Ratnapura have very little time to receive and act on warnings. Upgrading is needed for the flood classification system, dam operation standards and national hydro-meteorological data management system. Flood information needs should be based on assessment of the requirements of various users.

75 IRIN, *Sri Lanka: Over 120,000 affected by severe flooding in west*, 7 May 2007.

6.2.3 Tropical Cyclones

Cyclones and depressions that form in the southern Bay of Bengal from October to December generally affect the eastern and north-eastern parts of Sri Lanka, and occasionally the north-central and north-western parts. Major cyclones experienced in the past 50 years were those in 1964, 1978 and 2000. Poor preparedness, weak institutional capacity for warning and evacuation, and unsafe construction contribute to vulnerability in cyclone prone areas. Sri Lanka is a member of the WHO/UNESCAP regional Typhoon Committee that has been in existence for 39 years and meets annually.

6.2.4 Landslides

Landslides result from sloping geology and excessive rainfall in hilly areas, exacerbated by deforestation and unsustainable land-use practices. Landslide prone areas include Badulla, Nuwara Eliya, Ratnapura, Kalutara, Kandy and Matale districts and the southern province, covering about 20,000 sq km. Severe landslides occurred in January 1986, May–June 1989, and October 1993. In January 2007, flash floods and landslides were triggered by heavy rains in six districts in central and southern areas. Landslide hazard zonation mapping is implemented by the NBRO, however, there is no landslide forecasting and warning system in place.

Since landslides in Sri Lanka are associated with heavy rainfall during the monsoon season, accurate real time hydrological data from the DOM may be used alongside landslide maps, as well as human settlement and infrastructure maps, and land use data, to predict landslides. Landslide warning should also involve the Survey Department, GSMB and Land Use Policy Planning Division, and the Agriculture and Irrigation Departments. The NBRO has proposed a model that includes a geotechnical laboratory and necessary computing, survey and communication facilities.

6.2.5 Tsunamis

Prior to the 26 December 2004 event, the only recorded tsunami in Sri Lanka was due to the Krakatoa eruption in 1883. Since the 2004 tsunami event, under the IOC/UNESCO interim arrangement for tsunami early warning, the DOM receives international tsunami information from the PTWC and Japan Meteorological Agency by fax and e-mail. For tsunami forecasting, Sri Lanka is forging agreements with Thailand and Bangkok-based ADPC, India and Indonesia, which are developing tsunami early warning arrangements in the region, on sharing of tsunami information.

Further work needs to be accomplished to determine the tsunami risks. Capacity to assess risk and predict impacts (inundation modelling) would need to be built within GSMB or any other designated institution. The NARA GIS section conducts investigations (e.g. coral reefs, mangroves, sea grass, etc.) for coastal zone planning. Its activities can

be expanded to cover identification of vulnerable areas for tsunami risk analysis. The agency has also gathered extensive information on ocean and coastal bio-geophysical parameters, socio-economic data of coastal communities, and coastal resources. This information is not yet available in formats that can be easily accessed by planners and practitioners.

The GSMB is currently working on a GIS-based system to layer coastal geology, groundwater resources, and coastal geomorphology data. The National Disaster Relief Services Centre is also planning to develop a GIS-based system on disaster-related information. Hydrographic surveys are undertaken by the National Hydrographic Office (NHO). NHO's technical capabilities, however, were affected when the 2004 tsunami destroyed one of its survey vessels and other equipment.

In 2004, the NARA established a sea level station at Mutwal Fishery Harbour in Colombo (western coast) in collaboration with the University of Hawaii Sea Level Center (UHSLC). The station is a Global Sea Level Observing System Station, set up to monitor short- and long-term sea level changes. After the tsunami event, it was upgraded for more frequent sampling and data transmission to make it usable for tsunami monitoring. Sampling takes place by minute, with data transmission every 15 minutes through WMO's Global Telecommunication System and the Japanese Geostationary Meteorological Satellite. Two more sea level stations, with real time data transmission capabilities, will be established at Kirinda (southern coast) and Trincomalee (eastern coast) with assistance from the Federal Maritime and Hydrographic Agency of Germany and UHSLC. Ironically, sea level data from NARA are available in real time to PTWC and the Japan Meteorological Agency, but not to the interim warning centre at the DOM.

The NSF has capabilities to undertake tsunami risk-related research, but more resources are needed including numerical modelling capabilities for tsunami inundation forecasts. Strengthening the tsunami EWS requires establishment of a web-based GIS for online information sharing and decision-making; integration of databases within the NARA and making them available to relevant agencies in a user-friendly format for decision-making; development/enhancement of NHO capabilities in hydrographic, bathymetric, and post-tsunami surveys; and establishment of numerical modelling capabilities for tsunami inundation forecasting that include software, hardware and trained human resources.

6.2.6 Earthquakes

Sri Lanka has low seismicity, hence seismic monitoring was not given priority until the 2004 tsunami. GSMB's existing network is connected to the Global Seismographic Network that provides near real time data. There is a local network of four seismographs installed at four universities, as well as a micro-seismic monitoring network for reservoir-induced seismicity on the Mahaweli river. No seismological study has ever been conducted for Sri Lanka. The seismic monitoring requires upgrading to a fully operational local network producing real/near-real time data, and the GSMB needs to strengthen its data processing capability (hardware, software and trained personnel).

Box 6: Monitoring and Warning in the Road Map

Many of the recommendations made by ADPC in 2005 were captured in various components of the Road Map. A key recommendation is the establishment of direct links between prediction and warning institutions as critical to achieve the end-to-end multi-hazard system. The Road Map Component 3 "Multi-Hazard Early Warning System" includes largely monitoring and forecasting initiatives:

1. Establishment of the Early Warning Centre of the DMC on DOM premises
2. Institutionalization of interagency arrangements and formalized dissemination arrangements through the SLRCS radio
3. Improved meteorological observation and forecasting – 35 new automatic weather observation stations
4. Improvement of the hydrometric network for enhancing flood monitoring and forecasting capabilities – 25 new stations
5. Improvement in landslide prediction and early warning capabilities through a forecasting system
6. An advanced decision support system to disseminate information on potential droughts to agricultural and associated sectors
7. An effective cyclone tracking and storm surge warning system – arrangements with neighbouring countries
8. Development of a unified seismic monitoring and data processing and archival network
9. Establishment of EWS for major dams – 210 dams
10. Development of an oceanographic monitoring system with real time data for full time monitoring of sea level fluctuations
11. Early warning and response system for nuclear accidents and monitoring of environmental radiation

Summary of Main Points

1. Sri Lanka has made progress toward strengthening hazard monitoring and warning systems. Sri Lanka may anticipate increasing seismic activities as a result of the fracturing of the tectonic plate on which it is located. Chapter 7 of the draft NDMP sets out responsibilities for the Early Warning Unit of the DMC.
2. A comprehensive analysis was undertaken in 2005 by ADPC on monitoring and forecasting. The institutions involved in monitoring and forecasting include the DOM, Irrigation Department, GSMB, NARA, Sri Lankan Navy and NBRO. Some of these agencies require more capacity and not all have legal mandates for issuing technical warnings.
3. The DOM is the lead institution for tsunami early warning and works closely with the Irrigation Department and others on drought and flood warning. The DOM needs to upgrade aging and insufficient observation and data communication facilities and mechanisms.
4. More attention needs to be placed on the impact of drought on vulnerable citizens and the economy. The DOA plays a major role in dissemination of drought warning information but the weak capacity to deliver localized forecasts that meet end user needs (such as crop forecasting and predicting drinking water needs) is a major constraint.
5. Floods continue to cause excessive damage and loss of life as well as landslides. Encroachment of floodplains, conversion of paddy fields and inadequate drainage systems contribute to vulnerability. Upgrading is needed for the flood classification system, dam operation standards and national hydro-meteorological data management system.
6. Cyclones and depressions mostly affect the eastern and north-eastern areas. Poor preparedness, weak institutional capacity for warning and evacuation, and unsafe construction contribute to vulnerability in cyclone prone areas.
7. Landslides result from sloping geology and excessive rainfall in hilly areas, exacerbated by deforestation and unplanned land-use practices. Currently there is no landslide forecasting and warning system in place but the NBRO has proposed a model.
8. For tsunami forecasting, Sri Lanka is forging agreements with regional partners. Further work is needed to determine the tsunami risks and improve software, hardware and trained levels of personnel. Seismic monitoring requires upgrading to a fully operational local network producing real/near-real time data.
9. The Road Map Component 3 "Multi-Hazard Early Warning System" includes many monitoring and forecasting initiatives.

Recommendations for Stakeholders[76]

- Conduct an assessment of the capacity of technical agencies responsible for monitoring and warning, and address gaps and deficiencies in staffing, equipment and legitimate mandates with related SOP to coordinate, monitor and issue warnings.
- Continue to enhance support for the DMC, DOM and the wider network of relevant agencies for development of an integrated forecasting and warning system.
- Support the NBRO's model for landslide forecasting and warning and legitimize it as an authority for mapping and warning.
- Support the Road Map Component 3.

76 These recommendations are a synthesis of those made by interviewees in the UNDP ILS EWS process as well as those mentioned in documents.

7 Dissemination and Communication

This chapter discusses issues in institutional decision-making for warning, the communications and social networks, as well as technical systems used to disseminate the warning and the various warning messages. Dissemination and communication mechanisms must be continuously operational and effective, and tailored to the needs of different user communities. Accepted good practices offer indications of direction for development of dissemination and communication systems:[77]

- Dissemination must be based on clear protocols and procedures and supported by an adequate telecommunications structure.
- Systems for communication with internal and external actors should be based on internationally agreed standards and they should all work smoothly together.
- National warnings must be based on a clear chain of command and involve non-technical social networks, particularly in remote areas, to ensure that all in need receive the message.

Chapter 7 of the draft NDMP focuses on dissemination of early warning messages. Common institutional shortcomings identified in the chapter include inadequate institutional capacity, inadequate ICT systems, and the need for alternative communications systems. Other issues in dissemination and communication consist of the following:

- Procedures require formalization for the release and exchange of information among government staff, with media and civil society, and for coordination of responsibilities in informing the general public.
- Technical ICT systems are not up to international standards for effective exchange of data.
- The confusion over government roles and authorities and inadequate cooperation among information providers reverberates with the media and the public who may be skeptical about the sources of messages and the messages themselves.

77 UN Global Survey of Early Warning Systems, March 2006.

7.1 Institutional Roles in Warning Dissemination and Communication

Prior to the development of the DMC as coordinating body for DRR, a multitude of agencies played various roles in the dissemination of warning messages. The DMC organized a workshop in December 2006 to: 1) identify the exact roles and responsibilities of different stakeholders in multi-hazard EWS; and 2) to reach common consensus on the inter-linkages among stakeholders in dissemination and follow-up. The workshop helped to clarify:

- The sequence of warnings to the public formulated in line with international and technical standards – preliminary early warnings and comprehensive early warning bulletins
- The content of the warnings – short, precise, simple, factual and clear
- Who will formulate and send the messages – the technical agency formulates the preliminary warnings and the DMC formulates the comprehensive bulletin
- The steps required to formulate the messages – the technical agency formulates Part 1 on the nature of the hazard and warning level; the DMC and the technical agency formulates Part 2 describing the likely impact; and the DMC formulates Part 3 outlining the response actions
- The timing of dissemination – Part 1 is disseminated immediately at the national level by the technical agency; and the complete early warning bulletin is disseminated by the DMC at national and local levels
- Need for further definition of alert levels that are in line with international standards, such as for wind speeds and flood level intensity
- Need to examine the Disaster Management Act No. 13 to clarify any overlaps or ambiguity in roles

The system of communication in the country reaches from national level to district level, and then to divisional and local authorities. The communication to the GN level occurs mainly through police stations and fixed telephone lines. Generally various methods are used to reach the people, through alarms, sirens, loudspeakers, beating of drums and public announcements through radio and television.

Table 1: Organizations Responsible for the Formulation and Dissemination of Warning Messages[78]

Type of Hazard	Formulation of Warning Messages	National Level	Local Level
Adverse climatic conditions, cyclones and storm surges, lightning, tornadoes, high winds	• Warning Message Part 1 – DOM • Warning Message Part 2 – DMC, DOA, DOI, MASL, CEB • Warning Message Part 3 – DMC and DOM	• Technical Bulletin – DOM • Disaster Early Warning – DMC	DMC, DDMC, District Secretaries / Divisional Secretaries, GNs, Local Authorities, Village level DM Committees
Floods	• Warning Message Part 1 – DOI • Warning Message Part 2 – DMC, DOI. DOA, MASL, CEB DOM • Warning Message Part 3 – DMC and DOI	• Technical Bulletin – DOI, DOM • Disaster Early Warning – DMC	DMC, DDMC, District Secretaries / Divisional Secretaries, Div. Irrigation Engineers, Police, GNs, Village level DM Committees
Landslides	• Warning Message Part 1 – NBRO • Warning Message Part 2 – DMC, NBRO and DOM • Warning Message Part 3 – DMC and NBRO	• Technical Bulletin – NBRO • Disaster Early Warning – DMC	DMC, DDMC, District Secretaries / Divisional Secretaries, Police, GNs, Village level DM Committees
Epidemics	• Warning Message Part 1 – MOH • Warning Message Part 2 – DMC, MOH • Warning Message Part 3 – DMC, MOH	• Technical Bulletin – MOH • Disaster Early Warning – DMC, MOH	DMC, Provincial Directors of Health, MOH, District Secretaries / Divisional Secretaries, Pubic Health Inspectors, GNs
Tsunamis	• Warning Message Part 1 – DOM • Warning Message Part 2 – DMC, GSMB, NARA, CCD and DOM • Warning Message Part 3 – DMC, and DOM	• Technical Bulletin – DOM • Disaster Early Warning – DMC, GSMB, NARA, CCD	DMC, DDMC, District Secretaries / Divisional Secretaries, Police GNs, Local Authorities. NGOs, CBOs, Village level DM Committees
Droughts	• Warning Message Part 1 – DOM • Warning Message Part 2 – DMC, DOA, DOI, MASL, CEB, DAS and DOM • Warning Message Part 3 – DMC, and DOM	• Technical Bulletin – DOM • Disaster Early Warning – DMC, DOA, DOI, DAS, MASL	DMC, DDMC, District Secretaries / Divisional Secretaries, Farmer Organizations, Village level DM Committees

7.1.1 Addressing the Fear of False Alarms

To the organizations responsible, the fear of causing false alarms or panic and chaos can be as pervasive as the fear of not issuing timely warnings. The NDMP cautions that warning statements should not evoke curiosity or panicky behaviour and that rumour control action should be taken. The two-phased formulation of warning messages should help to create public trust that warnings are well founded.

A problem identified by stakeholders is the need for interpretation of news bulletins to the general public, otherwise, for example, just passing on information on the occurrence of an earthquake of around 5 on the Richter scale may cause panic. The technical accuracy of warning messages needs to be reconciled with aspects of human behaviour and relationships. In several incidences, people died when they did not believe warnings from what they

78 Conclusions of Workshop for Developing a National Consensus for Multi-hazard Early Warning and Disseminations System in Sri Lanka, compiled by Institute for Participatory Interaction in Development, 22 December 2006.

Table 2: Service Agencies for Dissemination and Communication

Type of Hazard	Related Service Agencies[79]	Level of Early Warning based on Forecasting
Adverse climatic conditions, cyclones and storm surges, lightning, tornadoes, high winds.	**DOM** DOA, DOI	• Cyclones/Tornadoes Category 1, Category 2, Category 3 } Wind speeds Levels 1, 2 and 3
Floods	**Irrigation Department, MASL, DAS** **DOM**	• Minor, Major, Critical, Dangerous – Water heights depend on river basin. • Flash floods/Urban floods/Dam-induced floods – levels to be defined Levels 1, 2, 3 and 4
Landslides	**NBRO** DOM	• Alert level 1 • Alert level 2 • Alert level 3 • Warning • Watch
Epidemics	**MOH** MRI	• Surveillance • Warning Warning level 1 Warning level 2 Warning level 3
Tsunamis	**DOM**, GSMB, NARA, SL Navy	• Alert Alert level 1 Alert level 2 Alert level 3 • Warning • Watch
Droughts	DOA DOM, DOI, MASL (No clear mandated Institution)	• Alert Alert level 1 Alert level 2 Alert level 3 • Alarm • Emergency (Needs to be developed)

79 Conclusions of Workshop for Developing a National Consensus for Multi-hazard Early Warning and Disseminations System in Sri Lanka, compiled by Institute for Participatory Interaction in Development, 22 December 2006.

perceived to be an unreliable source. The assistance of community leaders should be sought to help in explaining the threat, and a warning should be followed by subsequent information and an all-clear signal given when the threat of disaster has passed.

7.2 Hazard-specific Dissemination and Communication

A comprehensive analysis was undertaken in 2005 by ADPC sponsored by UNDP[80] of the state of the art of dissemination and communication in Sri Lanka. Some of the findings are summarized here and built upon.

The DOM plays a key role in the formulation and delivery of warnings and passes warnings to various sectoral agencies, at-risk communities and the general public through the local media, local police and local authorities by telephone and fax. The police play important roles in dissemination and communication. The Inspector General Command System of the Sri Lanka Police has developed and maintains a well-rehearsed communication system utilizing dedicated lines to receive warning messages from the DOM and the Irrigation Department, and deliver these to police stations in each district of the country, and then on to GNs and the communities within 15 minutes of the receipt of warning messages. The Inspector General Command System operates on a 24/7 basis.

7.2.1 Cyclone Warning

Cyclone alerts and warnings are issued by the DOM under the following conditions:

- If the cyclone is over 800 kilometres from the coast, general information about the cyclone is included in the normal weather forecast issued to the mass media.
- If the cyclone is about 550 kilometres off the coast, the Department issues a Cyclone Alert Bulletin. This bulletin indicates the distance of the storm centre from the coast, expected speed and direction of movement, and the expected maximum surface wind. This bulletin is issued every 12 hours.
- When the cyclone is 300 kilometres off the coast, a Cyclone Warning is issued every 6 hours. Point of landfall and areas likely to be affected are additional information that is included in these warnings.
- When the cyclone is 200 kilometres off the coast, repeated Cyclone Warnings are issued every 3 hours.

7.2.2 Flood Warning

For riverine floods and floods from dam breach/release of stored water, the Irrigation Department has an elaborate dissemination system defined in the Standing Orders for Flood Emergency Management. A 24-hour rainfall event exceeding 125 mm at any point in the catchment is the threshold for flooding. In this situation, the Director General of the DOM transmits rainfall data along with the meteorological forecast to the Deputy Director (Hydrology) of the Irrigation Department. The Deputy Director then studies the impact of the rainfall forecast on the Kelani Ganga, noting the hydrological conditions in the Basin and the observed river water levels. Depending on the potential impact, the following actions are then taken:

- For minor floods – information is sent to the Director General of the Irrigation Department, who then authorizes the dissemination of warning to people in low lying areas, with the least possible delay, through the Sri Lanka Broadcasting Corporation and Sri Lanka Television (Rupavahini).
- For continuing flood threat – the Flood Committee meets every 12 hours to respond to and monitor the situation, until the observed river level recedes below flood levels. The Deputy Director submits the latest flood forecast to the Director General of Irrigation, who then releases it to the mass media. Government agencies respond to the situation as detailed in the Standing Order.

7.2.3 Tsunami Warning

The DOM is the key technical actor in tsunami advisories and warnings. During the 28 March 2005 Sumatra earthquake, a decision to evacuate was made by the DOM in consultation with the GSMB and the Sri Lanka Navy, based upon the information received from PTWC on a high possibility that the earthquake has generated a tsunami. Warning was issued by telephone and fax to the local television and radio, and to the Police Communication System. Residents in the northern, eastern, south-eastern, and south-western coastal areas were evacuated. Since real time sea level data are not available to confirm the generation and propagation of a destructive tsunami, the interim warning system is prone to 'false' alarms. The Sri Lanka Navy however deployed tide watchers. The DOM cancelled the warning only upon receipt of information from PTWC that the threat was over.

7.3 Communication Systems and Technology

For an end-to-end EWS to function effectively, every link in the chain of communications must be periodically tested and upgraded if necessary. Communications should be sufficiently redundant to ensure that all members of the

80 ADPC, *Assessment of Early Warning Systems in Sri Lanka*, September 2005.

public at risk are warned. At present, the ICT systems in place do not yet cover all requirements.

Several initiatives are underway. A Disaster and Emergency Warning Network is being initiated by Dialog Telekom Limited, which can be used to instantly alert citizens either through SMS messages or a mass alert. The DMC EOC has programmed mobile phone numbers into the Network for testing and the SMS messages were successful. This system will be expanded to all mobile phone providers. It is also planned to establish a radio communications system linking the DMC with all sub-national administrations and other stakeholders.

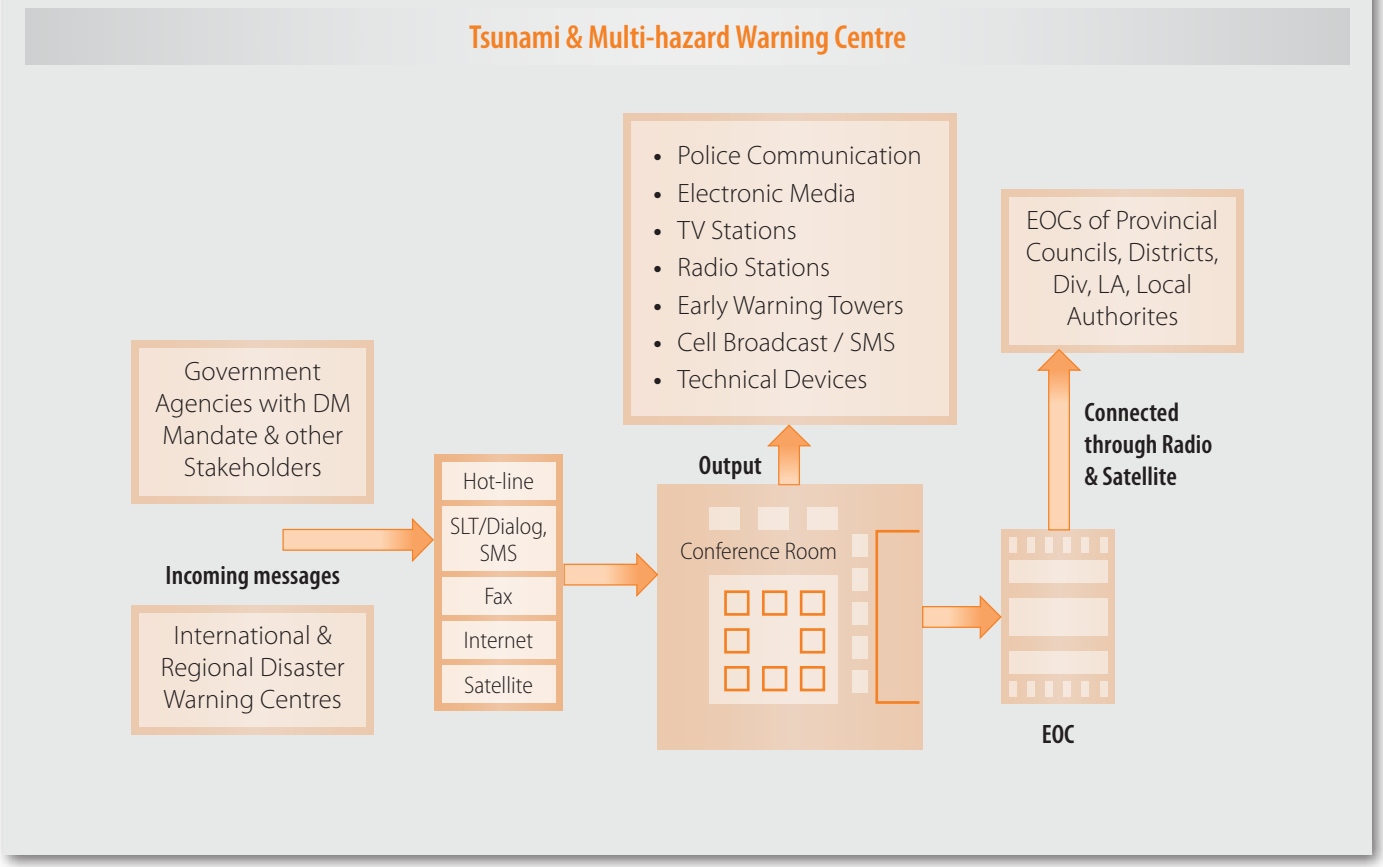
7.3.1 Warning Towers

A pilot project funded by UNESCO and the Government of the Republic of Korea has installed two of three warning towers that will function as multi-hazard warning towers. The towers will be effective within two to three kilometres; however, their performance may vary with the direction and speed of wind. Of the 200 towers proposed in the Road Map, 50 more towers were planned and funded by the Government of the Netherlands for 2007.

7.3.2 Community Warning Systems

A system supported by the USAID-funded IOTWS Program called Radio and Internet for the Communication of Hydro-Meteorological and Climate Related Information works by sending information into the warning system, which then prompts local operators to sound an alarm or otherwise instruct participants. The National Oceanic and Atmospheric Administration (NOAA) developed the system as a community-based communications programme designed to reach the 'last mile' in developing nations and remote locations. The DMC has already received 50 modem units from NOAA as a grant, to be installed in District Disaster Management Committee (DDMC) units and selected schools in vulnerable locations.

Figure 7: Disaster Warning Centre Inputs and Outputs



Box 7: Last Mile Hazard Information Dissemination Project

Major issues in dissemination for the EWS include the need for multiple strategies to reach people who live outside of ranges of normal communication and to ensure that redundant systems are working quickly and effectively in the event that one system fails. The Last Mile Hazard Information Dissemination Project (conducted in partnership between LIRNEasia, Vanguard Foundation, Sarvodaya, TVE Asia Pacific, WorldSpace Corporation, Dialog Telekom and International Development Research Centre) that was undertaken in 2006 aimed to explore strategies to effectively and credibly disseminate emergency warnings to the largest number of people in Sri Lanka in the shortest possible time.

The first phase focused on dissemination strategies, including testing different ICTs to deliver timely warnings to local people immediately at risk; and building community capacity to respond to such warnings rapidly and systematically. Different combinations of ICTs and community mobilization were tested out in 32 participating villages from eastern, western, northern and southern coastal areas of Sri Lanka. Based on the project's findings, the partners could identify the optimum combinations of technology, training and community mobilization that could help Sri Lankan communities to receive hazard warnings and disseminate them locally.

The project identified a number of warning strategies to include in the scope of its research and experimentation:

- **Training and community mobilization** – The project initially trained 30 youth leaders of Sarvodaya Shanti Sena (Peace Brigade) – a youth force of over 100,000 volunteers dedicated to peace building and community development. The trained youth leaders then returned to their areas to mobilize one or more coastal villages. Each community determined, through a participatory process, the most appropriate methods to communicate disaster warnings they receive.
- **Hazard Information Hub** – set up at the Sarvodaya headquarters in Moratuwa, just south of Colombo to maintain close links with official disaster warning agencies of the government. Warning received through these channels will be disseminated to the villages.
- **ICTs** – The participating villages were provided with different configurations of training and ICTs. Five ICTs investigated in this project included: Very Small Aperture Satellites; Disaster Warning Response and Recovery (DWRR) units based on addressable satellite radio; fixed telephones; mobile phones; and GSM-based disaster communications devices. The DWRR units were launched in January 2006 by Raytheon and WorldSpace, and the Last Mile Project was one of the first field applications. Each radio has an in-built global positioning system and a unique code.

An evaluation of the project indicated that all five ICTs can be incorporated into the communities. However, human resource capacity needs to be built to operate the technology and must be combined with effective risk management, public education to compensate for the deficiencies in the end-to-end EWS, and regularized simulations and evacuation drills.

Summary of Main Points

1. Institutional limitations identified in the draft NDMP include inadequate institutional capacity, inadequate ICT systems and need for alternative communications systems mobilizing social networks. Other needs include formalization of procedures, standardization of communications systems, dealing with panic and false alarms, and clarification of government roles and authorities.
2. A DMC workshop helped to clarify the sequence of warnings to the public, the content of the warnings, the actors and steps involved in formulating the messages, who will send the messages, timing of dissemination, need for further definition of alert levels, and need to examine the Disaster Management Act No. 13 to clarify any ambiguity.
3. The system of communication goes from national to district level and then to divisional and local authorities. The communication to the GN level is mainly through police stations and fixed telephone lines. Various methods are used to reach the public i.e. alarms, sirens, loudspeakers, beating of drums and public announcements through radio and television.
4. The NDMP cautions that warning statements should not evoke curiosity or panicky behaviour; the planned two-phased formulation of warning messages should help to create public trust that warnings are well founded. The assistance of community leaders should be sought to help in explaining the threat.
5. A comprehensive analysis was undertaken in 2005 by ADPC (sponsored by UNDP) of the state of the art of dissemination and communication in Sri Lanka. The

DOM plays a key role in the formulation and delivery of warnings and the Inspector General Command System of the Sri Lanka Police maintains a well-rehearsed communication system.

6. Cyclone alerts and warnings are issued by the DOM. For riverine floods and floods from dam breach/release of stored water, the Irrigation Department has an elaborate dissemination system defined in the Standing Orders for Flood Emergency Management. The DOM is the key technical actor in tsunami advisories and warnings.
7. At present, the systems in place do not cover all areas, and each individual warning system does not reach out to the entire population. A Disaster and Emergency Warning Network is being initiated by Dialog Telekom Limited. Of the 200 warning towers proposed in the Road Map, 50 more towers were planned and funded by the Government of the Netherlands for 2007.
8. LIRNEasia and partners have successfully tested various technologies for reaching the last mile but any system requires trained human resources and strong community risk management skills.

Recommendations for Stakeholders[81]

- Support the Road Map Component 4 to address shortcomings in institutional capacity for dissemination and communication.
- Conduct a gap analysis to determine coverage of communications networks and technologies, including the needed redundancy, and direct resources to areas requiring coverage.
- Provide support for training human resources to manage technical and operational aspects of dissemination and communication, particularly at community levels.
- Direct resources as soon as possible to formalize arrangements for warning and information exchange among government staff, media and civil society.
- Start a dedicated information campaign involving community leaders to build trust in the system.

81 These recommendations are a synthesis of those made by interviewees in the UNDP ILS EWS process as well as those mentioned in documents.

8 Response Capacity

The aim of this key element is to strengthen the ability of communities to respond to warnings and disasters. A technically sound warning is ineffective if people do not know what to do next. Successful warnings should activate an orderly movement of people out of harm's way and motivate people to cope with their situation by securing their assets and seeking shelter. Post-disaster response implies the wider range of relief, recovery, rehabilitation and reconstruction efforts. Both response to warning and response to disaster are part of disaster preparedness and are most effective when they employ standards and procedures as well as empower communities to participate. Sri Lanka has made significant progress in strengthening response capability, demonstrated in the effective response to the November 2006 flood disasters in four districts.

The following issues have been identified in Sri Lanka's response capacity:

- Local authorities are not fully prepared to respond to all potential hazards and require strengthened capacity in terms of equipment, infrastructure and operations training.
- Cooperation between national and community actors requires strengthening to increase efficiency and effectiveness of the response system.
- While warning response drills are increasing in numbers, coordination and geographical coverage are not adequate. Drills and evacuation mechanisms need to be supported by regulations that stipulate frequency for drills, standards for success, and procedures for each area and hazard.

8.1 National Emergency Operations Centre and Response Capacity

In 2006, a study supported by the DMC and UNDP set out the design and functioning of the national EOC and some of the recommendations are implemented.[82] The goals of the DMC are to establish EOCs at national and district levels (in 25 districts) and to assign responsibilities to focal bodies. In addition, the DMC is developing an institutional framework and coordination mechanism for emergency operations, and a resources network for emergency response. The EOCs of the DMC and priority districts are being set up with necessary office and communications equipment. The national treasury is expected to fund continuous 24/7 monitoring, including the human resources needed to staff the centres and capacity development for EOC staff. Basic hardware and software support have been provided to nine districts to establish District Disaster Management Coordinating Units that will be further strengthened to take over District EOC functions.

8.1.1 Incident Command System

Sri Lanka was one of the first countries in the region to introduce a system-wide disaster management procedure using an Incident Command System (ICS) approach.[83] The draft National Disaster Management Policy includes "adopting ICS where possible in response activities at district, divisional and local levels," as one of the 17 guiding principles in disaster management. The training for ICS is underway, supported by the IOTWS Program and the United States Forest Service. A May 2007 regional ICS workshop allowed Sri Lankans and Indonesians to exchange innovative strategies for building capacity in disaster management.[84]

8.2 Development of Disaster Preparedness and Response Plans

The DMC is implementing a well-targeted effort to support planning and management at various levels and in numerous sectors. Planning is conducted among actors at provincial, district, divisional and GN levels. Disaster Management Committees have been formed in many districts with sub-committees covering the areas of early warning dissemination, search and rescue and evacuation, shelter and relief management, health and first aid, water and sanitation, and patrolling and vigilance.

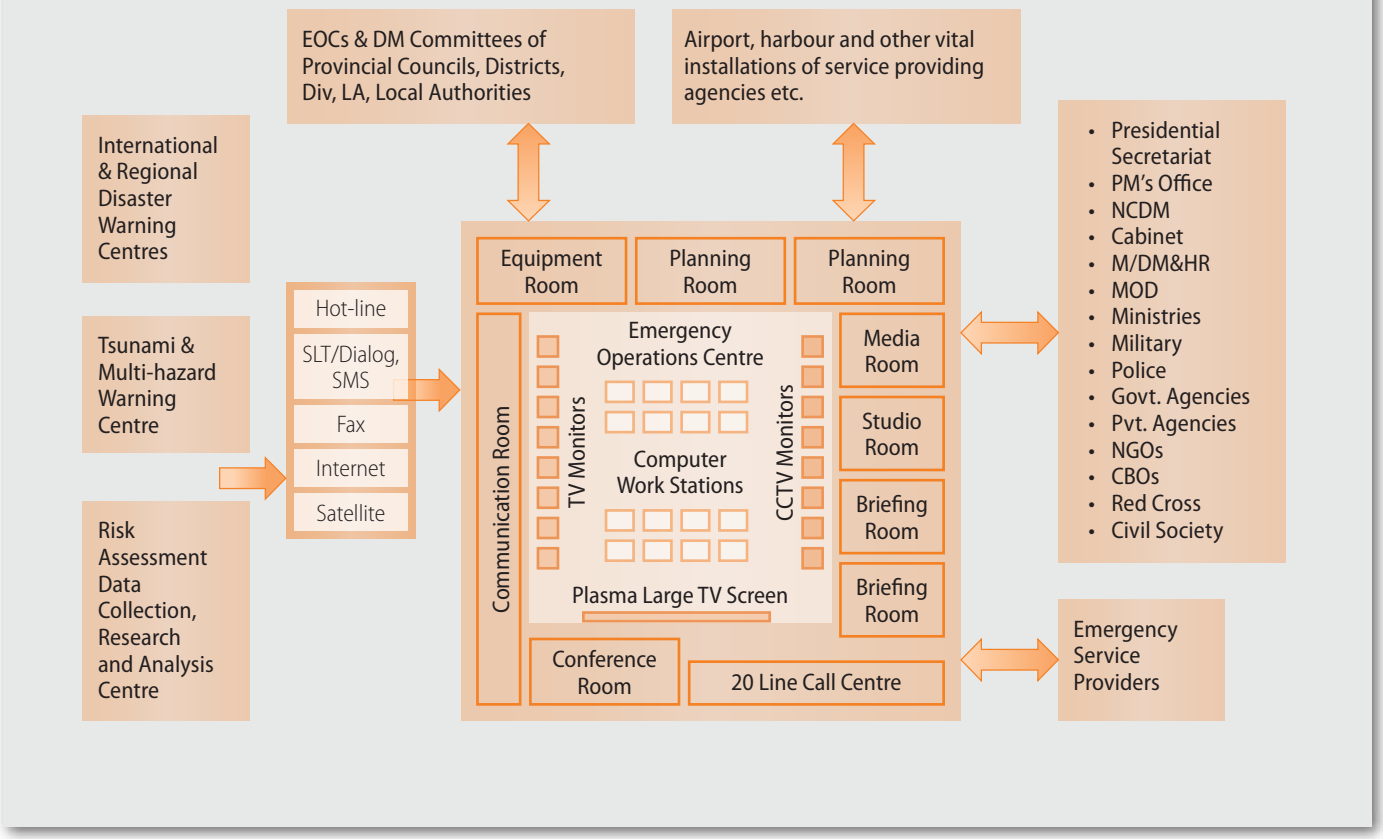
Preparation of district and divisional level disaster preparedness plans has commenced in the districts of Kalutara, Galle, Matara, Hambatota, Ratnapura, Ampara

82 Major General B. W. Howard, *A Report on the Establishment and Operation of the Sri Lanka National Emergency Operations Centre (NEOC)*, September 2006.

83 The ICS has been in use in the US for decades to help the government manage the chaotic situation following a disaster or crisis and is based on the organization of a team to deal with major functional areas. These are command, operations, finance and administration, planning and logistics.

84 IOTWS ICS Factsheet and website.

Figure 8: 24/7 National Emergency Operations Centre



and Batticaloa with active participation of the district and divisional level stakeholders. The objective of developing the plans is to ensure that the district administration is prepared to respond in a timely, dependable, efficient and reliable manner (some districts, such as Matara, had disaster preparedness plans prior to the tsunami disaster of 2004, but the plan was only available in English and had not been rehearsed).[85] Community contingency plans are also being developed at the GN level in several districts.

The Sri Lanka Army has its own contingency plan that is rehearsed every three months. The Sri Lanka Police have well organized plans to disseminate warning messages to communities and direct the public to safe areas. The police force is training many of its members in first response and is passing on this training to NGOs and residents with the DMC support.

The DMC faces challenges in the implementation of DRR activities that are largely related to political and social issues, including slack enforcement of legal provisions regarding land use, and reactive attitudes of government institutions and communities towards disasters.[86] The DMC is also challenged to avoid a top-down approach and to recognize the community-specific work by NGOs and grass-roots organizations, incorporating their approaches, needs and resources in the planning.[87]

85 USAID IOTWS, *Review of Policies and Institutional Capacity for Early Warning and Disaster Management in Sri Lanka* (Draft), January 2007.

86 UN/ISDR, UNDP and DMC, "Progress and Future Initiatives on DRR in Sri Lanka: National Progress on the Hyogo Framework for Action," presentation made at the National Consultative Meeting, 25 April 2007.

87 Review of Disaster Management Policy and Practice, undertaken by the Institute of Policy Studies in Sri Lanka with Oxfam America, September 2006, workshop discussions.

8.3 Development of Local Preparedness and Response Capacity

The local response actors require capacity development to strengthen their ability to meet large and smaller disaster response needs. Some of the requirements identified include equipment such as ambulances, water distribution vehicles, fire-fighting equipment, rescue boats, and storage space for disaster response items, among others. There are also shortages in human capacities to manage response resources. More than $5 million has been allocated from World Bank and national funds for purchasing equipment and assessing staffing needs, as well as developing databases on response resources. A Sri Lanka Disaster Resource Network is being established, which includes a web-based database of resources, software and formats for data collection. DMC will undertake the modification of the software and training for data collectors, and provide infrastructure to the districts such as computers and Internet connections.

8.3.1 Role of Volunteers

One of the greatest challenges facing Sri Lanka is connecting the community to the national and international DRR and EWS mechanisms and strengthening the community's own abilities to respond. The communities were largely the first to respond to the 2004 tsunami that hit without warning and their efforts have been widely praised. Empowering a community volunteer network is seen as one effective means to create closer cooperation and a more efficient response system. The DMC is enhancing local capacities through training community volunteers in the areas of DRR, first aid, and search and rescue. The SLRCS works through its network of volunteers and is implementing a large-scale training programme creating a training centre supported by the National Red Cross Society of the Republic of Korea. The Sri Lanka-Korea Disaster Management Centre will be used to train staff members, volunteers and members of the public.

8.3.2 Public Awareness and Regular Drills

Although the frequency of evacuation drills is increasing, considerable work remains to reach all communities. Evacuation drills are typically run on an ad hoc basis. Without tightly coordinated actors and adequate resources, it will be difficult to have drills in all towns and villages in the near future. In a study conducted in 2006 by the Institute of Policy Studies of Sri Lanka, 50 percent of community members sampled could identify a safe refuge but only 6 percent had practiced evacuation.[88] The DMC with partners such as the SLRCS are managing drills linked to community-based disaster preparedness.

The Sri Lanka Navy participated in managing an evacuation in response to a tsunami alert in March 2006 and according to Navy officials, the process was successful in that the entire eastern coastline was evacuated in 55 minutes. Television, radio and local police were used to communicate the warning. However, it is not known to what extent people in communities further inland responded.

Public laxity is a concern as people lose interest in risk reduction during a period without disasters and there are not enough drills to remind them of what they are to do. People need instructions to help them organize their families and should have an escape bag ready in their houses. In addition to more and regular drills, key actors in the evacuations such as the police need to be in close communication with communities. Community members must be assured that looting will be contained when they leave their houses and businesses. People will need some practice in order to modify their behaviour so they do not panic, and rely on official warnings and advice rather than on word of mouth and rumours.[89]

The following areas are critical for successful evacuation:

Procedures during evacuation require clarification. The evacuation routes and location of safe places need to be clarified in a strategy or plan by area and hazard through consultation with all relevant actors. The public's preferred method of movement away from the hazard is often by private vehicle such that traffic jams during evacuation drills may cause gridlock and accidents.

Vulnerable groups need greater support during drills and evacuations. People, particularly the poor, remotely located and marginalized groups, frequently have not made evacuation plans ahead of warnings. Within communities, people may not be aware of the most vulnerable members and/or have not taken specific precautions or plans to assist them.

Feedback is needed. The response system to warnings should be based on inclusive consultations on planning and feedback after a real warning or a drill from key groups, such as children, women, tourists, businesses owners, assistance organization staff, migrants and other minorities. People should have a channel through which they can communicate back to EWS planners and managers what triggered their reaction to a given warning and what steps they took when they understood the warning message. This feedback should then be analysed and resulting recommendations should be incorporated into preparedness plans and practice.

88 "Disaster Management Policy and Practice: Sharing Lessons between Government, Civil Society and Private Sector," presentation of study results by Institute of Policy Studies of Sri Lanka with Oxfam America, 28 September 2006.

89 These concerns were expressed by interviewees in the UNDP study.

8.4 Assistance Providers

The transfer of the National Disaster Relief Services Centre (formerly NDMC) to the Ministry of Disaster Relief, and the creation of the DMC have resulted in some tension in the area of disaster response; however, the system appears to be sorting itself out in practice. For example, the National Disaster Relief Services Centre has an Emergency Relief Unit and has released funds for support of the IDPs in the north-east, a response effort being coordinated by the DMC.

The Ministry of Social Services and Social Welfare has turned over the entire relief infrastructure and stockpiles to the National Disaster Relief Services Centre. Representatives of the Ministry remain concerned that special needs of the most vulnerable groups will not be taken into account in disaster response without their direct involvement, for example, in supplying psychosocial counseling. In the tsunami affected conflict zones, the recovery of people is still not complete and former conflicts and the current violence threaten to complicate efforts to organize DRR and early warning activities.

Numerous Sri Lankan NGOs are active in disaster response including the SLRCS, Savordaya, Sahana, Sewa Lanka and many others.

8.5 DRR and EWS in Disaster Recovery

The RADA represents the continuation of the original post-tsunami Task Force for Rebuilding the Nation, and has a mandate for coordinating reconstruction activities pertaining to both natural and human-made disasters. The RADA must address serious challenges to rebuilding in the north-east conflict zones, where 65 percent of the damages from the tsunami took place. These areas also face shortages of manpower and resources. The RADA is compiling baseline data on affected households through the National Data Centre and this data is handed over to the Government Agents in each province to track recovery. RADA collaborates with the DMC on use of DAD, and RADA has a Risk Manager who links with the DMC.[90]

Recovery activities need to address community vulnerabilities and gaps in national capacities, and part of recovery resources should be directed to enhancing preparedness and early warning measures. Sri Lanka participates in the Tsunami Recovery Impact Assessment and Monitoring

90 USAID IOTWS, *Review of Policies and Institutional Capacity for Early Warning and Disaster Management in Sri Lanka* (Draft), January 2007.

Box 8: The Critical Role of the Media in Disaster Preparedness and Response

The media are invaluable partners in influencing and educating the public regarding DRR and EWS. Repetition is the key to influencing people's behaviour – it is estimated that people do not understand or change their behaviour until they have heard the messages about seven times. Another critical role for the media is helping the government and the public deal with false alarms. To do this, a protocol should be agreed with media representatives that outlines how to report on why a disaster event did not take place as predicted.

Local media are important actors to move messages among communities. The preparedness and warning messages need to be passed among schools, hotel security, etc. and various types of media can be used to do this. There are exciting opportunities offered by the 'new' electronic media of binding communities together, through user-generated content, social networking and video blogging.

A regional brainstorming meeting held in December 2006 on Communicating Disasters: Building on the Tsunami Experience and Responding to Future Challenges put forth important objectives with regard to developing relationships between information providers and mass media for disaster communication. Some specific observations on Sri Lanka include the following:

- The tsunami affected the way people used media for information. Before the tsunami there were only a handful of blogs written by persons based in Sri Lanka, but within days of the disaster, many new blogs emerged. These not only tracked and reported what was happening on the ground, but continued to cover other matters of public interest afterwards. Now there are at least 100–200 regular bloggers, many expressing themselves on a daily basis.
- At least 80 percent of the public in Sri Lanka can be reached through television and 90 percent through radio. But the media cannot be the only channel. It cannot be left to the market alone to decide and manage early warning information. This is where government, civil society, academics and commercialized media all have to join hands.
- For organizations such as the SLRCS that mobilized thousands of volunteers in response to the tsunami, media understanding of the roles of their organization was critical, but the media did not always have a grasp nor appreciate the complexity of their efforts. Some misreporting and confusion arose as a result. Firm relationships need to be established with media before a disaster, and media should be trained to understand the way organizations work in preparedness and response.

System (TRIAMS) that has established a draft set of core indicators. The ProVention Consortium solicited expert papers to generate DRR indicators that reflect effective institutional and legislative practices and capacities, among others. Some indicators are:[91]

- Increase in the number of public information dissemination campaigns via media and schools for measurable change in public understanding of how to act on early warning messages
- Numbers of preparedness and response plans to reflect improved information on multiple risks in high risk areas
- Number of policies and legislation drafted or revised to facilitate action, enforce regulations and/or provide incentives
- Number of schools and hospital buildings conforming to building regulations and level of transfer of this practice to other high risk areas

Summary of Main Points

1. Sri Lanka has made significant progress in strengthening response capacity, demonstrated in the effective response to the November 2006 flood disasters. Issues include needs to strengthen local response capacities, promote better linkages between national and community actors, and take action to increase the number of regulated evacuation procedures.
2. The goals of the DMC are to establish EOCs at the national level and in 25 districts. In priority districts EOCs of the DMC are already being set up and provided with necessary office and communications equipment. Sri Lanka is using the ICS and related training is underway, supported by the IOTWS and the US Forest Service.
3. The DMC is conducting disaster planning exercises involving actors at provincial, district, divisional and GN levels. In addition community contingency plans are also being developed at the GN level (in several districts). The Sri Lanka Army has its own contingency plan; the Sri Lanka Police have well organized plans; and some international organizations such as Oxfam are preparing global contingency plans.
4. In implementing DRR activities, the DMC faces challenges related to political and social issues, and is challenged to avoid a top-down approach. Local response actors require capacity development to strengthen their ability to meet large and smaller disaster response needs. A Sri Lanka Disaster Resource Network (SLRDN) is being established.
5. One of the greatest challenges facing Sri Lanka is connecting the community to the national and international DRR and EWS mechanisms. The DMC is enhancing local capacities through training community volunteers in the areas of DRR, first aid, and search and rescue. The SLRCS works through its network of volunteers and is implementing a large-scale training programme.
6. Although the frequency of evacuation drills is increasing, considerable work remains to reach all communities. The DMC with partners such as the SLRCS are managing drills linked to community-based disaster preparedness activities. Public laxity is a concern and there are not enough drills to keep on reminding people of what they are to do in case of a warning/disaster.
7. The move of the National Disaster Relief Services Centre (formerly NDMC) to the Ministry of Disaster Relief and creation of the DMC have created some tension in the area of disaster response; however, the organizations have cooperated to respond to IDP emergencies in the north-east. The media are critical actors to support response.
8. The RADA must address serious challenges to rebuilding in the north-east conflict zones, where 65 percent of the damages from the tsunami took place. Sri Lanka participates in the TRIAMS that has established a draft set of core risk reduction indicators.

Recommendations for Stakeholders[92]

- Prioritize and coordinate the provision of resources to the capacity development of local authorities and communities for preparedness and response.
- Strengthen cooperation between national and local actors by ensuring that planning is a joint exercise, and that community-based work implemented by NGOs and grass-roots organizations is recognized and incorporated in DRR planning.
- Devote adequate human and material resources in order to increase the geographical coverage for response drills.
- Issue regulations that stipulate frequency for drills, standards for success and procedures for each area and hazard.
- Establish relations with the media prior to emergencies to support the EWS and use 'new media' to reach the public to stimulate participation in DRR.

91 ProVention Consortium, *TRIAMS Risk Reduction Indicators – Institutional Capacities*, contributed by Yasemin Aysan.

92 These recommendations are a synthesis of those made by interviewees in the UNDP ILS EWS process as well as those mentioned in documents.

9 Gender Aspects in the Context of Institutional and Legislative Systems for Early Warning in Sri Lanka

The institutional and legal frameworks in Sri Lanka provide opportunities to ensure that laws, regulations and SOP for DRR and the EWS are supportive of both genders. This chapter mentions fundamental issues affecting gender equality, access to resources, participation in decision-making and gender-related disaster effects. Relevant disaster-related legislation and institutional roles are examined through a gender lens. Finally, recommendations are made with reference to other sections of the report that look at various components of the people-centred EWS: risk knowledge, monitoring and warning, dissemination and communication, and response.

Status of MDG 3 Achievement

For those areas of the country where reliable data has been collected, Sri Lanka has the most advanced development indicators in South Asia.[93] The net enrolment ratio in primary education is above 95 percent and immunization coverage is successful. Maternal and infant mortality levels have been reduced overall, although infant mortality has increased slightly since 2002. Regarding MDG 3, gender equality has already been achieved in primary and secondary education. In universities, the number of women is on track for 2015 equality. Literacy rates have overall not improved in the last decade, although with 92 percent in 1996 and 2005 (males: 94.8 percent; females: 90 percent) literacy is quite high. Among women, high literacy and education levels have not resulted in sufficient well-paid jobs with promotion opportunities. Women still lack parity in legal rights and adequate political participation.

The World Bank poverty assessment (2007) points to unequal development within the country. Much of the country's wealth and economic activity is concentrated in the western province where growth is two to three times faster than in the rest of the country. Rural areas are home to more than 89 percent of the population and 88 percent of the poor (more than 23 percent of the population live under the poverty line). MDGs on poverty and hunger are assessed as 'not on track'. Among other factors the slow pace of poverty reduction is linked to rising inequality among income groups. Average per capita consumption grew by 50 percent for the richest consumption quintile but by only 2 percent for the poorest. Malnutrition affects 29 percent of all children. People living in the tea estates, the North and the East, and the tsunami affected coastal areas are more likely to fall into a cycle of poverty due to weaker long-term development patterns and the effects of civil conflict and/or natural disasters.

93 For over 20 years, large areas of the country have been cut off from government statistical surveys, and reliable data on human development for these areas in the north and east are not yet available.

Table 3: MDGs and Sri Lanka

MDGs	Sri Lanka's Position
Reduce extreme poverty by half	1991 – 23%; 2002 – 22.7% (% below poverty line)
Progress toward gender equality by eliminating gender disparity by 2005	Ratio of boys to girls in primary, secondary and tertiary education respectively
Reduce infant and child mortality by two thirds	Infant – 1991=18; 2002 = 11; 2005 = 12 Child – 1991 = 22; 2005 = 14
Reduce maternal mortality by three quarters	1991 – 42; 2002 – 28
Provide access to all who need reproductive services	Contraceptive prevalence – 2000 = 70% Birth attendance – 2000 = 96%

Table 4: Gender Disparity in Indonesia, Sri Lanka and Thailand

Country	UNDP Human Development Index Rank (2008) – out of 179 countries	UNDP Gender-related Development Index Rank (2008)	Social Watch Gender Equity Index Value (2008) Grading from 1–100	Evolution of the Gender Equity Index (2008) Variation 2008/2004 (%)
Indonesia	109	93	52	0.1
Sri Lanka	104	90	53	-5.4
Thailand	81	67	70	-8.9

9.1 Gender-related Disaster Effects

Women and children suffered significantly higher casualties than men in the 2004 tsunami but the actual numbers are difficult to ascertain. Several women's groups have contested official figures indicating that 60 percent of the deaths were women; in Batticaloa, a survey conducted by Suriya Women's Development Centre found that 80 percent of deaths were women and girls.[94] Some discussions point to the lower ability of women to swim as well as the traditional dress i.e. saris restricting movement as major risk factors, in addition to women risking death in order to save children and relatives. In Batticaloa district, the tsunami hit at a time when women typically take their bath in the sea.[95]

The impact of the tsunami on men affected their psychosocial well-being and coping abilities. In losing their homes, fishing boats and capacity to earn a living as heads of households, they also lost self-esteem and a sense of worth. Many men became widowers, uncommon among reproductive-age groups. Some men rapidly remarried. The psychosocial impact of the tsunami disaster on men remains a poorly understood problem that received insufficient attention from assistance organizations.[96]

A structured study[97] conducted in 13 temporary camps following the tsunami confirmed a higher mortality rate amongst women, children and the elderly.[98] Other significant risk factors, applicable to both females and males, include being indoors at the time of the tsunami and fishing as an occupation. The study noted that the age-gender mortality pattern of the tsunami victims is similar to that of earthquakes but very different to that of floods, where higher male mortality is typical. Importantly, the study pointed to needs for epidemiological studies to precisely identify vulnerable groups in relation to each hazard and disaster setting in order to provide information for subsequent disaster management and planning.[99]

Several studies and papers warned of the impact on the population caused by high numbers of female deaths in affected communities. WHO and UNICEF highlighted the potential significant impact of the loss of the middle-aged female population who are the primary caretakers of their children and families. Among surviving children it would be important to monitor nutritional status and morbidity including psychological illness. One study highlighted the need to monitor long-term risks such as the incidence of cardiovascular disease among the surviving population and possible mental disorders.[100] Social instability and the danger of an increase in sexually transmitted diseases, including HIV/AIDS, also deserve attention because of the change in the male-female ratio.[101] Research also suggests that the needs of the elderly and disabled require more focus – these groups

94 Sarala Emmanuel, *Sri Lankan Women's Small but Significant Gains in the Post Tsunami Reconstruction Process*, Suriya Women's Development Centre, Sri Lanka.

95 Anita Katyal and Caitlin Miner le Grand, "In the Eye of the Tsunami," *Voice Unabridged*, The e-magazine on Women and Human Rights Worldwide, 5 November 2005.

96 Manuel Carballo, Bryan Heal and Gabriela Horbaty, "Impact of the tsunami on psychosocial health and well-being," *International Review of Psychiatry*, June 2006; 18(3): 217–223, International Centre for Migration and Health, Geneva, Switzerland, page 220.

97 Nobuyuki Nishikiori, Tomoko Abe, Dehiwala G. M. Costa, Samath D. Dharmaratne, Osamu Kunii and Kazuhiko Moji, "Who died as a result of the tsunami? – Risk factors of mortality among internally displaced persons in Sri Lanka: A retrospective cohort analysis," *BMC Public Health*, March 2006.

98 A higher mortality was observed among females (17.5% vs. 8.2% for males, $p < 0.001$), children and the elderly (31.8%, 23.7% and 15.3% for children aged less than 5 years, children aged 5 to 9 years, and adults over 50 years, respectively, compared with 7.4% for adults aged 20 to 29 years, $p < 0.001$).

99 Nobuyuki Nishikiori, Tomoko Abe, Dehiwala G. M. Costa, Samath D. Dharmaratne, Osamu Kunii and Kazuhiko Moji, "Who died as a result of the tsunami? – Risk factors of mortality among internally displaced persons in Sri Lanka: A retrospective cohort analysis," *BMC Public Health*, March 2006, page 5.

100 Ibid.

101 Op. cit.

should be targeted with special preparedness measures by the EWS.[102]

The particular vulnerability of women to gender-based violence (GBV) after disasters was studied after the tsunami disaster and it was noted that DRR should draw more attention to GBV impacts in planning and mitigation. Incidences of GBV against women in households and conflict areas were high prior to the tsunami, but the disaster increased women's vulnerability to GBV even further. In particular, domestic violence increased, and, while remaining somewhat hidden, persisted well beyond the initial emergency phase of the disaster. Similar patterns of GBV have been well documented in the aftermath of other disasters worldwide.

Factors contributing to post-tsunami GBV in Sri Lanka included the frustration and stress associated with communal living, feelings of loss and trauma, and men's increased alcohol consumption. Other practices that were seen to contribute to GBV vulnerability, included the GoSL compensation scheme that discriminated against women, the weak attention to protection of women in the design of toilet and bathing areas, and women's lack of participation and inclusion in decision-making within the relief and reconstruction process at all levels. Further, instances of misconduct and insensitivity on the part of police (including failure to arrest perpetrators), health workers and humanitarian staff reflected the dominant harmful societal attitudes towards women and GBV.[103]

The 2004 tsunami disaster response highlighted gender aspects in relation to land rights. Land reform laws introduced in 1972, which provide for a pooling of the immovable property of husband and wife, operate to the disadvantage of women who own property, since they can lose their private lands in excess of the defined ceiling. Low-income women are discriminated in the allocation of state lands, since the statutory law does not entrench the rights of female heirs, including the female spouse, and reflects a preference for males.[104] Some informal tenure systems and those under customary or personal laws protected women's rights to land and property (such as the practice of conferring ownership of the parental home to the daughter on marriage among Muslims in the east of Sri Lanka). One problem with regard to such informal systems is the non-recognition of entitlements by individual families within an extended family system. There is however a danger that the imposition of blanket legal systems for holding property would remove traditional informal practices, such as the matrilineal one mentioned above, which have built up over the years to safeguard legitimate interests.[105]

The largest disaster affecting Sri Lanka is the escalation of hostilities between the GoSL and the LTTE, now further complicated by the emergence of the Karuna group. Over 4,000 people have been killed since early 2006 and the IDP total has reached 400,000 people, the majority women and children; some already displaced by the tsunami have been displaced a second time.[106] The security situation has steadily declined in the past few years and has led to freezing of donor commitments for Sri Lanka's development.[107] UNIFEM's study of the effects of the conflict on women point to numerous human rights abuses. There are an estimated 40,000–50,000 war widows in the country and approximately 30,000 female-headed families in the north and east.

9.2 Good Practices in Support of Gender Equality in DRR and EWS

The 2004 tsunami disaster response showed conclusively that women are powerful forces for preparedness and recovery. Excellent cooperation to address post-tsunami gender aspects was achieved through the Women's Coalition for Disaster Management (WCDM) in Batticaloa that was supported by local and international actors. The WCDM hosted weekly meetings for female representatives from local Tsunami Welfare Centres and NGO staff to discuss issues that the coalition would address. Details of these issues were documented in regular coalition 'Gender Watch' reports.[108] The People's Consultation on Post-Tsunami Recovery, a UNDP-led initiative, provided an invaluable platform for hundreds of women to voice their views on the consequences of the tsunami and their grievances.[109]

The UN/ISDR has compiled case studies in post-tsunami support to gender equality. Two good practices in Sri Lanka are summarized below.

102 Manuel Carballo, Bryan Heal and Gabriela Horbaty, "Impact of the tsunami on psychosocial health and well-being," *International Review of Psychiatry*, June 2006; 18(3): 217–223, International Centre for Migration and Health, Geneva, Switzerland, page 220.

103 Sarah Fisher, *Gender Based Violence in Sri Lanka in the after-math of the 2004 Tsunami Crisis: The Role of International Organisations and International NGOs in Prevention and Response to Gender Based Violence*, University of Leeds, October 2005.

104 *Country Gender Assessment: Sri Lanka*, Asian Development Bank, South Asia Regional Development Department, and Regional and Sustainable Development Department, 2004.

105 *Landlessness and Landrights in Post-Tsunami Sri Lanka*, IFRC and Centre for Policy Alternatives, November 2005, page 25.

106 OneWorldnet website.

107 Swiss Agency for Development and Cooperation, *Swiss Medium Term Plan for Human Security in Sri Lanka, 2007–2009*, page 5.

108 Sarah Fisher, *Gender Based Violence in Sri Lanka in the after-math of the 2004 Tsunami Crisis: The Role of International Organisations and International NGOs in Prevention and Response to Gender Based Violence*, University of Leeds, October 2005, page 22.

109 Tsunami Evaluation Coalition, *Impact of the Tsunami Response on Local and National Capacities: Sri Lanka Country Report*, April 2006, page 45.

1. **With support and encouragement, women have played a significant role in designing their own recovery, articulating their needs and priorities, and reducing their future risks**. Houses were built for a group of tsunami-widowed and tsunami-displaced women, who were marginalized because of economic, ethnic and gender issues. Appropriate technology and an integrated approach were used to improve community resilience to future disaster events, especially cyclones and tsunamis. Women played a significant role in defining the living spaces of their new homes. Spaces for kitchen, utilities, water storage, worship (shrine rooms), separate female and male halls specific to Muslim communities, were some of the ideas that emerged from gender-inclusive community discussions. The project kicked off in 2005 and ended in 2006 in Batticaloa and Ampara districts of the eastern province, and Hambantota and Matara districts of the southern province; it was used as an entry point for further work with the affected women.[110]
2. **With gender-infused training strategies and curriculums, leading training agencies promoted a gendered understanding of development and DRR concepts, how they are applied on the ground, and how gender-based differences can lead to discrimination, marginalization and increased vulnerability**. An initiative to build gender and DRR awareness was undertaken with the Institute of Bankers Sri Lanka by helping to integrate gender-specific aspects into its training curricula. The Institute of Bankers Sri Lanka is a key capacity building institute serving the development sector. In terms of gender aspects, the training programmes addressed specific problems encountered by women entrepreneurs in accessing credit due to lack of collateral and access to productive resources, gaps in their ability to prepare business plans, and prejudices and social acceptability at marketing and decision-making levels as well as among formal institutions. The training resource group included key national-level trainers who are connected to many other training programmes for national-level decision makers within institutions.[111]

110 Practical Action and Forum for the Advancement of the Human Science of Development, *Practical Houses for Marginalized Tsunami-Widowed and Tsunami-Displaced Women*, Sri Lanka.

111 UNDP Sri Lanka Tsunami Recovery Unit and Institute of Bankers Sri Lanka, *Gendering DRR Capacity-Building for Tsunami Recovery Service Providers – Laying the Foundation: Gendering Capacity-Building for DRR.*

9.3 International and Domestic Gender Equality and Human Rights Policy and Law[112]

Sri Lanka has ratified major international conventions that uphold principles of gender equality. The CEDAW and its optional protocol were ratified in 1981. In response to the CEDAW Committee's recommendations, the GoSL amended the Citizenship Act of 1948 in 2003 to eliminate the gender discriminatory provisions. Other ratified instruments include the ILO Convention No. 100 of 1951 (equal remuneration); ILO Convention No 103 of 1952 on Maternity Benefits and revisions (Government Publications Bureau, 1980); UN Conventions on Trafficking in Women; UN Convention on Migrant Workers in 1990; and UN Declaration on Violence Against Women in 1993.

A Women's Charter based on CEDAW was established in 1993 and allowed the establishment of a National Committee on Women, which was assigned the task of monitoring implementation of the Charter. Both the state and NGOs were involved in its formulation. Areas of concern include civil and political rights, rights within family, and rights to education and training, economic activity and benefits, health care and nutrition, protection from social discrimination, and protection from GBV. The provisions in the Women's Charter are enforceable but not legally binding.

On the occasion of the review of progress made since the Beijing Platform for Action (BPA), numerous achievements were cited including the following:

- A phenomenal increase in the participation of women in education and socio-economic activities, including many community-based initiatives and enhanced empowerment of women in the rural sector.
- Allocation by the GoSL of 10 percent of the Ministry of Women's Empowerment and Social Welfare budgets for programmes to improve the status of women.
- The national budget of 2005 has made provisions to extend maternity leave benefits from the previous period of three months to nine months.
- The Penal Code amendments introduced punishment for offences hitherto not included, and increased punishment for sexual offences.
- The Domestic Violence Bill was presented to Parliament in February 2005 and was later presented again with proposed amendments.

112 This section is compiled from: ADB, *Country Gender Assessment: Sri Lanka*, 2004; UNIFEM, *Report of the Fifth South Asia Regional Ministerial Conference Celebrating Beijing Plus Ten*, 3–5 May 2005, Islamabad, Pakistan; UNESCAP, *State of Women in Urban Local Government*, Chapter 5 – Gender Equality.

- With regard to the elimination of sexual-based gender violence, steps have been taken to establish police desks for women and children. The law enforcement agencies, mainly the police, the army and the judiciary have been gender-sensitized.
- Discrimination against women in land and property has been eliminated through amendments and citizenship laws as well as the land development ordinance.

Gender equality issues in governance and law include the following:

- Despite constitutional guarantees, very few laws have been amended to remove gender discrimination and make progress toward equality.
- The implementation of the BPA is dependent on the capacity of ministries to absorb the Plan into their own budgetary allocations and plans.
- The Domestic Violence Bill was commendable but resistance articulated on cultural grounds by parliamentarians raises concerns about the feasibility of its implementation.
- As a result of lobbying since 1995 by both government institutions and civil society groups, the cabinet has, in principle, approved a 33 percent quota for women to occupy positions in local government institutions. *However, culture, tradition, money and 'muscle-power' retard the upward mobility of women in power-sharing and decision-making, especially in politics.*[113]
- Although improving, the collection of gender-disaggregated data needs to be very context and area specific as women are not a homogenous group; for example the effects of conflict on women from different ethnicities and regions differ strongly.

9.4 Governance, Institutional Arrangements and Gender

Three critical factors prevent gender inclusiveness in Sri Lankan governance. These are: 1) completely insufficient representation of women in political institutions; 2) the predominance of patriarchal systems that work to override laws and advocacy efforts; and 3) as a result of factors 1 and 2, limited capacity of women decision makers to raise and address gender aspects.

Increased political participation of women is believed to be critical to promote better protection of women from disasters and to help sensitize all DRR actions. In Sri Lanka women are severely underrepresented at the political and decision-making levels. Although some women have occupied the highest positions such as that of president, only 56 women have represented their constituencies and only a few have held ministerial portfolios since the institution of parliament in 1942.[114] The reality of women's underrepresentation is ironic considering that the GoSL's commitment to gender equality was formalized in legislation decades before it became a party to the CEDAW. Women received the right of franchise together with men in 1931, and the right to represent their fellow citizens in elected parliament. The social policies on health and education put into place in the 1940s and 1950s guaranteed equal access for women and girls. The constitution of 1978 guaranteed equal rights for women and men and provided the basis to remove gender discrimination. The constitution recognized the need to move beyond formal equality and achieve substantive gender equality at all levels.[115]

9.4.1 Barriers to Gender Equality and Enforcement of Legal Instruments

Despite considerable progress, the strong influence of gender role stereotyping, low awareness of rights and weak use of remedial measures undermines promotion of human rights and enforcement of laws and policies. It is apparent that relying on laws and policies is not sufficient to achieve gender equality. Other measures including gender education, effective law enforcement and policy implementation, as well as social pressure may achieve more tangible results. Factors that constitute barriers to enforcement include the following:

- **Weak knowledge of laws and use of remedial mechanisms.** Many citizens, both women and men, are not aware of laws and mechanisms set up to report abuses. Even for those with knowledge, the social stigmas can be so considerable that they do not seek help or complain, for example in cases of sexual-based gender violence.
- **Perceptions of women's roles.** Women have been disadvantaged by perceptions of men as breadwinners, producers and community leaders, and the normative relegation of women to their reproductive role and to dependency and subordination.
- **Lack of gender sensitivity among professionals.** Gender role stereotypes are embedded in perceptions of policy makers, administrators, authorities and employers.
- **Low participation of women in government.** Stereotypical attitudes are not confronted because participation of women is minimal in policy-making and law drafting processes.

113 UNIFEM, *Report of the Fifth South Asia Regional Ministerial Conference Celebrating Beijing Plus Ten*, 3–5 May 2005, Islamabad, Pakistan, page 37.

114 OneWorldnet website.

115 *Country Gender Assessment: Sri Lanka*, Asian Development Bank, South Asia Regional Development Department, and Regional and Sustainable Development Department, 2004, page 2.

- **Programme designs are not effective against stereotyping.** A study by the Centre for Women's Research (CENWOR) indicates that gender stereotyping is present in tertiary education and technical training programmes. Trends were similar in the post-tsunami design of livelihood recovery programmes and in capacity development training.
- **Need for greater challenge to stereotyping by women.** Gender role stereotypes are also inculcated in women. Many educated employed women with resources do not challenge oppressive social practices that negate their personhood and individual worth. Women's rising economic roles have not necessarily resulted in equitable division of household labour.

Women working outside the home and/or earning independent cash incomes, migration overseas for employment and higher levels of education are factors that could break the resistance to change and reduce gender double standards. In contrast to patriarchal norms outside the home, joint decision-making appears to prevail in many families irrespective of whether women are employed or confined to domesticity.

9.5 Gender Equality in Domestic Disaster Policies, Plans and Legislation

Sri Lanka has adopted laws, policies and plans that can be used as springboards for integrating gender concerns in DRR and EWS. Yet, there are still opportunities to integrate gender concerns in policies and plans as a constitution reform process is ongoing.

The Road Map Volume II sets out a medium-term programme to review developments since the adoption of the Women's Charter (see section 9.3). Key objectives are to provide legal 'teeth' to the charter and promote greater participation of women in political parties such as through quotas for women in election laws. However the road maps fail to clearly elaborate upon linkages between these objectives and DRR/EWS.

Most disaster-related Sri Lankan legislation focuses on inter-institutional mechanisms, and institutional roles in addressing special needs of females and males vulnerable to disaster are rarely mentioned. Neither the Disaster Management Act of 2005 nor the Draft National Disaster Management Policy (April 2006) mentions gender, women or children. Guiding principle number 10 in the policy refers to, but does not elaborate upon equity: *Ensuring equitable distribution of relief, neutrality and impartiality in the provision of assistance, respect for the dignity of affected persons in post-disaster situations.*

The need to engender EWS is not mentioned in any policy document or legislation.

9.6 Stakeholders on Gender Aspects in DRR and EWS

There are a large number of organizations working towards gender equality and studying gender aspects in Sri Lanka. Since the late 1970s, when Sri Lanka signed the CEDAW, a number of government ministries and organizations were established focusing on women's rights and gender equality. Regrettably, changes have been very slow.

The **Ministry of Women's Affairs** was established in 1988 and contains a Children's Secretariat. This ministry is ultimately responsible for formulating state policy on women's issues and drafted the 2002–2007 National Plan of Action for Women that advances women's rights in the areas of education, health care and violence against women.

The **Women's Bureau** was created in 1978 to implement national policy. The **National Committee on Women** mentioned above was established in 1993 to oversee the Women's Charter and a Gender Complaints Unit was created under the Committee's supervision and leadership.

The **Ministry of Women's Empowerment and Social Welfare** obtained cabinet approval to mainstream gender in post-tsunami relief and recovery work. The GoSL is especially focusing on land rights, appointment of women to disaster management committees and other decision-making roles, providing livelihood assistance, meeting health and reproductive needs, addressing the safety of women, and providing psycho-social support to victims.

Other relevant organizations include national **NGOs and CBOs** that either focus exclusively on women's concerns or on community-related issues including gender. It is estimated that over 3,000 NGOs/CBOs are active in different parts of the country. Some have special focus areas in research, information sharing, working with media, mobilization of resources, support for victims of violence, promotion of economic activities etc., while others meet needs of women in a more integrated fashion. Two umbrella organizations are the **Sri Lanka Women's NGO Forum** that consists of over 50 organizations working to popularize the BPA, and the **Sri Lanka Women's Conference**.

Among centres conducting research, **CENWOR** promotes women's entry into non-traditional occupations including politics. The **Pacific and Asian Women's Forum** has a regional office in Sri Lanka and conducts regional workshops and studies, distributes alternative media and publishes newsletter links. Many UN agencies and international NGOs also contribute to capacity development for women and work

on gender issues. These include **UNDP, UNIFEM, UNFPA, ILO, UNICEF, the World Bank, the Asian Development Bank, CARE and OXFAM**.

It is frequently noted in forums and literature that much more work remains to be done and that the achievement of equality goals will require greater coordination among all engaged organizations. In regard to DRR, greater overall engagement of women is needed. Some preliminary steps would include building the awareness and training for staff of the DMC and other DRR-related institutions. The **DMC** in its coordinating, planning and training functions among government organizations, donors, NGOS and communities should use its reach to influence inclusion of gender aspects in DRR.

Summary of Main Points

1. Gender equality has been achieved in primary and secondary education and women's literacy has reached 90 percent. However, this has not resulted in sufficient well-paid jobs with promotion opportunities for women, parity in legal rights and adequate political participation.
2. The MDGs for poverty and hunger are not on track. Rural areas are home to 88 percent of the poor and there are huge regional disparities in the distribution of wealth. People living in the tea estates, the North and East, and the tsunami affected areas are more likely to fall into a cycle of poverty.
3. Women and children suffered significantly higher casualties in the 2004 tsunami. Women, children and the elderly are more vulnerable to tsunamis and earthquakes; vulnerabilities include being indoors and the weak quality and resilience of construction. The change in population structure points to the need to monitor nutritional status and morbidity including psychological illness, cardiovascular disease and sexually transmitted diseases in the years to come.
4. Incidences of GBV were high prior to the tsunami, but the disaster increased women's vulnerability to GBV even further. Contributing factors include stress, loss and trauma, men's increased alcohol consumption, unequal compensation, poor design of sanitary areas in collective temporary accommodation, women's lack of participation in the design of assistance strategies, and failure by many actors to counter discriminatory societal norms. Men suffered in terms of their psychosocial well-being and erosion of coping abilities, and their specific needs were also poorly understood by assistance providers.
5. The tsunami disaster response highlighted land rights issues for women, originally at a disadvantage; recovery policies threatened to remove isolated traditional practices that protect women's rights to land. The escalation of hostilities in 2006 in the North and East has resulted in 400,000 more IDPs, mainly women and children.
6. Good practices in support of gender equality in DRR included the WCDM in Batticaloa, the People's Consultation on Post-Tsunami Recovery, house building for a group of tsunami-widowed IDPs using their own definitions of living space, and gender-infused training strategies and curricula for leading training agencies.
7. Sri Lanka has ratified major international conventions including the CEDAW that led to amendment of the Citizenship Act of 1948. Achievements toward the BPA include special budgetary allocations; extended maternity leave benefits; Penal Code amendments; a Domestic Violence Bill; police desks for women and children; gender sensitization of the police, the army and the judiciary; and elimination of discrimination against women in land and property.
8. Issues in equitable governance include slow progress on amending laws, capacity issues for the BPA and Domestic Violence Bill, and needs for context and area specific disaggregated data. Women are seriously underrepresented in politics, patriarchal systems dominate society, and women decision makers have limited capacity to raise and address gender aspects.
9. Many pre-CEDAW instruments and the constitution of 1978 guaranteed equal rights without discrimination. Explanations for the continued inequality centre on gender role stereotypes used in practice by policy makers, administrators and employers, women and men, as well as weak awareness and use of legal rights and remedial mechanisms amongst women.
10. A Women's Charter was established in 1993. The Road Map Volume II sets out a medium-term programme to review developments since the adoption of the Women's Charter. Neither the Disaster Management Act of 2005 nor the Draft National Disaster Management Policy (April 2006) mentions gender, women or children.
11. Government organizations focusing on women's rights include the Ministry of Women's Affairs, Women's Bureau, National Committee on Women, and the Ministry of Women's Empowerment and Social Welfare. National NGOs that interface with gender aspects are thought to number over 3,000. Others include CENWOR and the Pacific and Asian Women's Forum, as well as many donor and international NGOs. The DMC is well positioned to build its own capacity for gender awareness and to use its influence for inclusion of gender aspects in DRR.

Recommendations for Stakeholders[116]

Promote gender sensitive policies and programmes for DRR and EWS through:

Including women and men in governance and institutions for EWS

- Support the review of disaster management policies, plans and legislation to address gender-based vulnerability and increase equality in EWS participation and decision-making.
- Specifically ensure that the plan for EWS capacity development encourages participation of women from different sectors (government, civil society, communities, etc.)
- Clearly stipulate activities that designate EWS roles of and protective measures for women and men, and girls and boys.
- Provide support for gender awareness training to government staff and research to increase knowledge about gender aspects.

Strengthening understanding of gender-based vulnerability and capacity

- Promote gender analysis and the development of monitoring and evaluation tools to assess vulnerability of each gender and their access to information regarding hazards and vulnerability, and to follow up on equality in all EWS projects and programmes.
- Draw attention to the increased vulnerability of women to GBV following disasters for consideration in preparedness planning, and raise awareness of harmful response and recovery practices.
- Make effective use of education systems, female politicians and legislators, and organizations and groups with gender-related mandates to further risk knowledge and participation in risk management and EWS.
- Provide capacity development support to community groups and networks to help change attitudes and promote empowerment of women through risk knowledge.
- Ensure the participation of women in the development of building codes, land titling, and environmental protection laws and practices.

Meeting warning needs specific to gender, age and physical capacity

- Involve women in assessing their own risks and in designing warning systems that reflect their monitoring and warning needs relative to individual hazards.
- Increase resources to incorporate protective measures in EWS for the disabled and elderly.

Ensuring warning messages reach both gender

- Prepare actionable warning messages that employ a gender sensitive approach in the context of community disaster preparedness and awareness programmes. Various times of day and the activities that females and males will be engaged in should be considered in terms of how each group can be effectively reached, and the reaction time they will need to flee to safety relative to the types of disasters they may face. The protection of children will require extra time for evacuation.

Learning to design EWS that work for both women and men

- Develop gender sensitive guidelines that focus on all aspects of DRR and EWS using a cooperative approach, and make use of lessons learned in previous disasters in Sri Lanka and other countries.
- Empower women through training and replication of good practices to become actors in community-based DRR and EWS.
- Evacuation drills, routes and procedures should be mapped taking into account gender considerations such as access, security, etc. for women.

116 These recommendations 'bounce off' recommendations in the other chapters.

Annex I – Glossary of Key Terms[117]

Building codes

Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure to insure human safety and welfare. Building codes include both technical and functional standards.

Capacity

A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personnel or collective attributes such as leadership and management. Capacity may also be described as capability.

Capacity development

The process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time (UNDP).

On the other hand, ***capacity building*** *commonly refers to a process that supports only the initial stages of building or creating capacities and alludes to an assumption that there are no existing capacities to start from. Capacity building can be relevant to crisis or immediate post-conflict situations where existing capacity has largely been lost due to capacity destruction or capacity flight.*

Disaster

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

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk reduction

The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Early warning

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.

Early warning systems include a chain of concerns, namely: understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population; and undertaking appropriate and timely actions in response to the warnings.

El Niño-southern oscillation (ENSO)

A complex interaction of the tropical Pacific Ocean and the global atmosphere that results in irregularly occurring episodes of changed ocean and weather patterns in many parts of the world, often with significant impacts, such as altered marine habitats, rainfall changes, floods, droughts, and changes in storm patterns.

Environmental degradation

The reduction of the capacity of the environment to meet social and ecological objectives and needs. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards.

Forecast

Definite statement or statistical estimate of the occurrence of a future event (UNESCO, WMO).

117 See UN/ISDR, "Terminology: Basic terms of disaster risk reduction," http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm.

Geographic Information Systems (GIS)

Analysis that combines relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programs for capturing, storing, checking, integrating, analysing and displaying data about the earth that is spatially referenced.

Geographic information systems are increasingly being utilized for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures.

Hazard

A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency and probability.

Mitigation

Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Preparedness

Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property.

Prevention

Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Public awareness

The processes of informing the general population, and increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

Recovery

Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Risk

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions.

Conventionally risk is expressed by the notation Risk = Hazards x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.

Vulnerability

The conditions determined by physical, economic and environmental factors or processes that increase the susceptibility of a community to the impact of hazards.

Annex II – Documents Consulted

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Annex III – Developing Early Warning Systems: A Checklist[140]

Key Element 1:

RISK KNOWLEDGE

Aim: *Establish a systematic, standardized process to collect, assess and share data, maps and trends on hazards and vulnerabilities.*

Key Actors

International, national and local disaster management agencies; meteorological and hydrological organizations; geophysical experts; social scientists; engineers; land use and urban planners; researchers and academics; organizations and community representatives involved in disaster management; international and UN agencies such as WMO, UN/ISDR, UNEP, UNU-EHS, UNOSAT, UNDP, FAO, UNESCO.

Checklist

1. Organizational Arrangements Established

- Key national government agencies involved in hazard and vulnerability assessments identified and roles clarified (e.g. agencies responsible for economic data, demographic data, land use planning, social data etc).
- Responsibility for coordinating hazard identification, vulnerability and risk assessment assigned to one national organization.
- Legislation or government policy mandating the preparation of hazard and vulnerability maps for all communities in place.
- National standards for the systematic collection, sharing and assessment of hazard and vulnerability data developed, and standardized with neighbouring or regional countries, where appropriate.
- Process for scientific and technical experts to assess and review the accuracy of risk data and information developed.
- Strategy to actively engage communities in local hazard and vulnerability analyses developed.
- Process to review and update risk data each year, and include information on any new or emerging vulnerabilities and hazards established.

2. Natural Hazards Identified

- Characteristics of key natural hazards (e.g. intensity, frequency and probability) analysed and historical data evaluated.
- Hazard maps developed to identify the geographical areas and communities that could be affected by natural hazards.
- An integrated hazard map developed (where possible) to assess the interaction of multiple natural hazards.

3. Community Vulnerability Analysed

- Community vulnerability assessments conducted for all relevant natural hazards.
- Historical data sources and potential future hazard events considered in vulnerability assessments.
- Factors such as gender, disability, access to infrastructure, economic diversity and environmental sensitivities considered.
- Vulnerabilities documented and mapped (e.g. people or communities along coastlines identified and mapped).

4. Risks Assessed

- Interaction of hazards and vulnerabilities assessed to determine the risks faced by each region or community.
- Community and industry consultation conducted to ensure risk information is comprehensive and includes historical and indigenous knowledge, and local information and national level data.
- Activities that increase risks identified and evaluated.
- Results of risks assessment integrated into local risk management plans and warning messages.

5. Information Stored and Accessible

- Central 'library' or GIS database established to store all disaster and natural hazard risk information.

118 This checklist is drawn from UN/ISDR, Developing Early Warning Systems: A Checklist, An outcome of the Third International Conference on Early Warning (EWCIII) hosted by the Government of Germany in Bonn, 27–29 March 2006.

- Hazard and vulnerability data available to government, the public and the international community (where appropriate).
- Maintenance plan developed to keep data current and updated.

Key Element 2:

MONITORING AND WARNING SERVICE

Aim: *Establish an effective hazard monitoring and warning service with a sound scientific and technological basis.*

Key Actors

National meteorological and hydrological services; specialised observatory and warning centres (e.g. for water, volcano); universities and research institutes; private sector equipment suppliers; telecommunications authorities; quality management experts; regional technical centres; UN agencies such as UN/ISDR, WMO, FAO, UNESCO, UNEP, UNOSAT, OCHA, ITU.

Checklist

1. Institutional Mechanisms Established

- Standardized process, and roles and responsibilities of all organizations generating and issuing warnings established and mandated by law.
- Agreements and interagency protocols established to ensure consistency of warning language and communication channels where different hazards are handled by different agencies.
- An all-hazard plan to obtain mutual efficiencies and effectiveness among different warning systems established.
- Warning system partners, including local authorities, aware of which organizations are responsible for warnings.
- Protocols in place to define communication responsibilities and channels for technical warning services.
- Communication arrangements with international and regional organizations agreed and operational.
- Regional agreements, coordination mechanisms and specialized centres in place for regional concerns such as tropical cyclones, floods in shared basins, data exchange, and technical capacity building.
- Warning system subjected to system-wide tests and exercises at least once each year.
- A national all-hazards committee on technical warning systems in place and linked to national disaster management and reduction authorities, including the national platform for disaster risk reduction.
- System established to verify that warnings have reached the intended recipients.
- Warning centres staffed at all times (24 hours per day, seven days per week).

2. Monitoring Systems Developed

- Measurement parameters and specifications documented for each relevant hazard.
- Plans and documents for monitoring networks available and agreed with experts and relevant authorities.
- Technical equipment, suited to local conditions and circumstances, in place and personnel trained in its use and maintenance.
- Applicable data and analysis from regional networks, adjacent territories and international sources accessible.
- Data received, processed and available in meaningful formats in real time, or near-real time.
- Strategy in place for obtaining, reviewing and disseminating data on vulnerabilities associated with relevant hazards.
- Data routinely archived and accessible for verification and research purposes.

3. Forecasting and Warning Systems Established

- Data analysis, prediction and warning generation based on accepted scientific and technical methodologies.
- Data and warning products issued within international standards and protocols.
- Warning analysts trained to appropriate international standards.
- Warning centres equipped with appropriate equipment needed to handle data and run prediction models.
- Fail-safe systems in place, such as power back-up, equipment redundancy and on-call personnel systems.
- Warnings generated and disseminated in an efficient and timely manner and in a format suited to user needs.
- Plan implemented to routinely monitor and evaluate operational processes, including data quality and warning performance.

Key Element 3:

DISSEMINATION AND COMMUNICATION

Aim: *Develop communication and dissemination systems to ensure people and communities are warned in advance of impending natural hazard events and facilitate national and regional coordination and information exchange.*

Key Actors

International, national and local disaster management agencies; national meteorological and hydrological services; military and civil authorities; media organizations (print, television, radio and online); businesses in vulnerable sectors (e.g. tourism, aged care facilities, marine vessels); communitybased and grassroots organizations; international and UN agencies such as UN/ISDR, IFRC, UNDP, UNESCO, UNEP, WMO, OCHA.

Checklist

1. Organizational and Decision-making Processes Institutionalised

- Warning dissemination chain enforced through government policy or legislation (e.g. message passed from government to emergency managers and communities etc).
- Recognized authorities empowered to disseminate warning messages (e.g. meteorological authorities to provide weather messages, health authorities to provide health warnings).
- Functions, roles and responsibilities of each actor in the warning dissemination process specified in legislation or government policy (e.g. national meteorological and hydrological services, media, NGOs).
- Roles and responsibilities of regional or cross border early warning centres defined, including the dissemination of warnings to neighbouring countries.
- Volunteer network trained and empowered to receive and widely disseminate hazard warnings to remote households and communities.

2. Effective Communication Systems and Equipment Installed

- Communication and dissemination systems tailored to the needs of individual communities (e.g. radio or television for those with access; and sirens, warning flags or messenger runners for remote communities).
- Warning communication technology reaches the entire population, including seasonal populations and remote locations.
- International organizations or experts consulted to assist with identification and procurement of appropriate equipment.
- Multiple communication mediums used for warning dissemination (e.g. mass media and informal communication).
- Agreements developed to utilise private sector resources where appropriate (e.g. amateur radios, safety shelters).
- Consistent warning dissemination and communication systems used for all hazards.
- Communication system is two-way and interactive to allow for verification that warnings have been received.
- Equipment maintenance and upgrade programme implemented and redundancies enforced so back-up systems are in place in the event of a failure.

3. Warning Messages Recognised and Understood

- Warning alerts and messages tailored to the specific needs of those at risk (e.g. for diverse cultural, social, gender, linguistic and educational backgrounds).
- Warning alerts and messages are geographically-specific to ensure warnings are targeted to those at risk only.
- Messages incorporate the understanding of the values, concerns and interests of those who will need to take action (e.g. instructions for safeguarding livestock and pets).
- Warning alerts clearly recognisable and consistent over time and include follow-up actions when required.
- Warnings specific about the nature of the threat and its impacts.
- Mechanisms in place to inform the community when the threat has ended.
- Study into how people access and interpret early warning messages undertaken and lessons learnt incorporated into message formats and dissemination processes.

Key Element 4:

RESPONSE CAPABILITY

Aim: *Strengthen the ability of communities to respond to natural disasters through enhanced education of natural hazard risks, community participation and disaster preparedness.*

Key Actors

Community-based and grassroots organizations; schools; universities; informal education sector; media (print, radio,

television, on-line); technical agencies with specialised knowledge of hazards; international; national and local disaster management agencies; regional disaster management agencies; international and UN agencies such as OCHA, UNDP, UNEP, FAO, UNESCO, UN/ISDR, IFRC, WMO.

Checklist

1. Warnings Respected

- Warnings generated and distributed to those at risk by credible sources (e.g. government, spiritual leaders, respected community organizations).
- Public perception of natural hazard risks and the warning service analysed to predict community responses.
- Strategies to build credibility and trust in warnings developed (e.g. understanding difference between forecasts and warnings).
- False alarms minimised and improvements communicated to maintain trust in the warning system.

2. Disaster Preparedness and Response Plans Established

- Disaster preparedness and response plans empowered by law.
- Disaster preparedness and response plans targeted to the individual needs of vulnerable communities.
- Hazard and vulnerability maps utilized to develop emergency preparedness and response plans.
- Up-to-date emergency preparedness and response plans developed, disseminated to the community, and practiced.
- Previous disaster events and responses analysed, and lessons learnt incorporated into disaster management plans.
- Strategies implemented to maintain preparedness for recurrent hazard events.
- Regular tests and drills undertaken to test the effectiveness of the early warning dissemination processes and responses.

3. Community Response Capacity Assessed and Strengthened

- Community ability to respond effectively to early warnings assessed.
- Response to previous disasters analysed and lessons learnt incorporated into future capacity building strategies.
- Community-focused organizations engaged to assist with capacity building.
- Community and volunteer education and training programmes developed and implemented.

4. Public Awareness and Education Enhanced

- Simple information on hazards, vulnerabilities, risks, and how to reduce disaster impacts disseminated to vulnerable communities and decision-makers.
- Community educated on how warnings will be disseminated and which sources are reliable and how to respond to different types of hazards after an early warning message is received.
- Community trained to recognise simple hydro-meteorological and geophysical hazard signals to allow immediate response.
- On-going public awareness and education built in to school curricula from primary schools to university.
- Mass media and folk or alternative media utilized to improve public awareness.
- Public awareness and education campaigns tailored to the specific need of each audience (e.g. children, emergency managers, media).
- Public awareness strategies and programmes evaluated at least once per year and updated where required.

Cross-Cutting Issue:

GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS

Aim: *Develop institutional, legislative and policy frameworks that support the implementation and maintenance of effective early warning systems.*

Key Actors

Political leaders; policy makers (e.g. environment, development and planning departments); international, national and local disaster management agencies; meteorological and hydrological organizations; researchers and academics; non-government organizations; international and UN agencies such as UNDP, UNEP, FAO, UNESCO, UN/ISDR, WMO, World Bank and regional development banks, IFRC.

Checklist

1. Early Warning Secured as a Long Term National and Local Priority

- Economic benefits of early warning highlighted to senior government and political leaders using practical methods such as a cost-benefit analysis of previous disasters.

- Examples and case studies of successful early warning systems disseminated to senior government and political leaders.
- Early warning role models or "champions" engaged to advocate early warning and promote its benefits.
- The priority natural hazard risk requiring an early warning system identified, and operational arrangements within a multihazard framework established.
- Early warning integrated into national economic planning.

2. Legal and Policy Frameworks to Support Early Warning Established

- National legislation or policies developed to provide an institutional and legal basis for implementing early warning systems.
- Clear roles and responsibilities defined for all organizations (government and nongovernment) involved in early warning.
- Overall responsibility and authority for coordination of early warning assigned to one national agency.
- One political leader or senior government official empowered by law as the national decision maker.
- Policies developed to decentralise disaster management and encourage community participation.
- Local decision making and implementation of early warning systems placed within broader administrative and resource capabilities at the national or regional level.
- Regional and cross-border agreements established to ensure early warning systems are integrated where possible.
- Relationships and partnerships between all organizations involved in early warning institutionalised and coordination mechanisms mandated.
- Early warning integrated into disaster reduction and development policies.
- Monitoring and enforcement regime in place to support policies and legislation.

3. Institutional Capacities Assessed and Enhanced

- Capacities of all organizations and institutions involved assessed and capacity building plans and training programmes developed and resourced.
- Non-governmental sector engaged and encouraged to contribute to capacity building.

4. Financial Resources Secured

- Government funding mechanism for early warning and disaster preparedness developed and institutionalised.
- Access to funding at the international or regional level explored.
- Public/private partnerships utilised to assist with early warning system development.

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