Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami

Final Report

UN Flash Appeal Project

For the period from 1 January 2005 to 31 December 2007

Prepared by UN/ISDR Platform for the Promotion of Early Warning

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This report was compiled by the UN/ISDR Platform for the Promotion of Early Warning based on the final reports of the above-mentioned 16 direct implementing partners. The editorial and report production team was comprised of Yoko Hagiwara, Stefanie Dannenmann and Sandra Amlang. The report has been reviewed by the implementing partners and by UN/ISDR staff members in Bangkok, Geneva, New York and Nairobi.

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Acronyms

ABU	Asia-Pacific Broadcasting Union
ADPC	Asian Disaster Preparedness Center
ADRC	Asian Disaster Reduction Center
ADRRN	Asia Disaster Reduction and Response Network
AIDCO	European Commission: EuropeAid Co-operation Office
AIDMI	All India Disaster Mitigation Institute
AMCEN	African Ministerial Conference on Environment
APELL	Awareness and Preparedness for Emergencies at Local Level
ASEAN	Association of South East Asian Nations
AU	African Union
BBC	British Broadcasting Corporation
CBDP	Community-based Disaster Preparedness
CBIS	Community-based Information System
CBO	Community-based organization
CNN	Cable News Network
CRED	Centre for Research on the Epidemiology of Disasters
CREDA	Caribbean Disaster and Emergency Response Association
CREED	Centre for Rural Education and Economic Development of India
DEWA	Division of Early Warning and Assessment of UNEP
DKKV	Deutsches Komitee Katastrophenvorsorge e.V. (German Committee for Disaster Reduction)
DLR	German Aerospace Center (Deutsches Luft- und Raumfahrt Zentrum)
DMC	Disaster Management Committee
DMC	Disaster Management Centre of Sri Lanka
DMT	Disaster Management Team
EC	European Commission
ECHO	European Commission's Humanitarian Aid Office
EDWG	UN/ISDR Environment and Disaster Working Group
EWC	International Conference on Early Warning
FAO	Food and Agriculture Organization
GLOSS	Global Sea Level Observing System
GRID	Global Resource Information Database
GTS	Global Telecommunication System
GTZ	German Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit)
HABITAT	United Nations Human Settlements Programme
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning System
ICPAC	IGAD Climate Prediction and Application Centre
IDNDR	International Decade for Natural Disaster Reduction (1990-1999)
IEWP	International Early Warning Programme
IFRC	International Federation of Red Cross and Red Crescent Societies
IGAD	Intergovernmental Authority on Development
IGSSS	Indo-Global Social Service Society
IOC	Intergovernmental Oceanographic Commission
IRI	The International Research Institute for Climate and Society, Columbia University, USA
IRP	International Recovery Platform
ISDR	International Strategy for Disaster Reduction
ITIC	International Tsunami Information Center
ITU	International Telecommunication Union
JMA	Japan Meteorological Agency
KAB	Knowledge, Attitude, Behaviour

KOGAMI	Tsunami Prepared Community in Padang, Indonesia
LIPI	Lembaga Ilmu Pengetahuan Indonesia (Indonesian Institute of Science)
MEAs	Multilateral Environmental Agreements
MEEW	Ministry of Environment, Energy and Water of Maldives
NDWC	National Disaster Warning Center of Thailand
NEAMS	North Eastern Atlantic and Mediterranean Seas
NGO	Non-governmental organization
NIDM	National Institute of Disaster Management of India
NMHS	National Meteorological and Hydrological Services
PA	Public Address
PPEW	Platform for the Promotion of Early Warning
PTWC	Pacific Tsunami Warning Center
RTH	Regional Telecommunication Hubs
SADC	Southern Africa Development Community
SADRC	Southern African Research and Documentation Center
SEAs	Strategic Environmental Assessments
SEEDS	Sustainable Environment and Ecological Development Society
SNAP	Strategic National Action Plan
SOP	Standard Operating Procedures
SOPAC	South Pacific Applied Geoscience Commission
TCDEW	Technical Committee for Disaster Early Warning of Sri Lanka
TEC	Tsunami Evaluation Coalition
TEWS	Tsunami Early Warning System(s)
TEWIS	Tsunami Early Warning Information System
TOR	Terms of Reference
TVE	Television Trust for the Environment
UNCCD	United Nations Convention to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNITAR	United Nations Institute for Training and Research
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNOOSA	United Nations Office for Outer Space Affairs
UNU-EHS	United Nations University - Institute for Environment and Human Security
UNV	United Nations Volunteers
USA	United States of America
USAID	United States Agency for International Development
USGS	United States Geological Survey
VHF	Very High Frequency
WCDR	World Conference on Disaster Reduction
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development

Executive summary

The objective of the initiative, "Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami", facilitated and coordinated by the United Nations International Strategy for Disaster Reduction (UN/ISDR), was to provide an overall integrated framework for strengthening early warning systems in the Indian Ocean region by building on the existing systems and to facilitate coordination among various specialized and technical institutions. The project has been highly relevant to the mandate of the UN/ISDR of advocating disaster risk reduction within the Hyogo Framework for Action, 2005-2015: Building the Resilience of Nations and Communities to Disasters[1] and the work of the Platform for the Promotion of Early Warning (PPEW), one of the thematic platforms of the ISDR system.

The project underscored a partnership approach to supporting the integrated development of tsunami early warning systems in close collaboration with the numerous United Nations and other organizations which have been devoted to improving disaster risk management and risk reduction. In particular, the project supported the United Nations Educational, Scientific and Cultural Organization Intergovernmental Oceanographic Commission (UNESCO/IOC) in its leadership to achieve a consensus on the core elements of a tsunami early warning system and set-up an interim warning system in the Indian Ocean region.

The project was financed with a total of US$10.5 million in contributions from seven donors, namely the Governments of Finland, Germany, Japan, Netherlands, Norway, Sweden, and the European Commission Humanitarian Aid Office (ECHO).

The project components were identified broadly in two different areas, namely warning system development and preparedness. As a cross-cutting theme, the project has promoted "people-centred early warning systems" emphasizing (i) risk knowledge, that is, prior knowledge of the risks faced by communities, (ii) monitoring and warning service, (iii) communications and dissemination of understandable warnings to those at risk and (iv) response capability and preparedness to act by those threatened aspects.

The project was coordinated by the UN/ISDR-PPEW, as part of the larger Flash Appeal coordinated by UNOCHA, and was implemented by 16 partners, namely United Nations Development Programme (UNDP) India and Sri Lanka Offices, the United Nations Environment Programme (UNEP), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), United Nations Educational, Scientific and Cultural Organization (UNESCO) Jakarta Office, the UNESCO Intergovernmental Oceanographic Commission (UNESCO/IOC), the United Nations Office for Project Services (UNOPS), the United Nations University Institute for Environment and Human Security (UNU-EHS), the World Meteorological Organization (WMO), the All India Disaster Mitigation Institute (AIDMI), the Asia-Pacific Broadcasting Union (ABU), the Asian Disaster Reduction Center (ADRC), the Asian Disaster Preparedness Centre (ADPC), the Centre for Research on the Epidemiology of Disasters (CRED), Sustainable Environment and Ecological Development Society (SEEDS) and the University of Geneva.

The activities of the project were structured into five key components, core system implementation, integrated risk management, public awareness and education, community-level approaches and project coordination. An interim tsunami early warning system in the Indian Ocean region has been operational since April 2005 with interim tsunami advisory information issued by two institutions, the Pacific Tsunami Early Warning Center in Hawaii and the Japan Meteorological Agency in Tokyo. These tsunami advisory information have been received by tsunami focal points of the Indian Ocean countries designated by 25 countries to date. The project activities have been completed by 31 December 2006 except some capacity building activities undertaken by UNESCO/IOC, UNESCO Jakarta and UNDP Sri Lanka, which have been completed by 31 December 2007 without additional cost implication.

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[1] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, http://www.unisdr.org/eng/hfa/hfa.htm

Various lessons were learned from the project. Although both the multi-partner, multi-donor nature of the project and the time constraint for the implementation caused some administrative challenges, the project successfully assisted in strengthening coordination, partnerships, linkages and synergies among the implementing agencies and donors during the process of implementing the project. A number of local good practices have been identified through the regional offices of the UN/ISDR in Asia and Africa. Some success stories have been reported by implementing partners such as UNESCO/IOC, UNESCO Jakarta, WMO and UNDP Sri Lanka for the successful application of the procedures and warning systems developed under the project at the time of the occurrence of tsunami, earthquake and landslides in Indonesia and Sri Lanka in 2006 and 2007. All outputs and publication of the project have been disseminated to a wider audience by the UN/ISDR secretariat and each implementing partner to further enhance awareness on tsunami early warning and disaster risk reduction and to facilitate the Indian Ocean countries to exchange of experiences and replicate good practices.

The project contributed to maximizing effectiveness of inputs and resources by providing strategic direction for the implementation and monitoring of the project activities and avoiding overlaps between the implementing agencies. It was the first time that the UN/ISDR secretariat provided overall coordination to a project under the UN Flash Appeal which was not necessarily focusing exclusively on humanitarian assistance. Nevertheless, the integrated approach and coordination proved to be effective.

The project has created an enabling environment for coordination and partnership-building necessary for the development of "end-to-end" and "people-centred" early warning systems in the Indian Ocean region. However, the project activities are only the first step for establishing fully-fledged tsunami early warning systems within a multi-hazard framework. Strong political commitment of the Indian Ocean countries as well as substantial financial and technical supports from the international community are crucial to achieve this goal in the long term.

In order to realize the fully-fledged tsunami early warning systems (TEWS) with a close linkage with other ocean related hazards, the following actions are recommended.

- The UN/ISDR, UNESCO/IOC, WMO as well as other UN, international and regional institutions working on early warning systems should continue to provide their assistance to the Indian Ocean countries in enhancing capacities and mobilizing resources necessary for both establishment of the TEWS and the establishment of national platforms for disaster risk reduction.

- To generate an enabling environment for TEWS in the Indian Ocean region, the UN/ISDR secretariat, its regional offices and other members of the ISDR system should continue to assist the countries in Asia and Africa to establish and/or strengthen national platforms for disaster risk reduction to effectively implement the Hyogo Framework for Action.

- The regional coordination mechanism for the tsunami early warning systems through the UNESCO/IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning System (ICG/IOTWS) should be strengthened through the activities of the Sixth Working Group on Mitigation, Preparedness and Response in addition to the on-going discussion of the other working groups in order to ensure integration of tsunami early warning systems into national and regional mitigation, preparedness and response capability building efforts within a multi-hazard framework.

- Before the 26 December 2004 tsunami, many of the countries in the Indian Ocean region did not have a well organized disaster management system except for tropical cyclone-prone countries such as India and Bangladesh. Thus, National Disaster Management Offices in most countries were very weak, and there were few established national platforms for disaster risk reduction in the region. The roles of the National Disaster Management Offices should be further enhanced for better coordination within a country.

- Constructing structural measures such as sea walls and shelters should be considered to protect lives, properties, and significant infrastructures from tsunami. Currently, very few countries have implemented the structural measures mainly due to a lack of information on risks. Countries need to have access to such information.

- Accurate tsunami risk assessment based on paleo-tsunami research in the Indian Ocean region is needed. Currently, sufficient scientific information is not available on the historical occurrence of natural hazards in the region, except Indonesia for which some records are available only for the last few hundred years. Research outcomes would facilitate policy-making process in each country. In addition, historical and geographical research should be promoted to analyze what happened in the region in the past.

1. Introduction

1.1 Background

An earthquake measuring 9.0 on the Richter scale struck the western coast of Sumatra, Indonesia on 26 December 2004, triggering massive ocean waves or "tsunamis". The resulting unprecedented disaster impacted the lives of millions of people in the Indian Ocean region and, to a lesser extent, in other regions. The tsunami left more than 270,000 people dead and caused billions of dollars of damage. While many people are believed to have died in the earthquake itself in Indonesia near the epicenter, the main cause of death was trauma and drowning from the flux of seawater and waves pouring into coastal areas without warning. It is widely acknowledged that the death toll would have been drastically reduced if effective early warning systems had been in place in the Indian Ocean region.

On 6 January 2005, the leaders of the Association of South-East Asian Nations (ASEAN) met in Jakarta, Indonesia to discuss the aftermath of earthquake and tsunami. In the meeting, former United Nations Secretary General Kofi Annan launched a US$977 million Flash Appeal for emergency aid, the largest appeal ever made by the United Nations following a natural disaster. The meeting adopted the Declaration on Action to Strengthen Emergency Relief, Rehabilitation, Reconstruction and Prevention on the Aftermath of Earthquake and Tsunami Disaster of 26 December 2004.[2]

The declaration specifically addressed the need for establishing a regional early warning system as part of efforts to establish regional mechanisms on disaster prevention and mitigation. As well as building and managing the regional early warning system and disaster management, it addressed the need for developing and promoting national and regional human and institutional capacity, transfer of know-how, technology and scientific knowledge through international cooperation and partnership.

In line with the need expressed in the declaration, the United Nations Flash Appeal had proposed, among other humanitarian assistance initiatives, a proposal on early warning to be facilitated and coordinated by the UN/ISDR with the objectives of rapidly boosting the capacities for action and planning for early warning by public authorities. Prior to the tsunami of 26 December 2004, a tsunami warning system was not in place in the majority of the Indian Ocean countries although hydro-meteorological warning systems existed. Therefore, the proposal entitled "Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami" aimed to provide authoritative information on early warning needed by the humanitarian community and to provide a sound basis for coordination for the implementation of tsunami warning systems in the region.

The project was expected to provide an overall integrated framework for establishing early warning systems in the Indian Ocean by building on the existing systems, facilitating coordination among various specialized technical institutions and to provide overall organizational assistance. The proposal outlined a partnership approach to supporting the integrated development of tsunami early warning systems, recognizing the numerous UN and other organizations that would contribute to improving disaster risk management and risk reduction, including early warning systems of the affected countries. In particular, the project supported UNESCO/IOC in its leadership to establish the core elements of a TEWS. The key components of the core elements of the TEWS are defined in the following section.

Although the initial UN Flash Appeal proposal of the Early Warning Strengthening Project targeted only a sub-set of the affected countries, its scope later expanded to involve all 28 countries[3] in the Indian Ocean region. Subsequently, the proposal received a total of US$10.5 million contributions from seven donors, and the Governments of Finland, Germany, Japan, Netherlands, Norway and Sweden and European Commission's of Humanitarian Aid Office.

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[2] http://www.unisdr.org/ppew/tsunami/pdf/jakarta-6-january-declaration-on-action.pdf

[3] The UNESCO/IOC member countries in the Indian Ocean countries were 27 at the inception of the project. Djibouti became the 28th member during the project duration.

1.2 Relationship of the project to disaster risk reduction

The importance of early warning systems has been underlined in various resolutions of the General Assembly as a critical element of disaster reduction. When the UN/ISDR was established in 2000[4] as the successor to the International Decade for Natural Disaster Reduction (IDNDR, 1990-1999),[5] promotion of early warning was clearly underlined and included in its mandate. Historically, the significance of early warning for disaster reduction has also been repeatedly emphasized in major international agendas including the Yokohama Strategy,[6] the Agenda 21,[7] the Barbados Plan of Action for Small Island Developing States[8] and the Mauritius Strategy,[9] the Johannesburg Plan of Implementation,[10] the G8 summit in Gleneagles[11] as well as major multilateral environmental agreements (MEAs) including the UN Framework Convention on Climate Change and the UN Convention to Combat Desertification.

To promote the goals of the Yokohama Strategy of 1994, specific activities on early warning were undertaken during the IDNDR. In 1998, the International Conference on Early Warning Systems for Natural Disaster Reduction (EWC'98)[12] was convened in Potsdam, Germany with the focus on the state-of-the-art knowledge of early warning systems. The Second International Conference on Early Warning (EWC II)[13] was organized in Bonn, Germany, in 2003, by the UN/ISDR and the Government of Germany.[14] As a thematic platform of the ISDR system, PPEW was established in 2004 to specifically undertake global advocacy and coordination on early warning. PPEW's original work was the follow-up to efforts of the Working Group 2 on Early Warning[15] of the Inter-Agency Task Force on Disaster Reduction.

The Hyogo Framework of Action adopted at the World Conference on Disaster Reduction (WCDR)[16] in Kobe, Japan about a month after the tsunami of 26 December 2004, highlighted early warning as one of the major elements of disaster risk reduction which could both save lives and help protect livelihoods and national development gains. Early warning has been recognized as an effective tool to reduce vulnerabilities and to improve preparedness and response to natural hazards. The mandate of the UNESCO/IOC in leading the process of establishing a tsunami warning and mitigation system as well as the role of the UN/ISDR in linking it to international efforts for disaster reduction and facilitating the process were stated in various high-level conferences in 2005.[17]

1.3 Project objectives

The objectives of the project were to link the available technical capacities on tsunami early warning systems with humanitarian and emergency management capacities and quickly implement the first steps to establish effective tsunami warning capacities in the region. In particular, it aimed to assist facilitating an interim warning capacity based on existing national and international capacities, supporting a conference to achieve technical specification and political consensus on the design of an appropriate early warning

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[4] General Assembly Resolution (A/RES/54/219)
[5] Resolution proclaiming the 1990´s as the International Decade for Natural Disaster Reduction (A/RES/44/236)
[6] Yokohama Strategy and Plan of Action for a Safer World (1994), http://www.unisdr.org/eng/about_isdr/bd-yokohama-strat-eng.htm
[7] http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm
[8] Barbados Plan of Action for Small Island Developing States (1994), http://www.un.org/documents/ga/conf167/aconf167-9.htm
[9] Report of the International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (Port Louis, Mauritius, January 2005) (A/CONF.207/11), http://www.un.org/smallislands2005/documents/documents.html
[10] World Summit on Sustainable Development (WSSD, Johannesburg, South Africa, 2002) http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf
[11] Response to the Indian Ocean disaster, and future action on disaster risk reduction at the Gleneagles G8 meeting (2005) , http://www.g8.gov.uk/Files/KFile/PostG8_Gleneagles_Tsunami.pdf
[12] http://www.gfz-potsdam.de/ewc98/
[13] http://www.ewc2.org/
[14] Specifically the conference was organized by the German Committee for Disaster Reduction (DKKV) and the Federal Foreign Office.
[15] The members of the Inter Agency Task Force Working Group 2 were: ADRC, CDERA, Drought Monitoring Centre (Nairobi), FAO, GeoForschungsZentrum Potsdam, HABITAT, IRI, Max Planck Institute for Chemistry, SOPAC, UN/ISDR, UNCCD, UNDP, UNEP (Chair), UNESCO and WMO. http://www.unisdr.org/eng/task%20force/tf-working-groups2-eng.htm
[16] World Conference on Disaster Reduction, http://www.unisdr.org/wcdr/
[17] For more detailed information about the mandate of the UNESCO-IOC, see the summary of the Twenty-Third Session of the UNESCO/IOC Assembly (Paris, France, 21-30 June 2005) at: http://ioc3.unesco.org/indotsunami/IOC23/ioc23.htm

system, developing networks among practitioners and authorities concerned with all hazards, conducting regional meetings of relevant practitioners for both training and coordination aims, developing interim information materials for practitioners and community leaders, providing necessary coordination for the affected countries and developing educational support and demonstration projects.

2. Project implementation overview

2.1 Beneficiaries

Although the original UN Flash Appeal was confined to a sub-set of affected countries, a series of consultation meetings led to a general agreement by implementing agencies and donors that all countries affected by the 24 December 2004 tsunami and other countries at risk to tsunami should be involved in this project for the establishment of tsunami early warning system in the Indian Ocean Region. The project supported all countries that are members of the UNESCO/IOC[18] in the Indian Ocean region. At the outset, the number of the Indian Ocean member countries was 27, which later increased to 28 (indicated in Figure 1) when Djibouti formally joined. However, Djibouti, even as an informal IOC member, had participated in various project activities. Some project activities were attended by all 28 countries, but financial support was provided mainly for the participants from developing countries.

At the national level, the project not only benefited national governments but also their disaster management agencies, local authorities, scientific and technical institutions, the broadcasting sector as well as other practitioners from the civil society and communities at selective locations. Wider participation was sought for all project activities, in particular, at the regional, national and local level. Gender-related project activities were highlighted by such agencies as AIDMI, CRED, UNDP India and UNU-EHS.

Figure 1: Countries supported by the project

2.2 Main components of the project

The project components were identified broadly in two areas, namely warning system development and preparedness. The activities in these two areas were carried out simultaneously. As the project duration was relatively short, consideration was made as to how the short term assistance could be most effective, while promoting an integrated approach to the tsunami warning and mitigation system, including linkages to other hazard warning systems. The UNESCO/IOC, UNU-EHS, WMO and others have made considerable efforts to ensure that the concept of "end-to-end" tsunami early warning system will be adopted by national tsunami early warning centers and that the warnings issued at the national level are followed by an efficient anticipated response in terms of evacuation to safe areas prior to the arrival of a tsunami.

The flow of the warning and the components of an end-to-end tsunami warning and mitigation system are shown in Figure 2. The project covered only the start-up activities of the overall development of the early warning systems in the Indian Ocean region at regional, national and local levels.

[18] http://ioc3.unesco.org/indotsunami/interimsystem/focal_points.htm

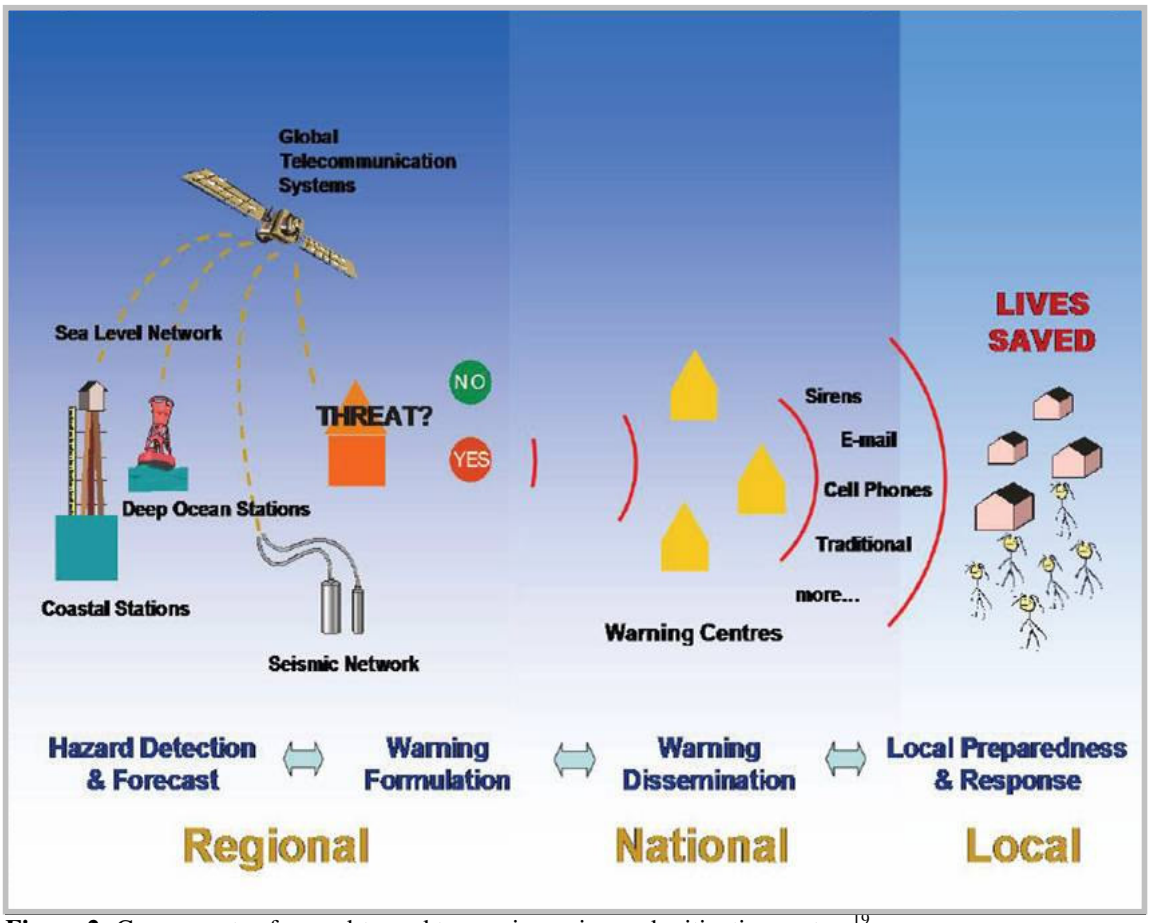

Figure 2: Components of an end-to-end tsunami warning and mitigation system[19]

Another important aspect of the warning systems was to make them "people-centred". The "people-centred" early warning systems emphasize (i) risk knowledge, that is, prior knowledge of the risks faced by communities, (ii) monitoring and warning service, (iii) communications and dissemination of understandable warnings to those at risk and (iv) response capability and preparedness to act by those threatened aspects. Sometimes this is called "end-to-end" early warning systems. While this project covered all these four components of the people-centred warning system, only some selective activities and pilots were covered for the last component, strengthening of preparedness and response capacity, as it would require much longer time. This component is expected to be considered during the process of establishing fully-fledged warning systems in the Indian Ocean region.

The process of establishing tsunami early warning systems started at the WCDR in 2005 with the reconfirmation by the Indian Ocean countries that the early warning system should be established in the region. In order to reach basic agreement on technical design and roles of relevant institutions for capacity building as well as for implementation, several high level consultations were held at the global and regional level during the first three months of the project duration. The regional coordination and efforts for mobilizing resources for fully-fledged early warning systems have continued since then. At the same time, national level assessment, capacity building as well as awareness-raising and various community based activities on enhancing preparedness and disseminating good practices took place at local and community levels.

[19] Source: UNESCO/IOC

The activities of the Early Warning Strengthening Project were structured into five key components. The Project Overview Plan has served as a guiding project document.

- **Core system implementation**
  Obtain regional consensus on the nature of a tsunami early warning system, design its core elements, particularly the observing system, national tsunami warning centres and permanent regional coordination mechanisms, and commence initial strengthening and implementation steps.

- **Integrated risk management**
  Integrate the tsunami early warning system into national disaster risk management and reduction mechanisms, seeking synergies with other hazard early warning systems and strengthening national capacities for tsunami-related disaster risk management and risk reduction.

- **Public awareness and education**
  Develop and disseminate information products on tsunami, early warning and risk reduction, tailored to local languages and cultures, targeting key intermediaries such as public officials, teachers and community leaders, and develop and promote mass media materials and campaigns.

- **Community-level approaches**
  Implement community-level pilot activities to test and demonstrate good practices, including hazard and vulnerability assessment, organizational strengthening, community participation, warning system operation, capacity building, evacuation planning and the design and construction of shelters and other works.

- **Coordination**
  Establish the mutual understandings, agreements, information resources, networks, support capacities and decision-making mechanisms needed to ensure the effective implementation of the project and its early warning system objectives.

2.3 Institutional arrangements

The initiative was originally designed by the UN/ISDR-PPEW with extensive inputs from the UNESCO/IOC in order to support the technical coordination role of the UNESCO/IOC for the establishment of TEWS. One of the most significant aspects of this project was the establishment of partnerships and coordination mechanisms across a wide range of partners and donors and the fact that it provides an example of an integrated vehicle for supporting the implementation of the Hyogo Framework for Action. This partnership approach has brought an added value to the diversity of activities and a more coherent and coordinated approach to the region's urgent need for establishing an early warning system, thus maximizing the effectiveness of inputs and resources. Sixteen institutions led the activities of their specific expertise in the project jointly with more than 50 collaborating institutions. The PPEW provided the overall coordination of the initiative, with emphasis on the strategic overview, planning, monitoring and evaluation, facilitating partnerships, meeting donor requirements and disseminating information.

Table 1: List of direct implementing partners

United Nations agencies
United Nations Development Programme (UNDP) India Office
United Nations Development Programme (UNDP) Sri Lanka Office
United Nations Environment Programme (UNEP)
United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)
United Nations Educational, Scientific and Cultural Organization (UNESCO) Jakarta Office
UNESCO Intergovernmental Oceanographic Commission (UNESCO/IOC)
United Nations University Institute for Environment and Human Security (UNU-EHS)
United Nations Office for Project Services (UNOPS)
World Meteorological Organization (WMO)

Other regional and specialized institutions
All India Disaster Mitigation Institute (AIDMI)
Asia-Pacific Broadcasting Union (ABU)
Asian Disaster Preparedness Centre (ADPC)
Asian Disaster Reduction Center (ADRC)
Centre for Research on the Epidemiology of Disasters (CRED)
Sustainable Environment and Ecological Development Society (SEEDS)
University of Geneva

In Asia, these collaborating institutions included UNDP Regional Centre in Bangkok; UNESCO International Tsunami Information Centre in Hawaii; Disaster Management Center of Sri Lanka; Geological Survey and Mines Bureau of Sri Lanka; National Disaster Management Institute of India; the State of Tamil Nadu, India; the city and district of Galle, Sri Lanka; National Coordinating Body for Disaster Response and IDPs in Indonesia (BAKORNAS); Indonesian Institute of Sciences (LIPI); Indonesian Center for Disaster Mitigation, Institute of Technology Bandung; local community-based organization (KOGAMI), Padang, Indonesia; University of Delhi, India; Tamil Nadu Voluntary Health Association, India; University of Colombo, Sri Lanka; the Sri Lankan Technical Committee for Disaster Early Warning; National Disaster Management Center of the Maldives; Telecommunication Authority of the Maldives; Maldives Department of Meteorology; Department of Meteorology and Hydrology of Myanmar; National Disaster Warning Center of Thailand; Asia Disaster Reduction and Response Network (ADRRN); and the environmental authorities of Indonesia, Maldives and Sri Lanka.

In Africa, the collaborating institutions included Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre (ICPAC); Disaster Management Department, Tanzania; Local Authorities from Dar es Salaam, Tanga, Coast, Lindi and Mtwara, Tanzania; Federal Tanzania Meteorological Services; Ministry of Education, Tanzania; Civil protection Department, Comoros; Ministry of Education, Comoros; Geo-Physics Observatory Institute of University of Antananarivo, Madagascar; National Council of Emergency, Madagascar; National Meteorological Department, Madagascar; Ministry of Education and Scientific Research, Madagascar; National Disaster Secretariat in the Office of the President, Seychelles; Ministry of Education, Seychelles; Wildlife Club of Seychelles; Seychelles Meteorological Services; National Office for Disaster Risk Reduction, Djibouti; Ministry of Education, Djibouti; Red Cross, Mozambique; Ministry of Education, Mozambique; Ministry of Special Programmes, Office of the President, Kenya; Kenya Meteorological Department, Kenya Institute of Education; and National Disaster Management Centre, South Africa.

Other UN agencies, international, regional and national organizations including the United Nations Office for Coordination of Humanitarian Affairs (UNOCHA), United Nations Volunteers (UNV), World Health Organization (WHO), the World Bank, German Aerospace Agency (DLR) and International Federation of Red Cross and Red Crescent Societies (IFRC) carried out some early warning related activities either as a

part of the ISDR coordinated project or within their own specialized areas of support to tsunami affected Indian Ocean countries.

There was also close cooperation with the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/ IOTWS) supported by UNESCO/IOC.

2.4 Timeframe

This project was introduced within the Consolidated Appeals Process (CAP) of the UNOCHA. Due to the nature of the UN Flash Appeal of requesting international support within the extremely short period of time, UN/ISDR's project concept was immediately drafted in early January 2005. However, the core components of the projects were later redefined and elaborated in response to various suggestions from affected countries, implementing agencies and donors. In particular, the Project Overview Plan dated 30 April 2005, which was subsequently developed, reflected the discussions at the WCDR and its outcome document, Hyogo Framework for Action. A sequence of the relevant events is shown in Table 2 (page 31).

The Early Warning Strengthening Project scheduled the first set of activities on early warning for the initial six months focusing on national level capacity assessment and consultation meetings. The second phase of another 18 months was envisioned for strengthening technical and institutional capacities at regional, national and local levels through training, awareness-raising and provision of necessary facilities. The project was multi-disciplinary in nature, to integrate the tsunami early warning system development into countries' other natural hazard warning systems and disaster risk management and reduction activities.

The activities of the first phase were completed as scheduled. However, capacity building activities in the second phase, given their nature, needed a longer time than what the original Flash Appeal allowed. Furthermore, some implementing agencies signed their agreement with the UN/ISDR secretariat late in 2005 after the contributions were made available. Therefore, the project period was first extended by the UNOCHA to 30 June 2006, and then to 31 December 2006.

Three implementing partners, UNESCO/IOC, UNESCO Jakarta, UNDP Sri Lanka had informed the UN/ISDR in early 2007 that some capacity building activities could not be completed by 31 December 2006. The three agencies requested a no-cost extension and have implemented the activities by 31 December 2007.

2.5 Summary of achievements

The performance of the project is reviewed based on the Project Overview Plan document and its logical framework matrix which was developed by UN/ISDR-PPEW. The summary of the activities by implementing agencies is shown in Table 3 (page 33). The summary of the achievements is presented in relation to the original logical framework matrix in Table 4 (page 35). The summary of the activities by country is shown in Table 5 (page 38).

2.5.1 Project component 1: core system implementation

As a first step for developing a regional tsunami early warning system (TEWS), regional consensus was required on the nature of the TEWS for designing its core technical elements, particularly the observing system, setting up an interim TEWS for immediate use, strengthening the institutional base for the operation of the TEWS including supporting the designation of national tsunami focal points and establishing regional coordination mechanisms, which would lead to the establishment of a fully-fledged TEWS for the Indian Ocean countries in the longer term.

This component referred to in this document as "core system implementation" was led by UNESCO/IOC and WMO in close collaboration with regional and national agencies including UNESCAP, ADRC, Pacific Tsunami Warning Center (PTWC) and Japan Meteorological Agency (JMA).

2.5.1.1 A regional consensus on the nature and core elements of a tsunami early warning system

Through the intergovernmental processes led by the UNESCO/IOC, a regional consensus and agreements were reached in a timely manner during the first three months of the project. This initial consensus

contributed to the progress toward core system implementation of a tsunami warning system in the Indian Ocean.

The WCDR which occurred within one month after the 26 December 2004 tsunami with participation by national governments, UN agencies, regional and other specialized institutions, non-governmental organizations and media, created political momentum and attracted much attention to early warning. The WCDR, in its plenary, included a special session "Indian Ocean disasters: risk reduction for a safer future". The conference also had a regional/thematic session "Promotion of tsunami disaster mitigation in the Indian Ocean – toward establishment of tsunami early warning systems in the Indian Ocean by sharing experiences in the Pacific Ocean" and a side event, "A scoping meeting on the development of tsunami early warning systems" organized by UN/ISDR, UNESCO/IOC, and ADRC.[20]

The special session of the WCDR resulted in a "Common Statement"[21] by the participants including the countries affected by the tsunami tragedy, recognizing the importance of enhancing national capacity and sharing experiences on natural hazards, disaster relief and post-disaster rehabilitation. The statement also recommended that necessary regional disaster response mechanisms be established and strengthened as soon as possible for all relevant natural hazards, which should include early warning systems, collaborative regional centers, and the use of science and technology. The regional/thematic session and the scoping meeting provided the first opportunity to share information on the process to develop more effective TEWS globally and in particular for the countries affected by the tsunami of 26 December 2004.

Following the WCDR, the UNESCO/IOC organized five major coordination meetings on the Indian Ocean Tsunami Warning System,[22] of which the UN/ISDR project supported the first two high-level meetings, in Paris (3-8 March 2005)[23] and Mauritius (14-16 April 2005).[24] The Paris meeting facilitated the 27 countries of the Indian Ocean to reach consensus on establishment of the Indian Ocean Tsunami Warning System. The UN/ISDR secretariat, jointly with the ADRC also organized "The Dialogue for High Level Administrative Policymakers on Establishing a Tsunami Early Warning Mechanism in the Indian Ocean"[25] in Tokyo, Japan, 22-24 February 2005 to enable regional leaders to gain insight into tsunami risks and existing early warning systems in Japan.

To elaborate key technical requirements for a TEWS, WMO organized "Multidisciplinary Workshop and Expert Meeting on the Exchange of Early Warning and Related Information Including Tsunami Warning in the Indian Ocean" in Jakarta, Indonesia, 14-18 March 2005. The workshop helped the Indian Ocean countries to reach technical consensus on the TEWS. The workshop endorsed the WMO Action Plan and developed the technical and operational plan. It also identified the countries' need for upgrading Global Telecommunication System (GTS).

The Mauritius meeting in April 2005 adopted the "Mauritius Declaration"[26] confirming (1) the establishment of ICG/IOTWS under the UNESCO/IOC; (2) the lead coordinating role of UNESCO/IOC for establishing the IOTWS; and (3) the necessary financial mechanism for the coordination of donors. The resolution of the 23rd IOC General Assembly, 21-30 June 2005 in Paris, France, endorsed the establishment of the ICG/IOTWS. The first session of the ICG/IOTWS was held in Perth, Australia, 3-5 August 2005.[27]

In parallel to the above-mentioned regional coordination efforts, national level capacity building started with identifying and confirming national tsunami warning centers' responsibilities. By 31 December 2006, 25 of the 28 Indian Ocean countries had established national tsunami focal points to be able to receive

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[20] http://www.unisdr.org/ppew/tsunami/pdf/IOTWS_scopingmtg.pdf
[21] The full text of the statement is available on: http://www.unisdr.org/wcdr/intergover/official-doc/L-docs/special-session-indian-ocean.pdf
[22] (1) Paris, France (3-8 March 2005), (2) Grand Baie, Mauritius (14-16 April 2005), (3) Perth, Australia (3-5 August 2005), (4) Hyderabad, India (14-16 December 2005) and (5) Bali, Indonesia (31 July - 2 August 2006)
[23] http://ioc.unesco.org/indotsunami/paris_march05.htm
[24] http://ioc.unesco.org/indotsunami/mauritius05/mauritius05.htm
[25] http://www.unisdr.org/ppew/tsunami/pdf/japan-proposal.pdf, http://www.unisdr.org/ppew/tsunami/pdf/japan-schedule.pdf
[26] http://ioc3.unesco.org/indotsunami/mauritius05/WR198.pdf
[27] The IOC General Assembly and the first session of the ICG/IOTWS were not the activities under the Early Warning Strengthening Project.

interim tsunami advisory information and alert the existing national warning centers such as national meteorological and hydrological services. A series of national coordination meetings both in Asia and Africa contributed to strengthening institutional set-up for receiving and disseminating the warnings at the national level.

2.5.1.2 Substantial progress on the initial strengthening and implementation process

Based on the initial agreement among the tsunami affected Indian Ocean countries and the partners, an interim IOTWS was established, relying exclusively on seismic data from earthquake monitoring stations, and became operational as of 1 April 2005 with the Japan Meteorological Agency (Tokyo) and the Pacific Tsunami Warning Center (Hawaii) providing interim tsunami advisory information to the designated national tsunami focal points. The WMO the interim system tested with two warning centres on the arrival time of disseminated information.

Enhancement of the technical capacity of the TEWS was supported by UNESCO/IOC and WMO. The UN/ISDR project partially supported these efforts. The UNESCO/IOC led the enhancement of existing Global Sea Level Observing System (GLOSS) network. The sea-level stations deployed in countries of the Indian Ocean represent core elements of the GLOSS network and constitute a fundamental basis for the monitoring and detection of tsunamis in the Indian Ocean. Training courses on sea level observation and data analysis for the Indian Ocean countries were organized by UNESCO/IOC in Tokyo, Japan (May 2006) and in Oostende, Belgium (November 2006).

The WMO assisted upgrading the Global Telecommunication System (GTS) to enable faster communication via telecommunication satellite. Operational satellite agencies have provided communication channels for the new instruments and have been engaged in supporting the process. The private sector has also been active and supportive. After fact-finding missions to eight countries, three countries (Bangladesh, Myanmar and Pakistan) were identified and their GTS was upgraded under the Early Warning Strengthening Project.

After the establishment of the interim TEWS in the Indian Ocean, national assessment missions[28] were carried out in response to the requests received from the countries in the region by international interdisciplinary teams of experts from UNESCO/IOC, WMO, ADRC, UNESCAP, United States Geological Service (USGS) and the UN/ISDR secretariat from May to September 2005 to identify existing and necessary capacity for the establishment and operation of a national tsunami warning and mitigation system within a multi-hazard framework. The missions also aimed at rapidly enhancing the capacities for action and planning by public authorities in the tsunami affected countries.

Other activities aiming to strengthen national capacities in the tsunami affected countries were two study tours organized by UNESCO/IOC, ADRC and the UN/ISDR secretariat in Tokyo, Japan (July 2005) and Hawaii, USA (July 2005) for government officials from Indian Ocean countries. Early warning systems for tsunami have been in place in the Pacific Ocean region for many years, coordinated by multilateral mechanisms under the UNESCO/IOC. A similar system has been sought for the Indian Ocean region. The study tour to Tokyo targeted the countries vulnerable to both local and distant tsunamis or countries with urbanized areas along the coast, while the study tour to Hawaii targeted the countries where the risk was high from distant tsunamis.

In addition, the UNESCO/IOC, in coordination with the WMO, the USGS and the UN/ISDR secretariat, organized various specific scientific courses from April 2005 to June 2006. The topics included Seismology and Tsunami Warning, GTS and Territorial Planning for Coastal Zones and Tsunami Numerical Modeling. A total of 252 participants from Indian Ocean countries were trained in Belgium, Indonesia, Malaysia, Maldives, Philippines, Sri Lanka and Thailand.

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[28] As of 31 December 2006, the assessment was conducted for 18 countries namely Bangladesh, Comoros, Indonesia, Islamic Republic of Iran, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Somalia, Sri Lanka, Tanzania, Thailand and Yemen. The national reports and a consolidated report are available at http://ioc3.unesco.org/indotsunami/nationalassessments.htm

2.5.2 Project component 2: integrated risk management

In order to lay a foundation for medium-term capacity building at the national level, the UN/ISDR project included a component for facilitating integration of the tsunami early warning system into national disaster risk management and reduction mechanisms, seeking synergies with other hazard early warning systems and strengthening national capacities for tsunami-related disaster risk management and risk reduction.

This component was led by UNESCO/IOC, UNDP India, UNDP Sri Lanka, UNEP, UNESCAP, UNU-EHS, WMO, AIDMI, UN/ISDR secretariat and others. Most of the implementing partners started the project activities under this component after September 2005 with the exception of the UNU-EHS which started its activities in May 2005.

This project component referred to as "integrated risk management" was composed of some start-up activities toward the goal of achieving longer term objectives which go beyond the project duration. This longer-term goal included supporting national efforts in assessing current national and local risk management capacities, setting up institutional and legislative frameworks, increasing multi-sector capacities, development of national and regional multi-hazard early warning systems, strengthening capacity for warning dissemination and preparedness and achieving vertical integration between national authorities and local communities. These items are expected to be pursued by establishing and strengthening national platforms for integrated risk management and risk reduction.

Within the framework of the ICG/IOTWS, the UN/ISDR secretariat contributed to, or facilitated the establishment of the Sixth Working Group on Mitigation, Preparedness and Response for the Intergovernmental Coordination Group (ICG) to ensure the integration of tsunami early warning systems into national and regional mitigation, preparedness and response capability building efforts within a multi-hazard framework guided by the Hyogo Framework for Action. The Sixth Working Group was formally adopted in the Third Session of the ICG in Bali, Indonesia in August 2006, and met at its Fourth Session in Mombasa, Kenya in February 2007.

Other project activities to enhance linkages between technical aspects of early warning and the broader disaster risk reduction and multi-hazard approach as well as to strengthen networking between disaster risk management national focal points and existing national authorities are presented below.

2.5.2.1 Promote the integration of a tsunami early warning system into national disaster risk management and reduction mechanisms

The 18 national assessment missions described under the section on core system implementation contributed to the initial stage of the countries' efforts for strengthening national capacity. It was found that most countries did not have appropriate national frameworks, mechanisms and capacities for disaster risk management relevant to tsunamis to ensure the integration of tsunami early warning system.

In order to assist the Indian Ocean countries and other countries in preparation of such national frameworks for disaster reduction, a draft document for consultation, "Words into Action" (November 2006)[29] for the implementation of the Hyogo Framework was developed, among other guiding documents, to promote the integration of tsunami early warning system into national disaster risk management and reduction mechanisms. A revised guideline document was presented at the Global Platform for Disaster Risk Reduction held in June 2007 in Geneva, Switzerland. UN/ISDR also developed a publication "Developing Early Warning Systems: A Checklist"[30] to support implementing effective people-centred early warning systems. The checklist was presented at the Third International Conference on Early Warning (Bonn, Germany, 27-29 March 2006). The original English version of the checklist has been translated into 19 languages.[31]

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[29] http://www.unisdr.org/eng/hfa/docs/words-into-action-consultation-draft.pdf
[30] http://www.unisdr-earlywarning.org
[31] The 19 languages are Afrikaans, Arabic, Bengali, Burmese, Chinese, Farsi, French, Hindi, Indonesian, Malay, Portuguese, Russian, Sinhalese, Somali, Spanish, Swahili, Tamil, Thai and Urdu.

At national level, the project supported the institutionalization of early warning systems within disaster management authorities and strengthening local governance for that purpose in selective countries. Both Indian and Sri Lankan authorities received technical assistance from respective UNDP country offices in this area.

Another important aspect of integrating tsunami early warning into national disaster risk management and reduction mechanisms was to promote TEWS within a multi-hazard framework. The Early Warning Strengthening Project and its implementing partners emphasized this aspect in various project activities. The UNESCO/IOC reviewed and stressed possible linkage between tsunami early warning systems and early warning systems for other ocean related hazards such as tropical cyclones and other coastal hazards during the 18 national assessment missions and subsequent regional consultations through the ICG/IOTWS. The WMO supported regional tsunami centres and brought together experts from those centres in a multi-hazard meeting in Singapore in November 2005 to discuss needs and exchange information to enhance maritime safety. The UN/ISDR secretariat, jointly with UNEP and the Government of Denmark organized an International Workshop "Strengthening resilience of local communities in coastal areas to water-related national disasters" in Copenhagen on 16-18 November 2005 to explore possibilities of integrating coastal zone management with hazard assessment and environmental assessment.[32] The UNEP also hosted two other workshops in Bonn (December 2005) and in Davos, Switzerland (August 2006) facilitating the linkage between tsunami early warning and other hazards related to climate change, urbanization and environmental degradation. Furthermore, UNEP contributed to multi-hazard risk assessment in coastal zones through integrating risk and vulnerability parameters within existing environmental assessment mechanisms in Sri Lanka. Multi-hazard assessments in the Maldives were strengthened through enhanced attention to environmental parameters. UNEP also assisted national environmental authorities in Indonesia to better understand their capacities and contributions to warning systems.

It was found that the above-mentioned integrated approach for risk management would require substantive national commitment and international support. Additional resources were required to ensure development of tsunami early warning within building capacities of national platforms for disaster risk reduction and preparedness. Among other initiatives of the UN/ISDR and partner agencies, the Early Warning Strengthening Project supported the Indian Ocean countries to develop plans and new project proposals for this purpose through the Indian Ocean Tsunami Consortium and the project's follow-up plan entitled "Strategy for Building Resilience to Tsunamis in the Indian Ocean for 2006-2008".

The strategy was prepared to further promote a systematic comprehensive people-centred early warning system, and was presented to donors in January 2006. The Aid Cooperation Office of the European Commission (AIDCO) responded positively, and offered an opportunity for funding a project for four Asian countries[33] in the Indian Ocean on "Building Resilience to Tsunamis in the Indian Ocean". The proposal was endorsed by the EC and a contribution agreement was signed with AIDCO in December 2006 for a 33 month operation that builds on the Flash Appeal project with stronger linkages to disaster risk reduction and sustainable development.

At the local and community level, the UNU-EHS tested a method for rapid multi-sector vulnerability and risk assessment to promote the integrated approach. A mapping of critical infrastructure was carried out focusing on buildings associated with different sectors such as health sector. Theoretical risk was compared with the observed damages in the city of Galle, Sri Lanka to identify the strengths and weaknesses of the proposed model. The results of the testing of this model showed that more precise information regarding tsunami-related hazard and vulnerability would be needed prior to the multi-sector risk assessment. The UNESCO/IOC ICG/IOTWS has been taking the lead in the discussion of how to achieve more precise hazard assessment.

An innovative approach for mobilizing additional resources for strengthening local capacity and for the recovery after tsunamis was introduced by AIDMI, an NGO. The Early Warning Strengthening Project

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[32] http://www.dhi.dk/resilience/
[33] India, Indonesia, Maldives and Sri Lanka

supported AIDMI's regional workshop (New Delhi, India, October 2005) and a publication on the role of micro-finance in disasters risk reduction.

At the Third International Conference on Early Warning (EWC III) in Bonn, Germany (27-29 March 2006), a side event on tsunami early warning in the Indian Ocean was organized by the UNESCO/IOC, UNU-EHS, CRED, the Technical Early Warning Committee of the Disaster Management Centre of Sri Lanka and the UN/ISDR-PPEW to provide a forum for information-exchange and discussion regarding the implementation of tsunami related activities and future prospects for partnership. The Mayors' Conference on Early Warning was hosted by the City of Bonn, Capacity Building International, Germany (InWEnt), German Committee for Disaster Reduction (DKKV) and UNU-EHS in Bonn on 26 March 2006, one day before the opening of the EWC III in which mayors of cities and municipalities participated from different regions of the world.

The UN/ISDR Asia and the Pacific and the UNESCAP, in cooperation with UNESCO/IOC and the members of the ISDR Asia Partnership,[34] convened a workshop in Bangkok, in June 2006 to facilitate discussion on sharing experiences in integrating tsunami early warning into disaster risk reduction and development processes.

2.5.3 Project component 3: public awareness and education

While the high-level political dialogue continued at the global and regional levels, public awareness-raising activities and other locally-focused education and training activities were carried out for the selected most affected communities. Various information products on tsunami, early warning and risk reduction were developed in English and later tailored to local languages and cultures targeting key intermediaries such as public officials, teachers, and community leaders. Mass media materials were developed and the media campaigns were launched. The Early Warning Strengthening Project provided accessible public information through the Internet to project partners and general public on early warning and risk reduction on tsunami and other hazards.

This component referred to as "public awareness and education" was led by UNESCO/IOC, UNESCAP, UNU-EHS, ABU, ADPC, ADRC, SEEDS, University of Geneva, the UN/ISDR secretariat and others.

2.5.3.1 The availability of accessible public information material on tsunami, early warning, and risk reduction

A considerable number of awareness-raising and educational materials were published by the partners including UNESCO/IOC, UNDP and ADRC as well as by the UN/ISDR secretariat. Some materials were also translated into various local languages. A list of publications produced under the Early Warning Strengthening Project is shown in Table 6 (page 40). Various newsletters and periodic updates on tsunami-related initiatives in the Indian Ocean region were issued by the UNESCO/IOC, ADPC, ADRC and the UN/ISDR secretariat, and were made available on-line to general readers.

An on-line version of the UN/ISDR database[35] on relevant information on organizations, projects, contacts as well as comprehensive country-by-country information on updated hazard profiles, maps and vulnerability information on fires, tropical cyclones, earthquakes and tsunamis worldwide until 2004 was developed by the University of Geneva in coordination with UNEP - Global Resource Information Database (GRID-Europe) and the UN/ISDR secretariat.

Relevant information materials on tsunami and other relevant natural hazards were also made available to some countries in printed versions. The UN/ISDR secretariat delivered 35 Disaster Reduction Field Libraries[36] to the countries most affected by the tsunami through ADPC, NDWC, SEEDS, UNESCAP and

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[34] Asia Partnership members are the Asian Disaster Preparedness Center (ADPC), the Asian Disaster Reduction Center (ADRC), UN Economic and Social Commission for Asia and the Pacific (UNESCAP), UN Development Programme (UNDP), UN Office for the Coordination for Humanitarian Affairs (OCHA) and the UN/ISDR.

[35] http://www.preventionweb.net

[36] The Field Library, a blue metal trunk on wheels, is packed with books and journals.

UNDP Country Offices.[37] For India, SEEDS facilitated local authorities to develop and demonstrate local centers and community-based information systems for providing mitigation and preparedness knowledge resources in selected communities in the Andaman and Nicobar Islands, India.

In coordination with partner agencies and other collaborating organizations, the UN/ISDR secretariat has compiled lessons learned from the tsunami of 26 December 2004. A brochure "Lessons for a Safer Future"[38] was published by drawing on the experiences of numerous organizations and individuals. Additional efforts have been made through the UN/ISDR's regional offices in Asia and Africa to collect more stories to shed light on the actual happenings, good and bad practices and lessons learned. Three short video clips were produced to emphasize the importance of integration of disaster risk reduction into every day decision making and how the critical factors such as traditional knowledge and education contributed to saving lives when the Indian Ocean Tsunami hit in December 2004. The International Recovery Platform (IRP) supported by ADRC, UNDP and UN/ISDR also produced a publication "Learning from disaster recovery - guidance for decision makers"[39] to provide a systematic analysis of disaster recovery experiences including the lessons from the Indian Ocean Tsunami of December 2004, Hurricane Katrina of August 2005 and the India/Pakistan earthquake of October 2005.

2.5.3.2 Targeted advocacy and media campaigns

The ABU, a professional association of 102 radio and television broadcasters in the Asia-Pacific region, organized two workshops jointly with the UN/ISDR secretariat and UNESCAP in Bangkok in June 2005, bringing broadcasters together with technical experts from the tsunami and weather warning fields to improve dialogue and understanding in respect to warning dissemination and public education.

In the second half of 2005 and in 2006, various products were developed for a media campaign, some of which were used to commemorate the tsunami of 26 December 2004. The ABU, through a collaborative arrangement with CNN International, compiled scripts and materials produced by the participants of the above-mentioned two Bangkok workshops. The produced pieces were broadcasted on CNN's World Report. The ABU also compiled unedited footage of the tsunami disaster through the contribution by the participating broadcast companies for the purpose of distribution on the International Day for Disaster Reduction on 12 October 2005.

The BBC, jointly with Television Trust for the Environment (TVE)[40] and the UN/ISDR secretariat produced three television documentaries for BBC Earth Report,[41] and were broadcasted by BBC in October-November 2006. The topics covered were; the role of education on disaster risk reduction in South East Asia, Central Asia and the Caribbean; tsunami recovery process in Thailand, Indonesia and Sri Lanka; and lessons learned from major disasters in Congo, Cuba, Bangladesh, Japan, Iran and French Alps. These documentaries were also aired by BBC WORLD.

The ISDR Asia Partnership and ASEAN hosted a workshop in Bangkok in October 2006, "Asian Partnership Forum on Disaster Reduction", on the occasion of the International Day for Disaster Reduction, and included a roundtable with journalists on the issue of education for disaster risk reduction.

2.5.4 Project component 4: community-level approaches

This component referred to as "community-level approaches" aimed to implement selected community-level pilot activities to test and demonstrate good practices, including hazard and vulnerability assessment, organizational strengthening, community participation, warning system operation, capacity building, evacuation planning, and the design and construction of shelters and other works.

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[37] African institutions (IGAD, African Union, SADC, SADRC), Bangladesh, Indonesia, India, Islamic Republic of Iran, Kenya, Malaysia, Maldives, Mauritius, Myanmar, Oman, Seychelles, Somalia (Somali Embassy in Nairobi), South Africa, Sri Lanka, Tanzania, Thailand, Yemen

[38] http://www.unisdr.org/ppew/tsunami/pdf/Lesson-for-a-safer-future.pdf

[39] http://www.undp.org/bcpr/iasc/content/docs/Learning_from_Disaster_Recovery_Exec_Summary_May2006.pdf

[40] TVE is an UK-based independent, non-profit organization.

[41] www.tve.org/earthreporthttp://www.tve.org/earthreport/archive/doc.cfm?aid=1810, www.tve.org/earthreport/archive/doc.cfm?aid=1801, www.tve.org/earthreport/archive/doc.cfm?aid=1659 and www.tve.org/earthreport/archive/doc.cfm?aid=1661

This component was led by UNDP India, UNDP Sri Lanka, UNEP, UNESCO Jakarta, UNU-EHS, ADPC, ADRC, CRED, SEEDS and other collaborating national and local institutions and the civil society organizations.

2.5.4.1 Identify means to strengthen disaster preparedness at the community level

Better understanding of the impacts of the tsunami of 26 December 2004 on the vulnerable communities is crucial to strengthen resilience of these communities for such future natural hazards. Various sample data collected in selected locations on the impacts of the tsunami and local vulnerability were analyzed by UNU-EHS, CRED and ADRC, in collaboration with national and local authorities and local experts.

The UNU-EHS, in collaboration with the universities and local authorities in Sri Lanka, conducted vulnerability assessments in two locations, the city of Galle and Batticaloa, Sri Lanka in 2005. The research results were discussed in a national workshop in Sri Lanka (January 2006) and at three international conferences in 2006.[42] In 2005, CRED carried out a study on risk factors for mortality and injury in Tamil Nadu, India, and published the results in a printed version.[43] The research results of the UNU-EHS and CRED studies were also presented at a regional workshop in June 2006 in Bangkok, Thailand. The ADRC carried out a study in Indonesia from December 2005 to April 2006 to review the perception of the most affected communities on the tsunami. The results were used to educate 5th-6th grade school children, and were also published on-line.[44]

The UNU-EHS in the above-mentioned vulnerability assessment in Sri Lanka, tested four different methodologies for rapid vulnerability assessment using satellite images, critical infrastructure, individual household surveys and the data generated by the Census Bureau of Sri Lanka respectively. The results showed that the satellite images and the census of the government served only as limited tools to assess vulnerability and that the analyses of the critical infrastructure and the household surveys gave a more precise picture regarding vulnerabilities and coping capacities. In addition, a drill was conducted in a public school in the city of Galle with the support from the Geological Survey, the Disaster Management Centre of Sri Lanka, and its local Galle District Disaster Management Committee to promote the awareness of the education sector regarding how to be better-prepared to react to tsunami warnings.

The Early Warning Strengthening Project promoted and strengthened community-based mechanisms for tsunami related early warning and preparedness through activities in selected locations so that the good practices can be disseminated and duplicated by the other Indian Ocean countries. A substantial part of the community-based activities took place in 2006.

The UNDP India and UNDP Sri Lanka implemented selected community-based activities within their post disaster support to the two countries to institutionalize early warning systems within the work of disaster management authorities and to strengthen dissemination mechanisms of warnings to communities. The UNU-EHS also provided technical assistance to Sri Lankan authorities on policy design, work planning, and establishing linkages with the activities of other UN agencies on early warning and disaster preparedness. The UNESCO Jakarta supported community-based activities in Indonesia to enhance resilience and preparedness for natural and human disasters, with a special emphasis on earthquakes and tsunamis. During the period from June 2006 to August 2006, four national workshops were organized by ADPC in Maldives, Myanmar, Sri Lanka and Thailand with the goal to improve community response to warnings.[45] The UNEP assisted environmental authorities in Indonesia, Sri Lanka and Maldives to identify environmental factors contributing to risk in coastal areas vulnerable to tsunamis, to manage

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[42]Montpellier (April 2006), New York (April 2006), Bangkok (June 2006)`

[43] English version is available at:
http://www.em-dat.net/documents/publication/RiskFactorsMortalityInjury.pdf
Hindi and Tamil version available at: http://www.cred.be/docs/publications/Tamil.pdf and
http://www.cred.be/docs/publications/Hindi.pdf

[44] http://web.adrc.or.jp/publications/Indonesia_Survey/NIAS/en/index.html
http://web.adrc.or.jp/publications/Indonesia_Survey/WEST%20ACEH/en/index.html
http://web.adrc.or.jp/publications/Indonesia_Survey/SIMEULUE/en/index.html

[45] http://www.adpc.net/ews06/ewsJul06.htm

environmental features in coastal communities vulnerable to tsunamis and to link local risk information, preparedness plans and risk reduction activities to national and regional warning systems.

2.5.5 Project component 5: project coordination

This component referred to as "project coordination" aimed to establish mutual understandings and agreements among partners, share information and networks and support capacity building and decision-making mechanisms to ensure the effective implementation of the Early Warning Strengthening Project and its early warning system objectives.

Main elements of the project coordination included defining roles and responsibilities for each implementing partner, providing information on project activities, monitoring and evaluating the project activities, advocating "people-centred early warning" in tsunami related policy dialogue, assisting regional coordination processes and meetings, assisting needs assessments and collating lessons learned from the project activities.

This component was primarily led by UNU-EHS, UNESCAP, UNOPS and UN/ISDR-PPEW in close partnership with other partners, principally within the ISDR system and among regional organizations.

2.5.5.1 Establishment of mutual understandings, networks, and coordination mechanisms necessary for effective implementation of the project

As this multi-partner initiative involved 16 leading implementing partners and a considerable number of collaborating national and local institutions, clarification of roles and responsibilities of each implementing partner was crucial for avoiding duplication and maximizing synergy between the partners. Following the initial round of consultations after the inception of the project, a more detailed and revised version of the project proposal called "Project Overview Plan" was developed with a logical framework matrix by the UN/ISDR-PPEW with emphasis on the multi-partner context and multi-disciplinary approaches. A preliminary budget was also developed as part of the Project Overview Plan while efforts of UN/ISDR-PPEW continued to secure pledges with donors and conclude bilateral agreement with each of the 16 implementing partners.

Throughout the project duration, the UN/ISDR secretariat ensured a coherent approach for the implementation of the Early Warning Strengthening Project in line with the overall disaster risk reduction efforts and the implementation of the Hyogo Framework for Action. The Early Warning Strengthening Project specifically assisted the establishment of the UN/ISDR Asia and the Pacific office which has been hosted by UNESCAP in Bangkok, Thailand and became operational in June 2005. The UN/ISDR-PPEW, two UN/ISDR Regional Offices in Asia and Africa and other UN/ISDR offices assisted partnership-building and the organization of regional coordination processes and meetings hosted by the implementing partners. The ISDR Asia Partnership has been a key instrument to promote regional activities on disaster risk reduction and to assist the countries in developing "Strategic National Action Plan (SNAP)", an action plan to enhance national needs assessment and coordination ensuring that disaster risk reduction will become a national priority.

The achievement in compiling and publishing lessons learned from the 26 December 2004 tsunami was elaborated in the earlier section on public awareness and education. The activities of the UN/ISDR-PPEW on monitoring, reporting and evaluation of the Early Warning Strengthening Project is detailed in the later section on monitoring and evaluation.

2.5.5.2 Additional Resource Mobilization

While the interim tsunami warning system was being set up and necessary technical training was being organized, various efforts were also started by organizations such as UNESCO/IOC, WMO and UN/ISDR secretariat to mobilize additional financial resources[46] for establishing a fully-fledged TEWS.

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[46] These additional financial contributions for the fully-fledged TEWS are not part of the ISDR project. The project only assisted the partners in starting the efforts of the resource mobilization.

Donor nations attending the Mauritius meeting (UNESCO/IOC coordination meeting in April 2005), including Belgium, Finland, Italy, and Norway, pledged a total of US$5 million out of a total amount of US$12 million requested by UNESCO/IOC. Several others, including Australia, France, Japan, Germany and the United States of America, along with the European Commission, also indicated their continuing support and their willingness to provide more financial aid when the plans become clear.

The WMO has continued to mobilize funding for upgrading the GTS in addition to the three countries supported under the UN/ISDR project. Some donors are funding and implementing several GTS upgrade projects in Maldives, Sri Lanka, Kenya, Madagascar and Tanzania.[47]

In March 2006, the UN/ISDR secretariat supported the development of the Indian Ocean Consortium consisting of seven ISDR system partners[48] and the Office of the Special Envoy for Tsunami Recovery, former U.S. President Clinton. The Consortium was launched during the Third International Conference on Early Warning (EWC III) (Bonn, 27-29 March 2006) to help the Indian Ocean countries in both Asia and Africa in formulating national action plans and to support their implementation. Eleven countries (Comoros, Madagascar, Maldives, Mauritius, Mozambique, Pakistan, Seychelles, Somalia, Sri Lanka, Tanzania and Thailand) have submitted national action plans to address their needs and gaps for capacity building for reducing tsunami risks. These eleven countries have requested support of the Consortium in mobilizing necessary financial resources. East Timor and Yemen have requested support from the Indian Ocean Consortium partners, but still need to develop their national plans. The Special Envoy actively promoted the Consortium and development of TEWS and disaster risk reduction in the Indian Ocean region within a global multi-hazard framework.

2.6 Financial overview

A total of US$10.5 million was contributed for the Early Warning Strengthening Project by seven donors, namely the European Commission Humanitarian Aid Office (ECHO) and the Governments of Finland, Germany, Japan, Netherlands, Norway and Sweden.

In addition, substantial resources were provided by the countries of the region, bilateral donors and many other organizations for the establishment of "end-to-end" early warning systems within a multi-hazard framework. Although these additional resources were not managed by the UN/ISDR secretariat, they have certainly contributed to achieving the same goals as the Early Warning Strengthening Project. The additional funding support included the contributions from Belgium, Finland, Italy, Norway and others through UNESCO/IOC for the core-system development, contributions from France and the United States of America through WMO for upgrading the GTS in the Indian Ocean region, support from the USAID through ADPC for community-based programmes, India's commitment to develop its national system, Thailand's offer to support UNESCAP to setup a multi-partner regional early warning system fund, UNEP's contribution to support environmental assessments and the contribution from IFRC and other NGOs to the support of early warning related activities.

2.7 Monitoring and evaluation

At the inception of the project, an ad hoc open-ended Project Advisory Group was established mainly for the planning of start-up activities and mainstreaming early warning within disaster risk management and risk reduction. The Project Advisory Group was comprised of several UN and regional organisations including UNESCO/IOC, ITU, UNDP, UNEP, UNESCAP, UNOCHA, UNU-EHS, UNV, WMO, IFRC, ADPC and ADRC. Some agencies directly implemented the project activities while the others did not. However, all the agencies which participated in the Advisory Group meetings had interests in tsunami early warning. The Project Advisory Group met at the two coordination meetings of the UNESCO/IOC in Paris (March 2005) and in Mauritius (April 2005). The group recommended the development of a comprehensive matrix of roles and activities of the implementing partners for the project coordination and management in a systematic manner. The group also recommended that the UN/ISDR secretariat provide

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[47] http://ioc3.unesco.org/icg/files/Presentations%20Day%202/WMO%20Report.pdf, http://www.wmo.ch/pages/prog/dpm/tsunamiprojects.html

[48] UNESCO/IOC, WMO, UNOCHA, UNDP, UNEP, IFRC and the World Bank

information regarding tsunami early warning system development both within and outside the Early Warning Strengthening Project, which would include national-level projects and initiatives.

In its overall coordinating and oversight capacity for this project, UN/ISDR-PPEW documented the progress, achievements and challenges to facilitate the steering of the project. A mid-term review was carried out in late November 2005 to early December 2005 to assess the progress of the project and to provide future directions. Two meetings were organized by the UN/ISDR secretariat on 25 November 2005 and on 7 December 2005 to invite the inputs from implementing partners and donors. Subsequently, the first progress report was produced in a summary form in December 2005. A more comprehensive version entitled "One Year After" was also produced. These two documents were presented at a donor consultation meeting in Geneva on 27 January 2006 to review the achievements of the project in 2005, to ensure continued inter-agency efforts for sustainability of the project and to enhance linkages and partnerships. As described in the earlier section on integrated risk management, the project's follow-up plan entitled "Strategy for Building Resilience to Tsunamis in the Indian Ocean for 2006-2008" was also prepared and presented to donors during the above-mentioned meeting in Geneva. The second progress report was produced in March 2006 and was distributed during the Third International Conference on Early Warning hosted by the Government of Germany (27-29 March 2006). The third progress report was produced in the form of a booklet in February 2007, and was distributed at the Fourth Session of the ICG/IOTWS in March 2007.

During the project implementation phase, a web-based information system,[49] developed by the UN/ISDR-PPEW with assistance from UNU-EHS, facilitated project management, monitoring and reporting. The system provided project related information to all stakeholders and general public. The above-mentioned progress reports and public information materials are also available on-line[50] for the partners and donors.

All implementing partners completed their project activities before 31 December 2006 except for the UNESCO/IOC, UNESCO Jakarta and UNDP Sri Lanka which requested the no-cost extension until 31 December 2007 to complete some project activities regarding national capacity building. A first draft of narrative and financial project completion report for the Early Warning Strengthening Project has been sent to the donors before 30 June 2007.

Final evaluation of the project is scheduled in the second half of 2008 according to the rules and regulations of the United Nations. An independent evaluation team will be engaged for this purpose.

2.8 Project risk management

This section describes how risks were managed during the implementation of the project. Clear distinction needs to be made in the use of terminology as this section refers to the risks associated with project management and not "disaster risks" described earlier in this document. The project risks are the ones which have a possibility of negatively affecting the implementation and the progress of a project. Although the project activities were subject to various risks identified in the Project Overview Plan, the project had sufficient flexibility to respond and manage these risks.

Although core technical elements of the tsunami early warning system were defined at a relatively early stage of the project, the establishment of the actual warning systems and ensuring their quality and conducting necessary training required considerable support and resources. The UN/ISDR secretariat jointly with the partners has facilitated and coordinated resource mobilization processes such as the Indian Ocean Consortium and presented the UN/ISDR secretariat's "Strategy" proposal at a donor meeting. With the UNESCO/IOC and WMO taking the lead, all implementing partners have also individually continued active resource mobilization in their specialized areas.

Lack of capacities in the most tsunami-affected Indian Ocean countries negatively affected some national and local level activities. Some countries were overwhelmed by a number of tsunami recovery initiatives by different international entities. As a result, the same national and local institutions were overstretched in

[49] http://www.unisdr-earlywarning.org/tewis
[50] http://www.unisdr-earlywarning.org/tsunami

carrying out many different activities. It was especially the case with preparedness-related activities which need to involve many local stakeholders. To cope with this challenge, both the UN/ISDR secretariat and the implementing agencies provided tools, training and technical expertise to the national governments and local authorities to enhance their capacities. A large number of publications and materials for awareness-raising and education were produced under the Early Warning Strengthening Project for this purpose. The Hyogo Framework for Action 2005-2015 has been providing a basis for identifying and addressing key regional and national priorities.

The Project Overview Plan stated that political constraints might affect regional coordination and implementation due to the degree of competition among countries, national concerns about sovereignty over data and warnings and varied policies of bilateral donors toward different countries. These political constraints indeed created some challenges, and some aspects still need to be resolved within the framework of establishing effective national platforms on disaster risk reduction. However, within the limited scope of the Early Warning Strengthening Project activities, the difficulties were largely overcome by the coordinated support to all Indian Ocean countries.

Civil conflict was present in some areas, but project activities were not located in the areas of known risk. The United Nations security procedures were followed and in-country activities were coordinated through UN Resident Coordinator offices as appropriate.

Substantial efforts were required to integrate the tsunami early warning system into national disaster risk management and disaster risk reduction policies and procedures. In addition to the above-mentioned support for enhancing national and local capacities, both the UN/ISDR secretariat and the implementing partners have advocated for this integration through various high-level political dialogues and by training for local authorities. The UN/ISDR regional offices in Bangkok and Nairobi have been instrumental in providing necessary support on this element.

3. Conclusion

3.1 Sustainability

The Early Warning Strengthening Project has created an enabling environment for coordination and partnership-building necessary for the development of "end-to-end" and "people-centred" early warning systems in the Indian Ocean region. However, the project activities are only the first step for establishing a fully-fledged TEWS within a multi-hazard framework. Strong political commitment of the Indian Ocean countries as well as substantial financial and technical supports from the international community are crucial in achieving this goal.

The UN/ISDR secretariat and the implementing partners will continue to support the Indian Ocean countries through various mechanisms to ensure sustainability of the project. Resource mobilization for the development of fully-fledged early warning systems as well as national platforms on disaster risk reduction and preparedness will continue through the Indian Ocean Tsunami Consortium, UNESCAP's Multi-donor Voluntary Trust Fund on Tsunami Early Warning Arrangements in the Indian Ocean and Southeast Asia, and the Global Facility for Disaster Reduction and Recovery of the UN/ISDR and the World Bank and other efforts of the partner agencies and the UN/ISDR secretariat. The UN/ISDR regional offices in Asia and Africa will continue to provide technical support in developing national plans and proposals in this regard. Regional coordination for TEWS will continue mainly through ICG/IOTWS and technical support will continue to be provided through the UNESCO/IOC and WMO. The UN/ISDR-PPEW will also follow-up establishment of TEWS in the Indian Ocean region within its follow-up activities for the establishment of a global multi-hazard early warning system mandated by the United Nations Secretary General.

All outputs and publications from the project have been disseminated to a wider audience by the UN/ISDR secretariat and each implementing partner to further enhance awareness on tsunami early warning and disaster risk reduction and to facilitate the Indian Ocean countries in exchanging their experiences and duplicate good practices.

3.2 Lessons learned on project implementation

The project faced some administrative challenges arising from the multi-partner and multi-donor nature of the project. The Early Warning Strengthening Project was implemented as a single integrated project, with all financial resources channelled through a single sub-account of the Tsunami Trust Fund managed by the UNOCHA. However, in addition each donor had specific requirements and administrative procedures for written agreements, transfer of funds, reporting, monitoring and evaluation. The Flash Appeal process of the UNOCHA itself was also managed outside the control of the UN/ISDR secretariat. Other challenges included difficulties in monitoring the progress of all of the project activities that were implemented by respective partners and in obtaining substantive and financial progress reports in a timely manner.

Substantial parts of the capacity building and community preparedness were undertaken toward the end of 2005 and in 2006. As a result, some partners including UNDP Sri Lanka, UNESCO Jakarta and UNESCO/IOC could not complete project activities by 31 December 2006. It was a challenge for the project to provide rapid assistance to the countries when requested, and to assist in longer-term enhancements of national and local capacities. This latter task requires considerable time for preparation and consultation with a much wider range of stakeholders including disaster management authorities and development planning agencies.

The project assisted in strengthening coordination, partnerships, linkages and synergies among the implementing agencies and donors. Various project activities have led to new opportunities for further contributing to the development of TEWS in the Indian Ocean region. In addition, the UN/ISDR secretariat and the implementing partners collaborated with a much wider group of UN agencies and national and local institutions with the common goal of establishing an effective TEWS in the region. At the global level, both humanitarian and development organizations were involved.

The project also contributed to maximizing effectiveness of inputs and resources by providing strategic direction for the implementation and monitoring of the project activities and avoiding overlaps between the implementing agencies. It was the first time that the UN/ISDR secretariat had provided overall coordination to a project under a UN Flash Appeal for humanitarian assistance. The integrated approach and coordination proved to be effective at linking immediate short term needs for early warning systems with longer term needs for risk reduction.

3.3 Success stories

Although occurrence of tsunamis and earthquakes has not been frequent in 2006 and in 2007, some success stories have already been reported by the partners to the UN/ISDR-PPEW. The interim warning system established under the project has proven to be effective not only for tsunamis but also for other hazards. The UNESCO/IOC and WMO reported that the GTS demonstrated its effectiveness for the July 2006 tsunami in Java. Interim tsunami advisory information was issued from the PTWC and JMA. Several national warning centres in the Indian Ocean region, including the one in Jakarta, Indonesia, received the interim tsunami advisory information from PTWC and JMA soon after the earthquake took place. The UNDP Sri Lanka office reported that the enhanced capacity for early warning and dissemination as well as the in-country partnership among relevant institutions saved some vulnerable communities in Sri Lanka on the occasion of the landslide in January 2007. The UNESCO Jakarta office reported that the Standard Operational Procedures (SOP) developed under the project in cooperation with KOGAMI, a local NGO, were effectively applied by the disaster control authority in Padang, Indonesia when the earthquake hit West Sumatra in March 2007.

3.4 Conclusion and recommendations

The international, regional and national efforts in response to the tsunami disaster provided a sound basis for strengthening early warning systems in the Indian Ocean region including substantial progress toward the development of capacities and intergovernmental processes.

Despite the challenges described above, the Early Warning Strengthening Project succeeded in achieving the original objectives and intended outcomes of defining core technical elements of the TEWS for the Indian Ocean region, quickly setting up an interim warning system, establishing regional coordination mechanisms, starting the process of integrating early warning into national disaster risk reduction and preparedness efforts, raising public awareness, strengthening the role of communities and local authorities and starting the resource mobilization necessary for the establishment of fully-fledged TEWS within a multi-hazard framework.

However, substantial support is still needed to establish the TEWS in the Indian Ocean region with a sound technical base and strengthened community response. In order to realize the TEWS with a close linkage to other ocean related hazards, the following actions are recommended:

- The UN/ISDR, UNESCO/IOC, WMO as well as other UN, international and regional institutions working on early warning should continue their assistance to the Indian Ocean countries in enhancing capacities and mobilizing resources necessary for both establishment of the TEWS and the establishment of national platforms;

- To generate an enabling environment for TEWS in the Indian Ocean region, the UN/ISDR secretariat, its regional offices and other members of the ISDR system should continue to assist the countries in Asia and Africa to establish and/or strengthen national platforms for disaster risk reduction to effectively implement the Hyogo Framework for Action. Low capacity, high risk countries require more international support.

- The regional coordination mechanism for the tsunami warning systems through the UNESCO/IOC ICG/IOTWS should be strengthened through the activities of the Sixth Working Group on Mitigation, Preparedness and Response in addition to the on-going discussion of the other working groups in order to ensure integration of tsunami early warning systems into national and regional mitigation, preparedness and response capability building efforts within a multi-hazard framework.

- Understanding of vulnerability and risk should be deepened through strengthening the multi-sector approach. The methodologies for multi-sector vulnerability assessment need to be further explored despite its complexity by building on the activities of the UNU-EHS undertaken under the Early Warning Strengthening Project. Methodology and tools for enhancing community-preparedness need to be adapted to local-specific conditions and context as the local capacity and socio-economic conditions differ from community to community.

- Before the 26 December 2004 Tsunami, many of the countries in the Indian Ocean region did not have a well-organized disaster management system except some tropical cyclone-prone countries such as India and Bangladesh. Thus, National Disaster Management Offices in most counties were very weak, and there were few established national platforms for disaster risk reduction in the region. The roles of the National Disaster Management Offices should be enhanced for better coordination within a country.

- Constructing measures such as sea walls and shelters should be considered to protect lives, properties, and significant infrastructures from tsunami. Currently, very few countries have implemented the structural measures mainly due to lack of information on risks. Countries need to have access to such information.

- Accurate tsunami risk assessments based on paleo-tsunami research in the Indian Ocean region is needed. Currently, sufficient scientific information is not available on the historical occurrence of natural hazards in the region, except Indonesia for which some records are available for the last few hundred years. Research outcomes would facilitate policy-making process in each country. In addition, historical and geographical research should be promoted to analyze what happened in the region in the past.

Table 2: List of major events relevant to the project

2005	
6 Jan 2005	Special ASEAN Leaders' Meeting on Aftermath of Earthquake and Tsunami (Jakarta, Indonesia)
11 Jan 2005	Tsunami Flash Appeal pledging meeting (Geneva, Switzerland)
18-22 Jan 2005	World Conference on Disaster Reduction (WCDR) (Kobe, Japan)
22 Jan 2005	A PPEW-hosted special event "Scoping Meeting on the Development of a Tsunami Early Warning Systems" immediately after the WCDR (Kobe, Japan)
22-24 Feb 2005	Dialogue for High Level Administrative Policy Makers on Establishing a Tsunami Early Warning Mechanism in the Indian Ocean (Tokyo, Japan)
3-8 Mar 2005	International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean within a Global Framework organized by UNESCO/IOC (Paris, France)
14-18 Mar 2005	Multidisciplinary Workshop and Expert Meeting on the Exchange of Early Warning and Related Information Including Tsunami Warning in the Indian Ocean organized by WMO (Jakarta, Indonesia)
14-16 Apr 2005	Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean organized by UNESCO/IOC (Mauritius)
30 Apr 2005	Development of a revised project document entitled "Project Overview Plan on the Tsunami Early Warning Strengthening Project" by the UN/ISDR secretariat (Bonn, Germany)
24-26 May 2005	The 11th meeting of the Inter-Agency Task Force for Disaster Reduction and the UN/ISDR secretariat's reporting on Tsunami Flash Appeal project (Geneva, Switzerland)
Jun 2005	Establishment of UN/ISDR-Asia and Pacific Office (Bangkok, Thailand)
13-16 Jun 2005	Two regional workshops organized by ABU to improve linkages between broadcasting media and experts on tsunami and weather warning (Bangkok, Thailand)
11-14 Jul 2005 26-29 Jul 2005	Study tours for national experts from 26 Indian Ocean countries organized by UNESCO/IOC, UN/ISDR secretariat, and ADRC (Tokyo, Japan and Hawaii, USA)
Sep 2005	Launch of a web-based database "Tsunami Early Warning Information System (TEWIS)" (Bonn, Germany)
May-Sep 2005	Sixteen needs-assessment missions to Indian Ocean countries by UNESCO/IOC, UN/ISDR secretariat, WMO and other organizations supported by multidisciplinary expert teams
7-8 Sep 2005	Public awareness and education workshop (Bangkok, Thailand)
14-15 Oct 2005	An international workshop on the role of micro-finance in tsunami risk mitigation and recovery coordinated by AIDMI and the UN/ISDR secretariat (New Delhi, India)
14 Oct 2005	Launch of the Field Library by the UN/ISDR secretariat in collaboration with national governments and UNDP country offices (India and Indonesia)
17-19 Oct 2005	Regional consultative meeting on early warning for the east coast of Africa organized by UN/ISDR Africa office (Nairobi, Kenya)
16-18 Nov 2005	An international workshop "Strengthening the resilience of local communities to cope with water related natural hazards" hosted by the Danish Government (Copenhagen, Denmark)

25 Nov 2005	First meeting for the mid-term review of the project with participation of the implementing partners and donors (Geneva, Switzerland)
7 Dec 2005	Second review meeting (UN/ISDR's internal meeting) in the UN/ISDR secretariat (Geneva, Switzerland)

2006	
27 Jan 2006	Donor consultation meeting to discuss Tsunami Early Warning in the Indian Ocean and follow-up plans (Geneva, Switzerland)
27-29 Mar 2006	Third International Conference on Early Warning (EWC III) and a side-event on tsunami early warning in the Indian Ocean (Bonn, Germany)
27 Mar 2006	A roundtable on Indian Ocean Tsunami Warning and Response Systems convened by UNESCO/IOC and the UN/ISDR secretariat in the presence of UN Special Envoy for Tsunami Recovery, President Clinton (Bonn, Germany)
11-13 May 2006	Regional workshop on tsunami, related coastal risks and education in Africa (Nairobi, Kenya)
13 -14 Jun 2006	Media and Disaster Reduction workshop (Nairobi, Kenya)
14 - 16 Jun 2006	Regional Workshop on Mitigation, Preparedness and Development for Tsunami Early Warning Systems (Bangkok, Thailand)
16-17 Jun 2006	Workshop on the Human Impact of Tsunami and Disaster Risk Reduction (Bangkok)
Apr - Aug 2006	Training and national public awareness workshops on disaster risk reduction for government officials, NGOs and community leaders (Comoros, Kenya, Madagascar and Tanzania)
Jul-Sep 2006	National workshops on disaster risk communication organized by ADPC in Myanmar (17-18 July 2006), Maldives (11 June 2006), Sri Lanka (21-22 September 2006) and Thailand (16-18 August 2006)
28 Oct 2006	Broadcasting of BBC/TVE Earth Report "After the Wave"
18-19 Nov 2006	Broadcasting of BBC/TVE Earth Report "Disaster class"

Table 3: Summary of interventions for the project by agency

Leading Institution	Keywords for the Intervention	Main Areas of support				
		Core System Implementation (incl. Coordination)	Integrated Risk Management	Public Awareness and Education	Community-based Approaches	Project coordination and management
UN Agencies						
UNDP India	Capacity-building, institutionalization of TEWS, local action, local coordination, local governance, technological options, dissemination mechanism, training, gender, pilot, best practice		X		X	
UNDP Sri Lanka	Capacity-building, institutionalization of TEWS, local action, community-based TEWS, dissemination mechanism, training, pilot, best practice		X		X	
UNEP	Capacity-building, environmental management, strategic environmental assessment (SEA), strategic framework for disaster risk reduction for environmental authorities, risk and vulnerability analysis, awareness-raising		X		X	
UNESCO Jakarta	Capacity-building, community preparedness, traditional knowledge, contingency planning, assessment, pilot				X	
UNESCO/IOC	Global framework, rapid assessment, international/regional coordination, international/regional consensus, policy guidance, define technical elements, observation and data analysis, establishment of interim TEWS, professional network, information sharing, multi-hazards EWS, interdisciplinary, training, experts, awareness-raising	X	X	X		
UNU-EHS	Capacity building, vulnerability assessment, development of methodology, ”people-centred” EW, ”end-to-end” EW, community, gender, on-line database, public awareness-raising, education		X		X	
WMO	Capacity building, enhancing exchange and distribution of TWS, effective use of GTS, upgrading national GTS, data-communication, operational tests, technology transfer, multi-hazards EWS, multi-disciplinary, assessment, training	X	X			

Leading Institution	Keywords for the intervention	Main Areas of support				
		Core System Implemen-tation (incl. Coordination)	Integrated Risk Management	Public Awareness and Education	Community-based Approaches	Project coordination and management
Regional and specialized organizations						
ABU	Awareness-raising, media's role in TEWS, regional collaboration of broadcasters			X		
ADPC	Awareness-raising, risk communication strategy, improve community response to warning		X	X	X	
ADRC	Awareness-raising, perception study, training, study tours, regional policy dialogue	X	X	X	X	
AIDMI	Awareness-raising, role of microfinance in recovery,gender		X	X		
CRED	Impacts and vulnerability, risk factors, analysis, community, link research to policy				X	
SEEDS	Setting up local institution, community-based information systems, knowledge center, field library, outreach, preparedness			X	X	
University of Geneva	Dissemination of information, on-line database, on-line maps, IT specialized service			X		
UN/ISDR secretariat and partners						
UN/ISDR Africa and UNOPS	Regional consultation, partnership-building, awareness-raising, multi-stakeholder, media, training, education, integration of DRR into development	X	X	X		
UN/ISDR Asia and Pacific, and UNESCAP	Regional consultation, partnership-building, awareness-raising, multi-stakeholder, education, coordination	X	X	X		
UN/ISDR Genev	Hyogo Framework for Action, public outreach and communication media, traditional knowledge, education, resource mobilization	X	X	X		X
UN/ISDR- PPEW Bonn	Coordination, advocacy, policy guidance, people-centred EWS, partnership-building, multi-stakeholder, information-sharing, monitoring and evaluation, lessons learned, sustainability	X	X	X		X

Table 4: Logical framework matrix

I) STRATEGIC FOUNDATIONS

HFA Goal	Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards
ISDR Goal	To increase commitment by Governments to engage and invest in disaster risk reduction as agreed upon in the Hyogo Framework To facilitate closer partnership and cooperation between UN, regional and sub regional organizations, civil society and governments To promote the leadership and commitment of individual specialized agencies/institutions for the integration of disaster risk reduction into their own programmes and policies

II) PROGRESS TOWARD THE INTENDED RESULTS

Project Objective	Provide an overall integrated framework for strengthening early warning capacities of countries of the Indian Ocean.				
Priority Area of Support	**Intended Outcomes**	**Intended Outputs**	**Indicators (means of verification)**	**Progress**	**Leading Agency**
Core System Implementation	(1) A regional consensus on the nature and core elements of a tsunami early warning system.	• Obtain political and technical consensus on system's key elements.	Regional consensus is obtained through meetings and dialogue.	Completed	UNESCO/IOC, ADRC, UN/ISDR
		• Define the system technical requirements.	Regional EW technical system needs are identified by expert group.	Completed	UNESCO/IOC,WMO
		• Identify and confirm national tsunami warning centre responsibilities.	National commitment was asserted and national tsunami EW focal point was designated.	Achieved (The processes have started.) 25 Tsunami Focal Points have been established out of 28 Indian Ocean countries.	UNESCO/IOC
		• Institute a mechanism for regional policy setting and coordination.	Regional mechanism for coordination and information sharing is in place.	Completed	UNESCO/IOC
	(2) Substantial progress on the initial strengthening and implementation process.	• Implement interim watch and warning system capacities.	Interim system in place.	Completed	UNESCO/IOC
		• Support the upgrade ocean observing systems and data communications (GTS).	Upgraded GTS and other observation system data in identified locations are in operation.	Completed	WMO
		• Undertake national needs assessments, training and study tours.	Assessment missions carried out to all countries identified, reports compiled and recommendations delivered.	Completed	ADRC, UNESCO/IOC, WMO, Pacific Tsunami EW Centres, UN/ISDR
		• Initiate resources mobilization processes to implement fully-fledged tsunami early warning system.	Coordinated resource mobilization efforts and funding proposals carried out.	Achieved (The processes have started.)	UNESCO/IOC, UNESCAP, UN/ISDR

Priority Area of Support	Intended Outcomes	Intended Outputs	Indicators (means of verification)	Progress	Leading Agency
Integrated Risk Management	Promote the integration of tsunami early warning system into national disaster risk management and reduction mechanisms.	• Development of a guideline document toward the implementation of Hyogo Framework for Action 2005-2015.	A "Getting Started" guidance document based on the Hyogo Framework of Action is developed targeting governments and practitioners.	Completed	UN/ISDR
		• Develop methodology for multi-sector vulnerability assessment.	Vulnerability assessment methodology agreed and available.	Completed	UNU-EHS, UNEP
		• Assessment of national frameworks, mechanisms and capacities for disaster risk management and risk reduction relevant to tsunamis.	Published assessment of national disaster risk management and risk reduction capacities with respect to integrated early warning systems.	Completed	UNESCO/IOC, WMO, UNEP, UN/ISDR
		• Promote plans, project proposals and resources mobilization to build capacities of national platforms.	Tentative plans and resources mobilization are initiated toward agreed upon capacity-building of national platforms.	Achieved (The processes have started.)	UN ESCAP, AIDMI, UN/ISDR
		• Support dialogue on tsunami issues with other hazard early warning entities.	Dialogue, coordination, and networking is enhanced across hazard early warning entities on tsunami issues.	Achieved (The processes have started.)	UNESCO/IOC, WMO, UN/ISDR
Public Awareness and Education	(1) The availability of accessible public information material on tsunami, early warning, and risk reduction.	• Collate example materials from tsunami and other relevant natural hazard awareness programmes.	Examples from tsunami and other hazards are collected and shared to raise public awareness.	Completed	UNESCO/IOC, UNEP, SEEDS, University of Geneva, GRID, UN/ISDR
		• Design, produce and disseminate publications for a range of audiences in local languages.	Interlocutor groups including national tsunami centers and disaster risk authorities have access to basic public information products for dissemination.	Completed	UNESCO/IOC, UNU-EHS, ADPC, ADRC, UNESCAP, UN/ISDR
		• Conduct workshop of experts and practitioners to develop packages of information products.	Tailored public information products are developed and disseminated targeting various levels at the community.	Completed	UN/ISDR
		• In coordination with other organizations and partners, summaries and disseminate lessons learned from 26 December 2004.	Lessons learnt from the tsunami of 2004 are collected, documented and shared with the wider public.	Completed	UNDP, UNESCAP, UNU-EHS, ADRC, ADPC, UN/ISDR
	(2) Targeted advocacy and media campaigns.	• Support information workshops and events for sector organizations.	Regional interaction and mechanisms for advocacy are strengthened.	Completed	UN/ISDR
		• Conduct workshops for broadcast media and warning organizations.	Media-focused workshops are held with broadcasters commitment asserted for collaboration on warning projects.	Completed	ABU, UN/ISDR
		• Develop mass media information products and promote their routine use.	Mass media products are available and partners committed to promoting their use.	Completed	ABU, UN/ISDR

Priority Area of Support	Intended Outcomes	Intended Outputs	Indicators (means of verification)	Progress	Leading Agency
Community-based Approaches	Identify means to strengthen disaster preparedness at the community level.	• Collect, analyze, and publish data on impacts and vulnerability in selected sample locations.	Quality and insightful data and analysis is available and accessible for at least two locations.	Completed	UNEP, UNESCO Jakarta, UNU-EHS, ADRC, CRED
		• Develop assessment methods for vulnerability.	Tools for assessment of vulnerability are developed.	Completed	UNU-EHS, UNEP
		• Collate and publicize good practices concerning community-based tsunami early warning and preparedness.	Good practices on community-based early warning systems are collected and disseminated to wide networks.	Completed	UNDP India, UNDP Sri Lanka, UNESCO Jakarta
		• Explore, promote and strengthen community-based mechanisms for tsunami-related risk preparedness' and risk reduction.	Strengthened community-based tsunami risk management at targeted locations including preparedness and contingency planning.	Completed	UNDP India, UNDP Sri Lanka, UNEP, UNESCO Jakarta, UNU-EHS, ADPC, SEEDS
Coordination (project management)	Establishment of mutual understandings, networks, and coordination mechanisms necessary for effective implementation of the project.	• Formulate and communicate strategy and overview plans including matrix of roles and responsibilities.	Project plans and activities are documented and shared.	Completed	UN/ISDR
		• Collect and publish lessons learned across all components.	Lessons learned are collected and published.	Completed	UN/ISDR
		• Ensure systematic flow of information across partners, donors, and stakeholders.	Information is flowing systematically and efficiently across all parties involved in the project.	Completed	UN/ISDR
		• Develop web-accessible project information database accessible to the public.	A web-accessible project information database is developed.	Completed	UNU-EHS, UN/ISDR
		• Develop, negotiate, document and monitor agreements, work plans and budgets among partners and donors and resolve problems.	Activities are implemented in a timely manner with official agreements signed, problems identified and promptly resolved.	Completed	UNESCAP, UNOPS, UN/ISDR
		• Establish project office support in Indian Ocean region.	Support, coordination, and follow-up services are available in the region through the UN/ISDR regional outreach office.	Completed	UN/ISDR

Table 5 : Summary of selected project activities by country

Main Areas of Support		Core System Implementation									
Intended outcomes		(1) A regional consensus on the nature and core elements of a tsunami early warning system (TEWS)			(2) Substantial progress on the initial strengthening and implementation process						
Results		Participated in the regional dialogue and meetings			National tsunami focal point was established	National data communication systems (GTS) was upgraded (selected countries)		Assessment mission was carried out on existing national capacities, needs and gaps for effective TEWS	Participated in technical training and study tours (reported total number of persons trained)		Requested support of the Indian Ocean Consortium for fully-fledged TEWS
		UNESCO/IOC Paris meeting	UNESCO/IOC Mauritius meeting	WMO expert meeting		GTS assessment was completed	GTS was upgraded		UNESCO/IOC technical training	Study tours to Tokyo and/or Hawaii	
Asia											
Bangladesh	**1**	X	X		X	X	X	X	X	X	
India	**2**	X	X	X	X				X	X	
Indonesia	**3**	X	X	X	X			X	X	X	
Islamic Republic of Iran	**4**	X	X		X			X	X	X	
Maldives	**5**	X	X	X	X	X			X	X	X
Malaysia	**6**	X	X	X	X			X	X	X	
Myanmar	**7**	X	X		X	X	X	X	X	X	
Oman	**8**	X	X	X	X			X	X	X	
Pakistan	**9**	X	X	X	X	X	X	X	X	X	X
Singapore	**10**	X	X	X	X				X	X	
Sri Lanka	**11**	X	X	X	X	X		X	X	X	X
Thailand	**12**	X	X	X	X			X	X	X	X
Timor Leste	**13**				X				X		X
United Arab Emirates	**14**		X								
Yemen	**15**		X		X (TBD)			X			X
Africa											
Comoros	**16**	X	X		X			X		X	X
Djibouti	**17**					X					
Kenya	**18**	X	X	X	X	X		X	X	X	
Madagascar	**19**	X	X		X			X	X	X	X
Mauritius	**20**	X	X	X	X			X	X	X	X
Mozambique	**21**	X	X	X	X			X	X	X	X
Seychelles	**22**	X	X		X			X	X	X	X
Somalia	**23**		X					X	X	X	X
South Africa	**24**	X	X	X	X					X	
Tanzania	**25**	X	X	X	X	X		X	X	X	X
Other											
Australia	**26**	X	X	X	X				X		
France	**27**	X	X	X	X						
United Kingdom	**28**	X	X		X						
TOTAL (# of countries)		23	26	16	25	8	3	18	21	21	13

Main Areas of Support		Integrated Risk Management			Public Awareness and Education					Community-based Approaches		Coordination
Intended outcomes		Promote the integration of TEWS into national disaster risk management and risk reduction mechanisms			(1) Availability of accessible public information material on tsunami, early warning, and risk reduction				(2) Targeted advocacy and media campaigns	Identify means to strengthen disaster preparedness at the community level		Coordination mechanisms
Results		Assessment report was produced on national disaster risk management and risk reduction capacities	Proposals were developed for resource mobilization for building capacities of national platforms		Publications and educational tools were made available for awareness-raising on tsunami and other hazards	Visual image and information on risk and human vulnerability to natural hazards were made available on-line	Relevant information on tsunami and other hazards and DRR were made available through local centers and field libraries	Tailored school manual and teacher's handbook were produced after conducting national workshops	Participated in the media-focused regional workshops for strengthening advocacy	Pilot activities and assessment were conducted on impacts on risks and vulnerability	Pilot activities, training, workshops and drills were conducted on warning dissemination and preparedness	Project coordination support was provided by UN/ISDR
			Through AIDCO	Through Indian Ocean Consortium								
Asia												
Bangladesh	**1**	X			X	X	X		X			X
India	**2**		X		X	X	X			X	X	X
Indonesia	**3**	X	X		X	X	X		X	X	X	X
Islamic Republic of Iran	**4**				X	X	X					X
Maldives	**5**		X	X	X		X		X			X
Malaysia	**6**	X			X		X		X			X
Myanmar	**7**	X			X		X		X			X
Oman	**8**	X			X	X	X					X
Pakistan	**9**	X		X	X	X						X
Singapore	**10**				X							X
Sri Lanka	**11**	X	X	X	X	X	X		X	X	X	X
Thailand	**12**	X		X	X	X	X	X	X			X
Timor Leste	**13**			X	X							X
United Arab Emirates	**14**				X	X						X
Yemen	**15**	X		X	X	X	X					X
Africa												
Comoros	**16**	X		X	X	X		X				X
Djibouti	**17**				X	X		X				X
Kenya	**18**	X			X	X	X	X	X			X
Madagascar	**19**	X		X	X	X		X				X
Mauritius	**20**	X		X	X	X	X					X
Mozambique	**21**	X		X	X	X		X				X
Seychelles	**22**	X		X	X	X	X	X	X			X
Somalia	**23**	X		X	X	X	X					X
South Africa	**24**				X	X	X					X
Tanzania	**25**	X		X	X	X	X	X	X			X
Other												
Australia	**26**				X	X						X
France	**27**				X							X
United Kingdom	**28**				X							X
TOTAL (# of countries)		17	4	13	28	21	17	8	10	3	3	28

Table 6 : List of publications supported by the project

Partner	Type	Title	Language
UNEP	Report	Environment and vulnerability – Emerging Perspective	English
UNESCO/IOC-ITIC, ADRC	Manual	Tsunami Text book: 4th-6th Grade	English, Thai
UNESCO/IOC-ITIC, ADRC	Manual	Tsunami – Teacher's Guide for 4th to 6th Grades	English, Thai
UNESCO/IOC-ITIC, ADRC, ADRRN	Booklet	Tsunami – Lesson learnt from Japanese Story "Inamura No Hi"	English, French, Bengali, Hindi, Indonesian, Malay, Nepalese, Sinhalese, Tamil
UNESCO/IOC	Manual	Tsunami Teacher	English, Bengali, Indonesian, Thai (Translation into French, Arabic, Spanish, Turkish and Urdu is planned)
UNESCO/IOC	Report	International Coordination Meeting for the development of Tsunami Warning and Mitigation System for the Indian Ocean within a Global Framework, UNESCO Headquarters, France, 3-8 March 2005	English
UNESCO/IOC	Report	Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean, Grand Baie, Mauritius, 14–16 April 2005	English
UNESCO/IOC	Report	Assessment of Capacity Building Requirements or an Effective and Durable Tsunami Warning and Mitigation System in the Indian Ocean: Consolidated Report for Countries Affected by the 26 December 2004 Tsunami	English
UNESCO/IOC - ITIC	Manual	Tsunami Glossary	English
UNESCO/IOC - ITIC	CD-Rom	Tsunami Awareness and Education Material	English, French, Spanish
UNESCO/IOC - ITIC	Booklet	Tsunami Warning!	English, Indonesian, Maldivian, Sinhalese, Thai
UNESCO/IOC - ITIC	Brochure	Tsunami Safety Flyers	English
UNESCO Jakarta	Comic	Buyung Dan Tsunami	Indonesian
UNESCO Jakarta	Poster	Gempa Bumi & Tsunami	Indonesian
UNESCO Jakarta	Pocket Book	Pedoman Menghapadi Bencana Gempa Dan Tsunami	Indonesian
UNDP India	Manual	Training Manual – Early Warning: Use and Practices	English
UNU-EHS	Report	Simplified Approach to Elaborate a Tsunami Scenario for the Port of Galle, Sri Lanka	English
UNU-EHS	Report	Rapid and Multidimensional Vulnerability Assessment in Sri Lanka	English
UNU-EHS	Report	Elements for the development of a Tsunami-Early Warning Plan for the City of Galle	English
ABU	Video	Compilation and distribution of footage of the Tsunami disaster, October 2005	English
AIDMI	Book	Micro-finance and disaster risk reduction	English
AIDMI	Report	The application of microfinance for disaster risk reduction in tsunami recovery	English
ADRC	Report	Perception Study on Tsunami Awareness in Indonesia	English

ADPC (through UN/ISDR Asia)	Report	UN/ISDR Informs, Asia, Issue 1, 2005	English, Chinese, Russian, Indonesian
ADPC (through UN/ISDR Asia)	Report	UN/ISDR Informs, Asia and Pacific, Issue 2, 2006; "The 2004 Indian Ocean Tsunami: One Year Later"	English, Chinese, Indonesian, Thai
CRED	Report	Risk Factors for Mortality and Injury: Post-Tsunami Findings from Tamil Nadu	English, Tamil, Hindi
UN/ISDR (UNEP GRID-Europe, University of Geneva)	Web site	Online Hazard Profiles, Maps, Vulnerability Information	English, French
IRP (through UN/ISDR)	Report	Learning from Disaster Recovery – Guidance for Decision Makers	English
UN/ISDR Africa	Manual	Training Manual, Workbook and Road Map on Disaster Risk Reduction (for ten African countries)	English, French, Portuguese
UN/ISDR Africa	–	Public Awareness Material on Earthquake and Tsunami	English, French
UN/ISDR	Report	Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami, Progress Report, December 2005	English
UN/ISDR	Report	Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami, Progress Report, March 2006	English
UN/ISDR	Brochure	Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami, Report on project outputs, February 2007	English
UN/ISDR	Brochure	Partnerships for Building Resilience to Tsunamis	English
UN/ISDR	Mobile library	Inter-Agency Field Library for Disaster Reduction	–
UN/ISDR	Catalogue	Inter-Agency Field Library for Disaster Reduction – Catalogue	English
UN/ISDR	Booklet	ISDR-Biblio: Tsunami	English
UN/ISDR	Video	The power of knowledge. Story of a little boy from Semilieu, Indonesia.	English
UN/ISDR	Video	Everybody's Business. Film on Hyogo Framework for Action.	English, French, Spanish
UN/ISDR	Video	Lessons Save Life – Story of Tilly Smith	English, French, Spanish
UN/ISDR	Manual	Early Warning Checklist	English and 19 other languages
UN/ISDR	Brochure	Lessons for a Safer Future	English
UN/ISDR	CD-Rom	Lessons for a Safer Future	English
UN/ISDR	Report	Words Into Action: Implementing the Hyogo Framework for Action, Document for consultation, Draft November 2006	English
UN/ISDR	Video	BBC/TVE Earth Report "Disaster Class"	English
UN/ISDR	Video	BBC/TVE Earth Report "After the Wave"	English
UN/ISDR	Video	BBC/TVE Earth Report "Before the Tsunami – Part 1"	English
UN/ISDR	Video	BBC/TVE Earth Report "Before the Tsunami – Part 2"	English
UN/ISDR	On-line Game	"Stop Disaster" Disaster Simulation Game	English, French, Spanish, Chinese

Annex

Details of the project activities by implementing agency

United Nations Development Programme (UNDP) India

Title of initiative:	Capacity Building for Local Level Action on Early Warnings in Tamil Nadu
Countries primarily supported:	India
Duration:	From 1 December 2005 to 31 December 2006

Objectives

This short-term initiative carried out by UNDP India and the Government of Tamil Nadu in Cuddalore district, Tamil Nadu, complements the medium-term initiative to be implemented in the 13 coastal districts of the state under the United Nations Recovery Framework in India.

The main objectives were:

- Institutionalization of Early Warning Systems within Disaster Management Committees and Disaster Management Teams;
- Strengthening dissemination mechanisms of early warnings to communities;
- Development of procedures for local level action and overall coordination, with special focus on local governance structures;
- Assessment of the "best technical" process to support dissemination of early warnings within the targeted communities.

Achievements

The initiative completed a pilot testing of technological options as well as community-level training in one of the worst tsunami-affected districts of the state. The project benefited the community with enhanced exchange of information with relevant local authorities and strengthened dissemination mechanisms of early warnings.

- **Institutionalization of Early Warning Systems within Disaster Management Committees (DMCs) and Disaster Management Teams (DMTs)**
  - A coordinated network was formed with the disaster management bodies of the state, district and the village, which formed the basis for institutionalization of early warning system within DMCs and DMTs.
  - A consultation workshop was organized in Chennai, in April 2006 for the government officials, the civil society organizations and the community representatives.
  - A district level consultation meeting was held in Cuddalore in May 2006.
  - The training of trainer (TOT) program on "Early Warning: Use and Practices" was organized for government departments, non-governmental organizations (NGOs) and community members in July 2006. A total of 33 key resource persons were trained in the workshop. The two-day training program focused on the five major hazards (cyclone, flood, tsunami, drought and epidemics) and the early warning systems suggested to be employed to mitigate the risks.
  - A training manual "Early Warning: Use and Practices" has been developed for the trainers and published. The manual focuses on early warning for the above-mentioned five major hazards.

- **Strengthening dissemination mechanisms of early warnings to communities**
  - A study was undertaken to map the existing early warning systems (present level of risk knowledge, existing dissemination and communication systems, degree of monitoring of warning messages and response capacity) in Tamil Nadu.
  - A public address (PA) system was installed in 55 locations in Cuddalore district for effective dissemination of the warning messages.
  - The Very High Frequency (VHF) wireless radio system was installed in 55 locations.
  - Two local NGOs, Indo Global Social Service Society (IGSSS) and the Centre for Rural Education and Economic Development (CREED) have organized 80 training programs in Cuddalore district for 2,559 members from the community on the significance and application of early warning systems.

- **Local level action and overall coordination, with special focus on overall governance structures**
  - Stakeholders including local administrative bodies, resource agencies, techno-social institutes, development organizations, community-based organizations and vulnerable community participated inthe process of planning and the implementation of the early warning systems.
  - Emphasis was given to build the capacities of women.

- **Assessment of the "best technical" process to support dissemination of early warnings within the targeted communities**
  - A study was carried out to compare various technological options of community-based communication for disseminating early warnings as well as their cost. The study resulted in the identification of 3 viable technical options namely VHF, Satellite Radio and Radio Data Systems, which was documented and shared with the state administration.
  - The VHF Transmitter technology has been piloted in Cuddalore as mentioned before.

Photo 1: Mock drill

Photo 2: Capacity building programme

Photo 3: Consultation workshop

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United Nations Development Programme (UNDP) Sri Lanka

Title of initiative:	Strengthening Early Warning Systems in Sri Lanka
Countries primarily supported:	Sri Lanka
Duration:	From 01 November 2005 to 31 December 2007

Objectives

This initiative aimed to address the environmental factors related to tsunami risk through building national capacity to integrate environmental assessment and management with national and regional early warning systems and efforts at disaster risk reduction. The initiative specifically addressed the following areas:

- Institutionalize early warning system (national, intermediate and local) and strengthen capacities for observation, detection, and prediction;
- Utilize existing IG Command emergency communication system for warning dissemination;
- Generate public awareness;
- Build and sustain community-based volunteer groups for providing early warning messages.

The expected outcomes were:

- Institutionalization of early warning system (particularly, tsunami, landslides and floods);
- Community-based flood and landslide monitoring system and early warning dissemination mechanism;
- Strengthening dissemination of early warning mechanisms to communities;
- Local level action and overall coordination;
- Post disaster support.

Achievements

- **Institutionalization of early warning system**
  - A workshop was held to develop a National Strategy for Early Warning. At the workshop, roles and responsibilities were clarified for forecasting, generation of early warning bulletins and dissemination of early warnings to mass media, police and communities.

- **Community-based flood and landslide monitoring system and early warning dissemination mechanism**
  - A pilot, integrated model for real-time landslide monitoring was established. Five rain gauges have been manufactured, and are currently being installed in five DS Divisions in Ratnapura District.[51] Once they are installed, the model can be tested for forecasting accuracy.
  - Training of three scientists from the National Building and Research Organization (NBRO) was completed in November 2006 in landslide simulation modeling and development of a real-time landslide simulation model. Hardware (computers) and applications (GIS and others) were provided to NBRO for this purpose.

- **Strengthening dissemination of early warning mechanisms to communities**
  - A total of more than 15 Public Address Systems were provided to police stations along the coastline in the landslides prone districts of Kalutara, Galle, Matara and Hambantota and in Ratnapura for the dissemination of early warning information. The public address systems were used extensively in early warning disseminations such as the tsunami early warning and evacuation on 12 September 2007

[51] The five Divisions are Eaipatha, Nivithigala, Kalawana, Pelmadulla and Kahawatha.

- Police were trained in Ratnapura along with the communities in October 2006 on disseminating warning messages. The police are expected to play a key role in disseminating warnings.
- Five hundred megaphones with sirens were purchased. They have been distributed to the coastal districts as well as areas vulnerable to landslides and floods.

➢ **Local level action and overall coordination**

- A training of trainers in community-based hazard mapping took place in a pilot site in the district of Hambantota on 24-25 June 2006. Forty DMC staff and UN volunteers were trained.
- The exercise developed a community hazard map, marked evacuation paths, demographic data for each household in the hazard prone area. An evacuation drill was carried out with over 200 community members from the village after the dissemination of information to the community.
- The same training was implemented with five communities in the district of Ratnapura in the five landslides prone Divisions where the rain gauges were installed.
- Draft SOPs have been developed for testing through national simulation drills.
- Two tsunami evacuation mock drills were conducted in Kudawella and Rakawa in Matara and Hambantota districts
- With additional support from two additional UNDP programmes, community leaders have been identified to coordinate post warning operations. Five sub-committees have been established under the village-level Disaster Management Committees mirroring the different tasks they have to perform in a disaster situation.

➢ **Post disaster support**

- For the purpose of documentation of best practices, two video documentaries were produced capturing the implementation of community-based early warning activities in Hambantota and Ratnapura.

Photo 4

Representatives from the community from Kudawella developed their hazard map, marked evacuation paths, collected demographic data for each household in the hazard prone area and then briefed each household on the evacuation paths and the safe areas closest to them. A drill was carried out the following day. The police issued a warning, and drove around the area with the sound of siren. Community members from the village followed the evacuation sign boards to the safe location, carrying with them valuable legal documents.
Over 200 people evacuated to the safe area. At the end of the exercise, 80% of the villagers arrived there within 20 minutes after the issuance of the early warning.

Photo 5

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United Nations Environment Programme (UNEP)

Title of initiative:	Environmental Information for Risk Assessment and Early Warning
Countries primarily supported:	Sri Lanka, Indonesia, Maldives
Duration:	From 1 November 2005 to 31 December 2006

Objectives

The objective of the initiative was to integrate environmental management within the disaster risk reduction agenda. Specific capacity building initiatives were tailored to national circumstances pursuing the following three outcomes:

- Strengthened capacity of environmental authorities in Indonesia, Sri Lanka and Maldives to identify environmental factors contributing to risk in coastal areas vulnerable to tsunamis;
- Strengthened capacity of environmental authorities in Indonesia, Sri Lanka and Maldives to manage environmental features in coastal communities vulnerable to tsunamis;
- Strengthened capacity of environmental authorities in Indonesia, Sri Lanka and Maldives to link local risk information, preparedness plans and risk reduction activities to national and regional warnings systems.

Achievements

- **Enhanced integrated assessment instruments were adapted and delivered for coastal communities to environmental authorities**
  - ***Strategic Environmental Assessments in Sri Lanka:***

    UNEP facilitated technical training and promotion of integrating disaster risk concerns within Strategic Environmental Assessments (SEAs) in Sri Lanka. In addition to field-based exercises, this activity resulted in the establishment of an inter-ministerial taskforce for SEAs in Sri Lanka and parliamentary support for Strategic Environmental Assessments.

  - ***Detailed Risk Analyses for Safer Islands in the Maldives:***

    UNEP supported the Ministry of Environment, Energy and Water (MEEW) in identifying vulnerable locations in ten islands. This activity resulted in cooperation between the Ministry of Planning, Ministry of Environment, Energy and Water and other sectoral agencies in planning for Safe Islands. It also contributed to having Environment and Disaster Risk Reduction identified as one of three pillars in the UN Development Assistance Framework (UNDAF) for the Maldives.

- **National authorities were engaged with disaster managers to be involved with advancing national and regional early warning systems**
  - ***Strategic Framework for Disaster Risk Reduction for Ministry of Environment Indonesia:***

    UNEP worked with the Ministry of Environment in Indonesia to develop a strategic framework to guide disaster related work within the Ministry. The work has focused on identifying international practices and integrating environmental and disaster risk information into Spatial Planning for Recovery and Risk Reduction. This activity has led to an active and continuing dialogue among all the deputies within the ministry. This activity has also led to new opportunities for the Ministry's engagement in developing national plans for disaster risk reduction.

- ***Indian Ocean Tsunami Early Warning Consortium:***

  UNEP, as part of the Consortium of ISDR partners to further strengthen tsunami multi hazard early warning systems in the Indian Ocean region, offered advisory support in assessing Environmental Flashpoints at sub-national level for use in preparedness and spatial planning and disaster risk reduction. UNEP fully participated in the Consortium's efforts and coordinated with national counterparts to review and revise national plans of actions for consideration by donors. This activity contributed to interdepartmental efforts at the national level to design an action plan: it has also supported the development of new modes of coordination among supporting agencies.

- ***UN/ISDR Environment and Disaster Working Group (EDWG):***

  The 11th session of the Inter Agency Task Force for Disaster Reduction agreed to establish an Ad-Hoc Working Group on Environment and Disaster Risk Reduction. The group has met three times to date (in Nairobi, October 2005, in Bonn, March 2006 and in Davos, August 2006). UNEP has provided leadership and technical guidance to the group. This activity has led to a consolidation of efforts by organizations concerned with environmental issues to advocate for greater attention among members of the Global Platform for Disaster Reduction.

➢ **National and international meetings were convened on environment and disaster risk reduction for enhanced early warning**

- ***International Conference on Disaster Reduction, Davos, Switzerland, August-September, 2006***:

  This activity resulted in greater awareness among disaster managers of key environmental issues. It also resulted in a strong statement from Anders Wijkman, member of European Parliament of the need to specifically engage politicians.

- ***Second International Symposium on Disaster Reduction and Global Environmental Change, Bonn, December 2005:***

  This activity has resulted in strengthening a coalition among organizations working on climate change, urbanization and environmental degradation.

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Photo 6: Field based exercise, Sri Lanka

United Nations Educational, Scientific and Cultural Organization (UNESCO) Jakarta

Title of initiative:	Strengthening community-based disaster preparedness in Indonesia
Countries primarily supported:	Indonesia
Duration:	From 15 November 2005 to 31 December 2007

Objectives

The overall objective of the initiative was to establish much needed resilience and preparedness at a community level for natural and human disasters, with a special emphasis on earthquakes and tsunamis.

The specific objectives were:

- Identify and assess critical factors and issues related to community-based disaster preparedness for disaster prone or high-risk areas at local level, i.e. level of Community-based Disaster Preparedness (CBDP), assessment of the effectiveness of interface between Tsunami Warning System (TWS) and CBDP and existing local warning system in Simeulue Island;
- Support initiatives on community-based disaster preparedness at different levels and contexts in pilot sites, as a follow-up action of CBDP assessment;
- Support the development of coherent in-country strategies and vision regarding CBDP, with emphasis on the effective interface between TWS and CBDP.

Achievements

- **Comprehensive assessment on critical factors and issues related to community-based disaster preparedness in disaster prone or high-risk areas (pilot sites)**
  - The comprehensive assessment comprised two components i.e. a general assessment on preparedness in three pilot sites in Sumatra (Padang, Bengkulu and Aceh Besar districts) and an assessment on the use of traditional knowledge in disaster preparedness on Simeulue Island were completed.
  - The results of the first assessment have shown that the three pilot sites were not prepared for an earthquake and/or tsunami. The results and the findings have been compiled in a report "The Indonesian Community Preparedness Assessment Framework in Earthquake and Tsunami Disasters".
  - The results of the second assessment showed that a wide range of factors, including cultural features and physical settings, have contributed to saving many lives in the Simeulue Island during the 2004 Tsunami. The results and the findings have been compiled in a report "SMONG - Local Knowledge and Strategies on Tsunami Preparedness in Simeulue Island, Nangroe Aceh Darussalam".

- **Level of community preparedness in pilot sites has improved**
  - Based on the above-mentioned assessment results and in line with the recommendations put forward by the expert team, a range of follow up activities were organized in these pilot sites including training, workshops and public awareness activities.
  - The activities have helped to put disaster preparedness on the agenda for key-stakeholders in the pilot sites, as well as generated a great interest of a broad public.
  - Knowledge, Attitude, Behavior (KAB) surveys showed improved awareness amongst key-stakeholders.
  - Through the design of a systematic education mechanism for disaster preparedness at schools, the level of disaster preparedness in the communities has been increased.

- **Existence of long-term and coherent strategies on community-based disaster preparedness, more particular on interface between TWS and CBDP, in place**
  - A Standard Operational Procedures (SOP) workshop was conducted in Padang with the participation of all relevant local stakeholders. After the workshop, the City Government of Padang and KOGAMI[52] presented the first ever locally developed draft SOP, one of the long-term and coherent strategies generated by this initiative, to BAKORNAS.[53]
  - The assessment report on the lack of preparedness in the three pilot sites in Sumatra has generated discussions at pilot sites and national level. As a result, many stakeholders have taken action to assist the pilot sites in developing improved strategies on community-based disaster response (e.g. GTZ and USAID are assisting the Government and other stakeholders in Padang in establishing the Tsunami Warning System.)
  - A workshop on "Integration for Disaster Preparedness" was conducted where twenty-eight participants from different NGOs/INGOs attended. The workshop was an important step to integrate programs of disaster preparedness among NGOs.
  - In collaboration with the Indonesian Institute of Sciences (LIPI), the initiative developed a website[54] on community-based disaster preparedness in Indonesia. Currently all outcome documents are being translated from Bahasa Indonesia into English.

Figure 3: Tsunami booklet

Figure 4: Leaflet on earthquake and tsunami

Contact person

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[52] KOGAMI: Tsunami Prepared Community – Padang, a local organization which was born out of the awareness to improve tsunami preparedness in Padang.
[53] BAKORNAS: National Coordinating Board on Disaster Response and Refugees of Indonesia.
[54] http://www.siagabencana.lipi.go.id/

UNESCO Intergovernmental Oceanographic Commission (UNESCO/IOC)

Title of initiative:	Toward the Development of an Indian Ocean Tsunami Warning and Mitigation System within a Global Framework
Countries primarily supported:	Indian Ocean countries
Duration:	From 1 February 2005 to 31 December 2007

Objectives

The initiative aimed to provide an overall integrated framework for strengthening early warning systems in the Indian Ocean region, primarily for tsunamis, but also recognizing the context of multiple hazards, risk management and risk reduction.

The UNESCO/IOC and its partners coordinated eight key activities described under the "Achievements" section below. These activities targeted:

- The rapid assessment of tsunami warning capacities in the region;
- Establishing interim networks among practitioners and authorities;
- Conducting regional meetings of relevant practitioners for both training and coordination aims;
- Developing interim information materials for practitioners and community leaders;
- Providing the necessary coordination and support for affected countries.

Achievements

- **International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System in the Indian Ocean within a Global Framework**

  The meeting was convened from 3-8 March 2005 in Paris, France. Governmental experts and organizations from 45 countries participated.[55] The 27 countries of the Indian Ocean Rim reached consensus on establishment of the Indian Ocean Tsunami Warning System (IOTWS).
  On 1 April 2005, an interim IOTWS was established, relying exclusively seismic data from earthquake monitoring stations. Japan Meteorological Agency (Tokyo) and Pacific Tsunami Warning Center (Hawaii) have been providing tsunami advisory information as of this date. The required National Tsunami Focal Points have been established in 14 Indian Ocean nations to receive warnings.

- **Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System in the Indian Ocean within a Global Framework and Scientific and Technical Follow-up Meetings**

  A second meeting was held in April in Mauritius from 14-16 April 2005. The meeting adopted the Mauritius Declaration. The Declaration confirmed (1) the establishment of an Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) under the UNESCO/IOC, (2) the lead coordinating role of UNESCO/IOC for establishing the IOTWS, and (3) the necessary financial mechanism for the coordination of donors. Belgium, Finland, Italy, and Norway pledged contributions for specific activities linked to the tsunami warning and mitigation system. Several others, including Australia, France, Japan, Germany and the United States of America, along with the European Commission, also indicated their continuing support and willingness to provide more financial aid as the plans for the system became more clearly defined. A series of scientific and technical meetings have been held to follow-up the outcome of the second coordination meeting.[56]

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[55] http://ioc.unesco.org/indotsunami/paris_march05.htm,
http://ioc.unesco.org/indotsunami/mauritius05/mauritius05.htm
[56] http://ioc3.unesco.org/indotsunami/calendar.htm

- **National Coordination Meetings and Expert Advisory Missions**

National assessments missions to the 16 interested countries[57] in the Indian Ocean have been carried out by international, interdisciplinary teams of experts from the UNESCO/IOC, UN/ISDR-PPEW, WMO and the Asian Disaster Reduction Centre (ADRC) from May 2005 to September 2005. The IOC of UNESCO also coordinated assessment missions to Iran and Yemen in 2006. The 18 national reports to date, along with a consolidated report are available for immediate use.[58]

- **Distribution of Pamphlets to Promote Awareness and Preparedness**

Educational materials, books, brochures, posters and flyers explaining tsunami safety rules, the Tsunami Warning System and what people in coastal areas should do in times of emergency have been produced. These materials have been specially adapted for local communities and widely distributed throughout the Indian Ocean region in nine languages.[59] Translation into more languages have been in progress. Some materials have been also sent to the UN/ISDR's Africa Office for wider dissemination. Specific educational activities and material include:

- The Great Wave and the Tsunami Glossary (produced by IOC's International Tsunami Information Centre, Hawaii)
- Posters and flyers
- "Tsunami Warning!" awareness booklet (translated by ITIC with the support of Tsunami Warning Focal Points for Indonesia (10,000 copies), Maldives, Sri Lanka and Thailand (2000 each)). The bookles were distributed to affected schools in each country, in-country UN partners through UN Resident Coordinators' offices and key non-UN partners. A booklet about Japanese educational story on tsunami response, "Inamura no Hi" or "Fire of Rice Sheaves" (translated in nine languages and 16,000 copies have been distributed to 8 Indian Ocean countries.)
- Two 3-day workshops were organized in 2006 by the ADRC and the Government of Thailand in Phuket and Phang-Nga provinces in Thailand for school children.
- A one-day workshop was organized in 2006 for 123 teachers in Banda Aceh, Indonesia.
- In Bangladesh, 6,000 booklets were distributed to conduct workshops for community leaders.
- A further 30,000 English versions and 20,000 French versions of the materials were printed and delivered to the UN/ISDR Africa Office for wider dissemination.

- **Support for National Awareness and Preparedness Activities**

- An information kit "TsunamiTeacher"[60] has been developed by the UNESCO/IOC and its International Tsunami Information Centre (ITIC), and has been translated into Bhasa Indonesia, Thai and Bengali. Translation into five other languages[61] is planned in future.
- Two issues of Tsunami Newsletter were published by the ITIC, and distributed to the readers in approximately 70 countries.

- **Establishment of Core Operational GLOSS Sea Level Gauges in the Indian Ocean Region**

- The initiative assisted the construction and installation of 6 sea-level stations in India, Indonesia, Malaysia, Myanmar, Sri Lanka and Thailand and up-grading of 15 existing real-time sea level sites in close coordination with Hawaii Sea-Level Centre to complete the upgrade of the Global Sea Level Observing System (GLOSS) network in the region. The sea-level stations deployed in countries of the Indian Ocean represent core elements of the GLOSS network, which constitutes a fundamental basis for the monitoring and detection of tsunamis in the Indian Ocean.

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[57] Bangladesh, Comoros, Indonesia, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Somalia, Sri Lanka, Tanzania, and Thailand
[58] http://ioc3.unesco.org/indotsunami/nationalassessments.htm
[59] Thai, Bahasa Indonesia, Bengli, Hindi, Tamil, French, Urdu, Arabic, Malaysian
[60] "TsunamiTeacher" is available at: http://ioc3.unesco.org/itic/
[61] French, Arabic, Urdu, Turkish, Spanish

- A sea level observation and data analysis-training course was conducted for participants from the Indian Ocean at the Japan Meteorological Agency, 15-26 May 2006. A second course took place at the IOC office in Oostende, Belgium in November 2006, primarily for Western Indian Ocean participants.

➢ **Training Courses and Support to the Establishment of a National Tsunami Assessment, Mitigation and Warning System.**

The UNESCO/IOC, in coordination with the WMO, UN/ISDR and the U.S. Geological Survey (USGS), has been organizing and sponsoring a number of educational seminars and scientific workshops to develop capacity in tsunami disaster education and preparedness in the Indian Ocean region. The educational seminars include "Train the Trainer" workshops using TsunamiTeacher teaching modules to target national meteorological services in charge of tsunami warning, national disaster management organizations responsible for tsunami emergency response and UN partner agencies. The scientific courses are related to each core area of the IOTWS (hazard assessment, hazard mitigation, and warning guidance). Specific scientific courses carried out are:

- One-week training course on Seismology and Tsunami Warning took place in Sri Lanka, (3-7 April 2005, 20 participants), Indonesia (8-17 May 2005, 47 participants), Thailand (15-22 May 2005, 27 participants), Malaysia (21-25 August 2005, 51 participants), Maldives (27-31 August 2005, 14 participants).
- Two-week training courses on GIS and Territorial Planning for Coastal Zones took place in Belgium (2-12 May 2005, 13 participants).
- Two-week training courses on Tsunami Numerical Modelling took place in Philippines (7-19 November 2005, 17 participants), Malaysia (8-19 May 2006, 39 participants) and Belgium (6-16 June 2006, 24 participants).

➢ **Regional workshop on strengthening of Standard Operating Procedures for Indian Ocean and Southeast Asian countries**

A Regional workshop on strengthening of Standard Operating Procedures for Indian Ocean and Southeast Asian countries was held in Bangkok, 12-16 May 2008. 35 participants from 17 countries attended plus 11 trainers and UNESCO IOC Secretariat staff. The participants were from National Tsunami Warning Centres and National Disaster Management Organizations and they received training in a broad range of topics concerning tsunami warning as well as in-depth workshopping of issues related to tsunami warning and emergency response.

➢ **Strengthening the UNESCO/IOC's Coordination Role for the IOTWS**

The Tsunami Coordination Unit, consisting of ten experts, was created within the UNESCO/IOC secretariat including three seconded personnel supported by France, Germany and Japan. Australia, Ireland and Norway also contributed toward the reinforcement of the Unit. This team was able to respond rapidly to the considerable demand on UNESCO/IOC while maintaining other IOC priority activities during 2005.

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Photo 7: Education and awareness rising in a pilot-class in Thailand

Photo 8: Global Sea Level Observing System (GLOSS) network

United Nations University Institute for Environment and Human Security (UNU-EHS)

Title of initiative:	Strengthening Early Warning Systems in Sri Lanka
Countries primarily supported:	Sri Lanka
Duration:	From 1 February 2005 to 31 December 2006

Objectives

The initiative targeted its efforts specifically in Sri Lanka. The proposed goals were:

- Strengthening capacities on early warning at the national level and promoting the execution of efforts to ensure the link from the national to the local level regarding early warning;
- Contributing to the efforts to strengthen people-centred early warning capacities in the coastal city of Galle;
- Development and testing of methodologies to assess vulnerability associated with tsunamis, focusing on the cities of Galle and Batticaloa;
- Strengthening the capacities of UN/ISDR-PPEW regarding information management via the development of a user-friendly, internet-based database;
- Contributing to other efforts as requested by UN/ISDR-PPEW;
- Strengthening the role of local universities in disaster risk reduction and the promotion of disaster resilience as well as effective early warning.

Achievements

The UNU-EHS-coordinated initiative was executed with the support of government agencies and universities in Germany and Sri Lanka. As a pilot project, the initiative extended support to the recently established Disaster Management Centre (DMC) and provided an opportunity for the Sri Lankan Technical Committee for Disaster Early Warning (TCDEW) to view and incorporate the advantages of an "end-to-end" early warning system linking the international monitoring efforts within the Indian Ocean to the anticipated response at the local level.

- **Strengthening capacities of the Technical Committee on Disaster Early Warning**
  - Technical assistance and policy-relevant advice was provided to the TCDEW in relation to people-centred, efficient early warning, and risk management.
  - A laptop computer and a beamer were provided to the TCDEW.
  - Posters and leaflets were provided to the TCDEW and DMC to support their awareness-raising campaigns in 11 districts in Sri Lanka, including Galle.
  - UNU-EHS facilitated the involved of TCDEW in the scope of the German-Indonesian Tsunami Early Warning Project.

- **Strengthening "people-centred" early warning capacities in Galle**
  - A tsunami drill was coordinated and executed in conjunction with the TCDEW and GSMB in the C.W.W. Kannangara School in Galle, which is a vulnerable facility (in terms of children) located in a high-exposure area next to the ocean (October 2005).
  - A national workshop was conducted by UNU-EHS on 26-27 January 2006 in Colombo to discuss results of the vulnerability assessment in Galle involving universities, national, and international agencies.
  - Local workshops were conducted in Galle targeting the staff of the District-level Disaster Management Committee and the Tourism and Hotel Sector of Galle. The activities of other UN agencies (Humanitarian Information Center of UNOCHA) were linked with the work of TCDEW.

- **Other capacity building activities**
  - UNU-EHS provided technical assistance to the Technical Early Warning Committee in Galle by providing two Laptop computers.
  - UNU-EHS and UNEP promoted the elaboration of training kits for institutions devoted to disaster reduction using the APELL[62] approach.

- **Rapid vulnerability assessment methodologies were developed and tested**
  - Rapid vulnerability assessments were developed and conducted jointly with Sri Lankan scientists in the cities of Galle and Batticaloa, Sri Lanka. The research results and the new methodologies to measure social, economic and environmental vulnerability were discussed in a national workshop in Sri Lanka (January 2006) and in three international conferences (Montpellier (April 2006), New York (April 2006), Bangkok (June 2006)).
  - Publication of the results in scientific journals and a book.

- **Other activities**
  - A user-friendly, internet-based database, Tsunami Early Warning Information System (TEWIS),[63] was developed
  - Exchange and invitation of Sri Lankan scientists to important events in Germany.
  - The UNU-EHS assisted the professionals from Sri Lanka, Indonesia, and China to participate in international conferences in Thailand (UNESCO/IOC International Conference, February 2006) and in Germany (EWC III, March 2006). Prior to the EWC III, UNU-EHS facilitated the participation of the members of the TCDEW and the local authorities of Hambantota in the Mayors' Conference on Early Warning in Bonn.
  - The UNU-EHS supported the execution of a regional workshop organized by UNESCO/IOC WESTPAC on Post-Tsunami Impacts and Recovery of Coastal Ecosystems and Communities in the Indian Ocean.
  - The results of the initiative of the UNU-EHS were also presented in other conferences (Second NEAMS[64] Conference, May 2006), WMO Early Warning Conference, May 2006), UNITAR/UNU/ISDR seminar (New York, 2006), UNU/CRED/ISDR Regional Workshop on the Human Impact of Tsunami and Disaster Risk Reduction (Bangkok, June 2006); GTZ/IFRC/UNDP/USAID regional workshop (Padang, 2006).
  - Presentation of UNU/EHS's achievements in UN/ISDR Informs, Asia and Pacific (2006).
  - The results of the initiative of the UNU-EHS have been transferred to local authorities and to the local emergency committee of the city of Padang.
  - A document outlining an approach to elaborate scenarios of impacts in case of tsunamis for different sectors of development in cities has been elaborated.

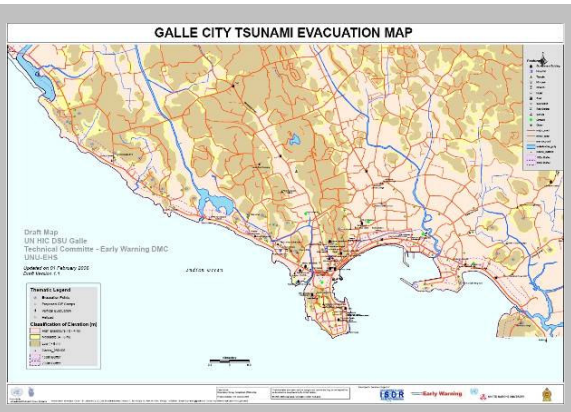

Figure 5: Tsunami evacuation map, Source: UNU-EHS

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[62] APELL (Awareness and Preparedness for Emergencies at Local Level) is a programme of UNEP. More information is available at: http://www.unep.fr/pc/apell/process/what_is_apell.html.
[63] http:// www.unisdr-earlywarning.org /
[64] NEAMS: North Eastern Atlantic and Mediterranean Seas

World Meteorological Organization (WMO)

Title of initiative:	The WMO'S Global Telecommunication System (GTS) for exchange and distribution of Indian Ocean tsunami warning system alerts and related information
Countries primarily supported:	Indian Ocean Countries
Duration:	From 1 March 2005 to 31 December 2006

Objectives

- The objective of the initiative was to ensure the most effective use of the WMO's Global Telecommunication System (GTS), including its satellite–based and data-collection sub-systems, which interconnects all National Meteorological and Hydrological Services (NMHSs), for supporting the exchange and distribution of Indian Ocean Tsunami Warning System (IOTWS) alerts and related information, including for the interim Tsunami Watch arrangements.
- The project also aimed to support upgrading the national GTS components where needed, on a priority basis, for NMHSs of developing and less-developed countries to enable all countries of the Indian Ocean Rim to participate and take benefit from the GTS as part of multi-hazard alert and response mechanisms, including the IOTWS.

Achievements

- **Regional/International Multidisciplinary workshop and expert meeting**

  The WMO Multidisciplinary Workshop and Expert Meeting on the Exchange of Early Warning and Related Information including Tsunami Warning in the Indian Ocean was held in Jakarta, 14-18 March 2005. The workshop endorsed the WMO Action Plan and developed the technical and operational plan. It also identified the countries' need for GTS upgrade.

- **Experts team missions to developing and less-developed countries for on-site assessment of upgrading/strengthening of national GTS components**

  Missions of WMO Expert team were carried out to Sri Lanka, Bangladesh, Maldives, Myanmar, Pakistan, Djibouti, Kenya and Tanzania. Survey and projects information that was developed in the framework of the Tropical Cyclone Programme in the Southwest Indian Ocean was used for Comoros, Madagascar and Seychelles.

- **Technical development of national projects proposals for sustainable upgrade of GTS components, where needed**

  - A Coordination meeting on GTS upgrade in the Indian Ocean to support multi-hazard early warning systems, including Tsunami warning system was organized from17-19 October 2005 in Geneva to review and consolidate the proposed projects for ensuring a consistent GTS upgrade and implementation plan for the whole Indian Ocean Rim. Some donors announced their firm or imminent decision to fund several projects including France and USA.
  - Two missions of GTS experts were carried out to GTS/ Regional Telecommunication Hubs (RTH), New Delhi and RTH Bangkok, respectively to upgrade the GTS circuit (New Delhi – Bangkok) of critical importance for the Indian Ocean.

- **Procurement and installation of data-communication equipment at National meteorological Centres to alleviate the most serious shortcomings (the initiative supports initial highest priority needs)**

  The competitive procurement process for GTS upgrades for Bangladesh, Myanmar and Pakistan was completed. The equipment became functional at NMCs of Bangladesh and Pakistan. Some administrative arrangements still need to be made in Myanmar in 2007 including factory training and equipment acceptance test.

- **Training seminar on GTS procedures and practices specific to IOTWS**

  Operational procedures on GTS have been further developed and agreed by WMO bodies (ref. Commission for Basic Systems, November 2006) to enhance the operational exchange of Tsunami watch and warning messages and related information (e.g. sea-level data and seismic data) in support of the EWS/TWS. With some complementary funding from WMO, operation and technical personnel (three each) from NMCs of Bangladesh, Myanmar and Pakistan have been trained (factory training and on-site training).

- **Organization/coordination of operational tests and monitoring exercises on the exchange of IOTWS alerts and information**

  - "Tsunami Watch Information (TWI)" bulletins from Japan Meteorological Agency (JMA) and Pacific Tsunami Warning Center (PTWC) have been routed over the GTS to Indian Ocean rim countries, including via its satellite-based data distribution systems, RETIM-Africa and EUMETCast (West Indian Ocean), CMA PCVSAT (Northeast Indian Ocean), ISCS and EMWIN (East Indian Ocean). Operational tests have been routinely performed.
  - The GTS demonstrated its effectiveness for the 17 July 2006 Tsunami in Java, with the interim tsunami advisory information issued from PTWC and JMA after the earthquake and received by several national warning centres in the Indian Ocean region, including the one in Jakarta.

- **Regional implementation-coordination meeting on GTS support to IOTWS and multi-hazard warning system**

  A Workshop "Multi-Hazard Early Warning Centres' Concept of Operations for the Indian Ocean Tsunami Warning System" was held in November 2005 in Singapore to share knowledge and experience of the established WMO Regional Specialized Meteorological Centres, and those of existing tsunami warning centres (TWS) to further promote and develop the concept of operations of multi-hazard multi-purpose early warning systems supported by the GTS.

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All India Disaster Mitigation Institute (AIDMI)[65]

Title of initiative:	Disaster Risk Mitigation: Potential of Micro Finance for Tsunami Recovery
Countries primarily supported:	India
Duration:	From 1 September 2005 to 31 December 2006

Objectives

Microfinance is one of the tools that can reduce the suffering of people and alleviate the tsunami recovery. In addition to relief or compensation, financial services enable the poor among victims to accelerate their recovery and diversify their livelihoods with more productive sources of income. Major objectives of the initiative were:

- Use the existing knowledge and experiences in microfinance to see if it can be adapted to the tsunami recovery and future disasters;
- Increase public awareness and wider access to information on microfinance writing a comprehensive publication on the subject;
- Promote microfinance at national and community level.

The expected outcomes were:

- A International workshop in New Delhi on the potential of Microfinance for Tsunami Recovery;
- Publish newsletter and disseminate the experiences;
- A National Campaign to promote microfinance.

Achievements

- **A Round table in New Delhi on the potential of micro finance for Tsunami recovery**
  - A two-day workshop " Disaster Risk Mitigation: Potential of Micro Finance for Tsunami Recovery" was organized by AIDMI in New Delhi in October 2005 in partnership with the UN/ISDR and the National Institute of Disaster Management (NIDM), the Government of India.
  - The workshop was attended by more than 70 participants including representatives from the national and state government of India and experts from a diverse range of professional fields from different countries including Bangladesh, India, Japan, Philippines and Sri Lanka.
  - It provided a platform for the launch of a global debate on how microfinance can reduce the impact of disasters. This is the first time that the concepts of microfinance and disaster risk reduction have been addressed concurrently. The focus was on the potential use of microfinance in the Tsunami recovery.

- **Publication of a report on micro finance in the tsunami affected countries**
  - A publication of a research study, "Application of Microfinance for Disaster Risk Reduction in Tsunami Recovery", has been produced to summarize the presentations made during the above-mentioned international workshop. The publication provided perspectives and experiences of microfinance and risk reduction from a variety of operational levels from six tsunami-affected countries in South Asia and Southeast Asia, India, Bangladesh, Maldives, Sri Lanka, Thailand and Indonesia.

  - A hardcover, 225-page book entitled "Micro-Finance and Disaster Risk Reduction - Proceedings of International Workshops on Disaster Risk Mitigation: Potential of Micro-Finance for Tsunami Recovery, New Delhi, 14-15 October 14-15, 2005" was published.[66]

[65] www.southasiadisasters.net
[66] http://www.akhilbooks.com/frmsingleproductDet.aspx?id=12883

- A special issue of AIDMI's newsletter "southasiadisasters.net" entitled "Disaster Risk Mitigation: Potential of Micro Finance for Tsunami Recovery" (Special Issue 7, 14 October 2005, English) was published.[67]

➢ **National Campaign to promote microfinance**

- Posters and leaflets were developed and distributed in different areas of the country in local languages during the month of June-July 2006. The AIDMI together with other partners helped to convey messages of promoting and disseminating microfinance in India.
- Audio-visual material has been compiled for production and dissemination. One or two short video messages will be produced to be broadcast on local and national TV and radio networks. The AIDMI will look for the support of the Indian Government to launch a broader campaign on the issue.

Photo 9: AIDMI team discussed about flood measures

Photo 10: Planning of rehabilitation

Photo 11: AIDMI discussed needs and support in the village Singarathopu

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[67] The newsletter is available at: http://www.unisdr.org/eng/public_aware/world_camp/2005/events/iddr-india-workshop.pdf

Asia-Pacific Broadcasting Union (ABU)

Title of initiative:	Regional workshops on emergency information flows and public awareness, preparedness and response in disaster situations
Countries primarily supported:	Countries affected by the Indian Ocean Tsunami of 2004
Duration:	From 1 June 2005 to 31 December 2006

Objectives

The Asia-Pacific Broadcasting Union (ABU), a professional association of 102 radio and television broadcasters in the Asia-Pacific region, proposed a series of Asia-Pacific regional workshops for radio and television broadcasters. The objectives of these workshops were:

- To help develop a faster, more effective early warning systems in the Asia-Pacific region by increasing the rate and accuracy of information flows from meteorological and geographic organizations to broadcasters;
- To ensure a rapid flow of disaster and emergency information from broadcasters to the public;
- To help develop faster, more accurate coverage of disasters when they strike;
- To raise public awareness of disaster reduction and prevention and emergency preparedness by airing special educational programmes and public service announcements.

Achievements

- **Media-targeted regional workshops**

  Two workshops were jointly organized by Asia-Pacific Broadcasting Union (ABU), UN/ISDR secretariat and UNESCAP in June 2005, bringing broadcasters together with technical experts from the tsunami and weather warning fields to improve dialogue and understanding in respect to warning dissemination and public education.

  - The first workshop entitled "Emergency Information Flows from Meteorological Organizations to Broadcasters" was organized from 13-14 June 2005 in Bangkok. The workshop was technical in nature, and targeted mainly engineers and TV broadcasters involved in weather reporting. Seventeen representatives from influential broadcasting companies of the countries affected by the Indian Ocean Tsunami and from Kenya, Tanzania and Seychelles, three observers from Thailand TV broadcasting companies as well as representatives from meteorological, oceanographic and disaster management organizations including ADRC, ADPC, UNESCO/IOC, UNOCHA and WMO participated in the meeting.
  - The second workshop entitled "Public Awareness, Preparedness and Response of Individuals and Communities" was organized from 15-16 June 2005 in Bangkok back-to-back with the first workshop to address broadcasters' capacity and responsibility to educate audiences and raise awareness of the dangers of and appropriate responses to natural disasters through the use of public service announcements, educational documentaries, current affairs programming and other content. This workshop involved programming and production directors from broadcasting companies from the 12 tsunami-affected countries.[68]

[68] http://www.abu.org.my/public/compiled/p586.htm

- **Professional discussion during ABU's General Assembly, November 2005**

  To continue the discussion on the role of broadcasters in disaster prevention, reduction, awareness and response, the ABU organized a professional discussion during its Annual General Assembly in Hanoi, Vietnam 26-28 November 2005. The discussion involved more than 400 high-level broadcast executives and heads from more than 100 broadcast companies.[69]

- **Compilation and distribution of footage of the Tsunami disaster, October 2005**

  The ABU compiled unedited footage of the Tsunami disaster through the contribution by the participating broadcast companies for the purpose of distribution on the International Day for Disaster Reduction on 12 October 2005. The content of the footage was distributed to broadcasters via satellite across the region and was used in compiling individual news stories by broadcasters across the region. It was also made available to European broadcasters via Eurovision. An alternative backup footage (B-roll footage) was sent to Asia-Pacific Broadcasters by the UN/ISDR secretariat through the European Broadcasting Union.

- **Broadcasting disaster reduction related programmes on the occasion of Tsunami commemoration around 26 December 2005**

  The Asia-Pacific Broadcasting Union, through a collaborative arrangement with the CNN International, compiled scripts and materials produced by the participants of the above-mentioned two Bangkok workshops. The compiled content was circulated to broadcasters in the Asia-Pacific region via satellite for their use on and after 26 December 2005 to commemorate the 26 December 2004 Tsunami. ABU has produced together with the UN/ISDR secretariat a B-roll and Video news releases to compliment the content produced by the participants. The pieces were also broadcasted in CNN World Report. Participating broadcasters have produced news features on tsunami recovery efforts and issued Public Service Announcements (PSAs) to convey messages to raise awareness on disaster reduction on the Tsunami Commemoration event.

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[69] http://www.abu.org.my/public/compiled/p641.htm

Asian Disaster Preparedness Center (ADPC)

Title of initiative:	1) Risk Communication: Improving Community Response to Warnings 2) Production and dissemination of Disaster Reduction in Asia – ISDR Informs
Countries primarily supported:	Maldives, Myanmar, Sri Lanka, Thailand
Duration:	From 22 August 2005 to 31 December 2006

Objectives

The initiative was designed with a goal to improve community response to warnings in the Maldives, Myanmar, Sri Lanka, and Thailand. The specific objectives were:

- Clarify roles of stakeholders in the end-to-end warning;
- Identify gaps in existing warning dissemination system;
- Recommend a set of actions for improving warning dissemination system;
- Develop a risk communication strategy.

The expected outputs were:

- Stakeholders clear of each others' roles in the end-to-end warning;
- Gaps, constraints, and needs in existing warning system identified;
- Recommendations for improving existing warning dissemination system;
- Risk communication strategy.

Achievements

- **ADPC Activities for ISDR Asia Partnership Newsletter**[70]

  Two issues of the newsletter entitled "The Disaster Reduction in Asia – ISDR Informs (Issue 1, 2005)" and "The Disaster Reduction in Asia and Pacific – ISDR Informs (Issue 2, 2006)" were produced by ADPC under this initiative. The publication aims to provide latest information on the activities, initiatives/projects and events that took place in Asia and the Pacific including various publications of relevant partners.

  - The first issue was printed in English (3,000 copies) with translated versions in Chinese, Bahasa Indonesia and Russian (2,000 copies each). The translated versions were distributed at the World Conference on Disaster Reduction (Kobe, Japan, 18-22 January 2005).
  - The second issue was produced in consultations with the members of the ISDR Asia Partnership and the UN/ISDR Asia office, and was printed in English (5,000 copies), Thai (2,000 copies), Chinese (2,000 copies) and Bahasa Indonesia (2,000 copies). This particular issue contains a 23 page special section, "The 2004 Indian Ocean Tsunami: One year Later".

[70] Both newsletters were produced in collaboration with the Asian Disaster Reduction Center (ADRC), UN Economic and Social Commission for Asia and the Pacific (UNESCAP), UN Development Programme (UNDP), UN Office for the Coordination for Humanitarian Affairs (OCHA) and the UN/ISDR, who together represent the ISDR Asia Partnership. Both issues are available at: http://www.unisdr.org/asiapacific/ap-informs/ap-informs.htm

- **Risk Communication: Improving Community Response to Warnings**

Status of early warning systems in the above-mentioned four countries was studied by utilizing ADPC's reports from national assessments and secondary information from various sources.

The information was verified, and study results were discussed during the national workshops specified below. National workshops on disaster risk communication were organized by ADPC in Maldives, Myanmar, Sri Lanka and Thailand to improve community response to warnings.[71]

- **Maldives:**
  A national risk communication meeting was held in Male on 11 June 2006. It was attended by the representatives from over 10 government and non-governmental institutions including broadcasting, tourism, education and health sectors.
- **Myanmar:**
  A national workshop was held in Yangon on 17-18 July 2006. It was attended by representatives from over 20 government and non-governmental institutions.
- **Sri Lanka:**
  A national workshop on disaster risk communication was held in Hikkaduwa on 21-22 September 2006. It was attended by the representatives from over 15 government institutions (ministries, departments, research and other organizations), an academic institution, a broadcasting corporation as well as international and non-governmental organizations.
- **Thailand:**
  A training program was carried out from 16-18 August 2006. It was attended by over 40 young professionals of the National Disaster Warning Center.

The workshops brought together stakeholders involved in communicating disaster risks. Discussions during the workshops focused on 1) describing the status of communicating risks for enhancing disaster prevention, mitigation, and preparedness; and 2) identifying constraints and needs of institutions involved in communicating risks. Participants also recommended a set of actions including a risk communication strategy. Follow-up activities have been undertaken to practically apply the introduced disaster risk communication concepts.

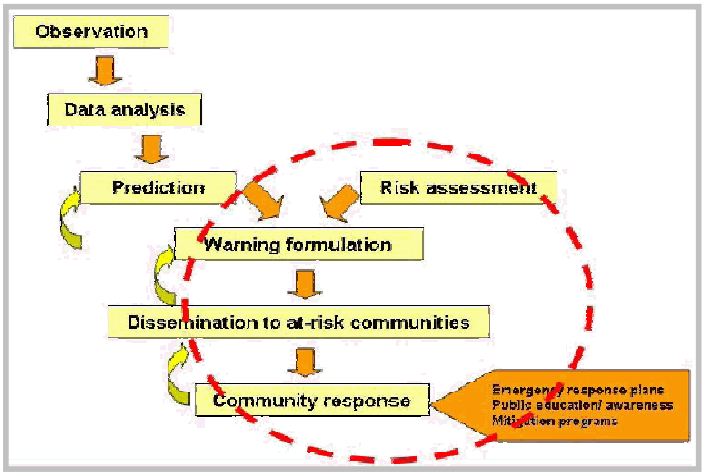

Figure 6: Disaster risk communication in an end-to-end early warning system, Source: National Workshop on Disaster Risk Communication, 21-22 September 2006, Hikkaduwa, Sri Lanka

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[71] http://www.adpc.net/ews06/ewsJul06.htm

Asian Disaster Reduction Center (ADRC)

Title of initiative:	1) Mission on policy dialogue for high level administrative policy makers on establishing a tsunami early warning mechanism in the Indian Ocean 2) Study tour on national tsunami warning system implementations for high level administrators responsible for tsunami warning activities 3) Perception study on tsunami awareness in Indonesia 4) Wide dissemination of "Inamura-no-hi" in the tsunami affected countries
Countries primarily supported:	Countries affected by the Indian Ocean Tsunami of 2004
Duration:	From 15 January 2005 to 31 December 2006

Objectives

The objectives of the initiative were to:

- Facilitate local arrangement for a scoping meeting of relevant organizations on the margin of the World Conference on Disaster Reduction (Kobe, Japan, 2005) to map out and coordinate activities on tsunami early warning systems;
- Facilitate training and familiarization meetings and visits concerning tsunami early warning systems by affected country representatives;
- Assist with the development of information materials for practitioners and community leaders on tsunami early warning systems and community preparedness, in partnership with UNESCO/IOC, UN/ISDR-PPEW and other relevant parties;
- Provide information, technical support and consultancy to UN/ISDR-PPEW and other relevant parties.

Achievements

- **Policy Dialogue**
  - A scoping meeting of relevant organizations was facilitated by the ADRC on the margins of the World Conference on Disaster Reduction (2005) to map out and coordinate activities on tsunami early warning systems.
  - Policy dialogue for high level administrative policy-makers on establishing a Tsunami Early Warning System in the Indian Ocean was organized by the UN/ISDR secretariat and ADRC (22-24 February 2005) with 24 participants from 10 countries in the Indian Ocean region.

- **Training and Study Tours**
  - Study tours for national experts from 26 Indian Ocean countries were organized jointly by the ADRC, UNESCO/IOC and the UN/ISDR secretariat to visit and observe existing tsunami early warning systems in Japan (11-14 July 2005, 23 participants and 6 experts) and Hawaii (26-29 July 2005, 33 participants and 15 experts). The participants have enhanced their knowledge and capacity to identify requirements for national tsunami warning and mitigation systems. The enhanced knowledge and capacity have already resulted in concrete actions of setting up national tsunami early warning centres and providing public information products.

- **Development of information materials**

  - The ADRC previously produced two versions (for adults and children) of tsunami awareness booklets by introducing an old Japanese educational story on tsunamis "Inamura-no-hi" in nine languages, and distributed a total of 1,000 copies to eight countries in collaboration with the Asian Disaster Reduction and Response Network (ADRRN). Under the joint initiative with the UN/ISDR secretariat, and in collaboration with UNESCO/IOC and the ADRRN members, 5,000 copies of the children versions of the booklets were printed and distributed to Bangladesh, India and Indonesia. Additionally, another 5,000 copies of the children versions was printed and distributed to Malaysia, Singapore and Sri Lanka. Both English and French versions of the booklets were distributed to African countries, Somalia, Kenya, Seychelles, Tanzania, Comoros, Mozambique, Madagascar, South Africa, Mauritius, Re Union, and Djibouti. Additional 30,000 copies of the English version and 20,000 copies of the French version were printed and delivered to the UN/ISDR Africa Office for wider dissemination.[72]

    A perception study was carried out in Indonesia from December 2005 – April 2006 to collect the information, experiences and perceptions on the Tsunami disaster from local residents, elementary school students, teachers and government officials. More than 1,000 responses were collected in each of the three locations, Nias Island, Simeulue Island and West Coast of Aceh. The perception study served as a pilot project to educate 5th and 6th grade school children about tsunami and other natural disasters and to teach them on simulations of evacuation. In coordination with the Ministry of Education of Indonesia, the ADRC is promoting the replication of this project in Indonesia.[73]

Photo 12: Study Tour, Lecture on Japan's Disaster Management in Cabinet Office (CAO)

Photo 13: Perception Study, Questionnaire Survey in Indonesia

Photo 14: Study Tour, Operation in Japan Meteorological Agency (JMA)

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[72] http://www.adrc.or.jp/publications/inamura/top.html http://www.adrc.or.jp/publications/inamura/list.html
[73] http://web.adrc.or.jp/publications/Indonesia_Survey/NIAS/en/index.html
http://web.adrc.or.jp/publications/Indonesia_Survey/WEST%20ACEH/en/index.html
http://web.adrc.or.jp/publications/Indonesia_Survey/SIMEULUE/en/index.html

Centre for Research on the Epidemiology of Disasters (CRED)

Title of initiative:	Indian Ocean Tsunami Early Warning System – Preparedness and Response
Countries primarily supported:	India
Duration:	From 1 May 2005 to 31 December 2006

Objectives

- The primary objective of the initiative was better informed preparedness and mitigation policy through objective evidence on risk factors following the tsunami.
- The secondary objective was an evidence base for the global disaster risk reduction community on the direct human impact of the disaster.
- The initiative consisted of a study on risk factors for mortality and injury in Tamil Nadu, India, associated missions, meetings and dissemination of the study result.
- The overall goal of the study was to reduce mortality and morbidity resulting from natural disasters and to learn lessons for this purpose from the recent tsunami-earth quake disaster.

Achievements

- **A study report "Risk Factors for Mortality and Injury: Post-Tsunami Epidemiological Findings from Tamil Nadu"**

  The study was completed based on the field survey in the 25 most-severely tsunami affected hamlets in Nagapattinam District, Tamil Nadu, India. Data from 651 households (out of 660 randomly selected households) and 3131 individuals was collected and validated for statistical analyses.

  The results of the study suggest that the vulnerability of coastal populations could be reduced in a number of ways including promotion and provision of swimming lessons amongst women, improvements in local housing and other infrastructure such as multi-purpose emergency shelters and development of effective message dissemination methods of early warning systems in conjunction with community disaster preparedness and awareness programmes.[74]

- **Regional Workshop, "The Human Impact of Tsunami and Disaster Risk Reduction: Linking Research to Policy" (16-17 June 2006, Bangkok)**

  The CRED, jointly with UN/ISDR, UNU-EHS, organized a regional workshop on "Human Impact of Tsunami and Disaster Risk Reduction" 16-17 June 2006 in Bangkok, Thailand. The results of the study and its policy implications were presented in the workshop.

  A total of 53 researchers, policy-makers, and disaster management experts shared their research findings and experiences in tsunami-affected countries as a means of strengthening information exchange between the disciplines. The workshop also identified national and regional needs and priorities for future research and policy initiatives in order to sustain long-term disaster risk reduction work in the region.[75]

[74] http://www.em-dat.net/documents/publication/RiskFactorsMortalityInjury.pdf
http://www.cred.be/docs/publications/Tamil.pdf
http://www.cred.be/docs/publications/Hindi.pdf
[75] http://www.unisdr.org/ppew/tsunami/pdf/Workshop_outcome_report.pdf

- **A side-event on tsunami early warning in the Indian Ocean at the Third International Conference on Early Warning (EWC III), Bonn, Germany, 27-29 March 2006**

  The CRED presented the early-warning related findings of the study at a side event jointly organized with UN/ISDR secretariat, UNESCO/IOC and UNU-EHS.

- **Distribution of the Study Findings**

  In addition to the presentation at the above-mentioned conferences, the findings of this study have been reported and widely distributed through a number of other channels including:

  - ✓ Publication and international distribution of the full study report in English, Tamil and Hindi. Approximately 700 English, 500 Tamil and 500 Hindi hard copies have been distributed.
  - ✓ Links to the report through various websites (Tsunami Evaluation Coalition[76])
  - ✓ Distribution of 5-page summaries of the main research findings to conference participants, UN Conference Centre, Bangkok
  - ✓ UN press release, 28 January 2006[77]
  - ✓ Newspaper article on study findings published in the Times of India, 7 August 2006

Photo 15: Field survey in Nagapattinam District

Photo 16: Survey Training session, Nagapattinam District

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[76] http://www.tsunami-evaluation.org/Other+Evaluations+and+Reviews/Surveys+and+Impact+Studies.htm
[77] http://www.em-dat.net/documents/TsunamiTamilNaduSurveyPressRelease.pdf

Sustainable Environment and Ecological Development Society (SEEDS)

Title of initiative:	Building Citizens' Knowledge Resources for Disaster Preparedness
Countries primarily supported:	India
Duration:	Phase I: from 31 July 2006 to 30 September 2006 Phase II: from 1 December 2006 to 31 December 2006

Objectives

- The objective of the project was to develop and demonstrate local institutionalization of mitigation and preparedness knowledge resources in communities recovering from the tsunami in the Andaman and Nicobar Islands, India which were highly vulnerable to earthquakes and tsunamis.
- The target community for the project was citizens particularly school students, community leaders and other "change agents".
- The focus of the project was on local knowledge development and dissemination in the areas of early warning, habitat and land use, local environment, livelihoods and education.

Achievements

- **Establishment of Citizens' Resource Centre**

  The Citizens' Resource Centre will serve as a hub for awareness-raising, education, and other activities for building knowledge resources on disaster reduction and environment for local citizens.
  - The construction of the Resource Centre has been started under this initiative in the capital city of Port Blair. The Municipal Council made available the land of 5,454 square meters for this purpose.
  - The sections for display on disaster management and mitigation activities as well as the center for Electronic-Governance for the citizens will be operational during 2007.
  - The centre will be suitably equipped with appropriate hardware, software and communication equipment. A company donated multi-media equipment to be installed in the Centre.
  - The Centre will be completed and handed over to the Municipal Council in December 2008.

- **Establishment of two Village Knowledge Centres**

  Two Village Knowledge Centres, with computer equipment, basic furniture and software, have been established in two coastal locations in South Andaman, namely Wandoor and Brindraban to create local hubs within communities to increase the outreach of the Citizens' Resource Centre and to facilitate dissemination of early warning.

- **Establishment of a Community-based Information System (CBIS)**
  - Profiles of local risks, vulnerabilities and standard operating procedures for disaster preparedness and response has been compiled and organized spatially in a customized platform called Community-based Information System (CBIS), a system based on customized Geographical Information System (GIS).
  - A pilot CBIS was undertaken by conducting a survey in all the 4 wards of Wandoor village, South Andaman.

- **Preparation of resource material, including UN/ISDR Field Library**
  - Each Resource Centre has been provided with resource materials and necessary equipment for immediate response including items for fire safety, first aid, search and rescue and evacuation.
  - A portable earthquake shake table has been acquired for the Citizens' Resource Centre to be used for raising awareness on affects of earthquake on building structures.

- The Citizens' Resource Centre has housed the UN/ISDR Field Library. The Field Library was officially launched and coved by local media. The Library became popular among local students and researchers.

➢ **Outreach programmes**[78]

- A Community Radio show, titled Radio Lighthouse has been produced and aired on the local station of All India Radio (AIR). The local community in the islands was involved in the preparation.
- A local workshop and a mock drill were carried out at one of the Village Knowledge Centres in South Andaman to demonstrate emergency preparedness.
- A three-day workshop on School Safety Programme including a mock drill was carried out in six schools in Port Blair and South Andamans.
- All 18 Wards of Port Blair Municipal Council have been mapped for developing a community-based disaster preparedness plan.
- The need assessments of these two villages have been completed. The training requirements of the village people are Computer (one-year course), Typing (one-year course), Agriculture, Tailoring, Poultry, Animal Husbandry and GPS (Fishing in open sea).

Photo 17: Community resource centre - Model

Photo 18: Earthquake Drill

Photo 19: Community resource centre in Port Blair

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[78] For more information: http://www.seedsindia.org/

University of Geneva

Title of initiative:	Web access of disaster risk reduction databases, updated hazard data, maps and information on disaster risk reduction, tsunami and early warning systems
Countries primarily supported:	-
Duration:	From 1 July 2005 to 31 December 2006

Objectives

The objective of the initiative was to collect, analyze and publish the information concerning natural hazards and disaster risk reduction initiatives including the information which would support the development of an Early Warning System in the Indian Ocean. The information was to be refined and synthesized for subsequent dissemination to a wide range of individual users, partner institutions and national organizations.

The main activities were:

- Develop an on-line version of the ISDR database (DB) on information, contacts, organizations, projects, in particular, development of the background information for the contacts (design of the application, creation of the database, development of the search and update interfaces, second level user support);
- Provide IT specialized services, including a Secure Shell (SSH) connection between UN/ISDR and UNEP/GRID-Europe (for accessing the UN/ISDR database hosted at GRID-Europe), hosting a staging server for the PreventionWeb (temporary) site and other online applications, developing tools such as a mechanism to be used for sending the IDSR Highlights publication to about 6,000 contacts;
- Update hazard and vulnerability information on the PREVIEW-IMS application (fires, tropical cyclones, earthquakes and tsunamis) for the period until 2004.

Achievements:

The above mentioned three activities were successfully completed. The University of Geneva, in coordination with UNEP-Division of Early Warning and Assessment (DEWA), the Global Resource Information Database (GRID-Europe) and UN/ISDR, has redesigned and updated UN/ISDR's on-line hazard profiles, maps and vulnerability information worldwide.[79]

- **The UN/ISDR database on information, contacts, organizations and projects was redesigned and improved for an efficient use on the web including search and update functionalities.**
  - The existing MS-Access database of the UN/ISDR has been considerably improved through various modifications.
  - A server dedicated to UN/ISDR[80] for testing and temporarily hosting applications was installed and configured.
  - An on-line application allowing viewing, searching and updating UN/ISDR data was developed.
  - A semi-automatic solution for electronic mailing was implemented to facilitate the dissemination of relevant information such as "ISDR Highlights".[81]
  - The present content is expected to be preserved through continuous updating by the UN/ISDR secretariat and other partners worldwide by using the newly developed web interface.

[79] http://www.unisdr.org/eng/country-inform/introduction.htm
[80] http://www.preventionweb.net
[81] "ISDR Highlights" is a monthly distribution of latest news on disaster reduction.

- **An updated geo-spatial datasets and cartographic application (Preview-IMS) has become operational and ready for further inclusion in the websites of the UN/ISDR and partners. On-line maps with information on natural hazardous events have been updated with the following time series:**
  - 1979-2000 for earthquakes and tsunami (including the Indian Ocean Tsunami in December 2004;
  - 1980-2004 for volcanic activities, cyclones and floods, (tsunamis as well until 2004? The final report says that year 2004 was added for Tsunami);
  - 1980-2001 for droughts;
  - 1997-2003 for wild land fires.

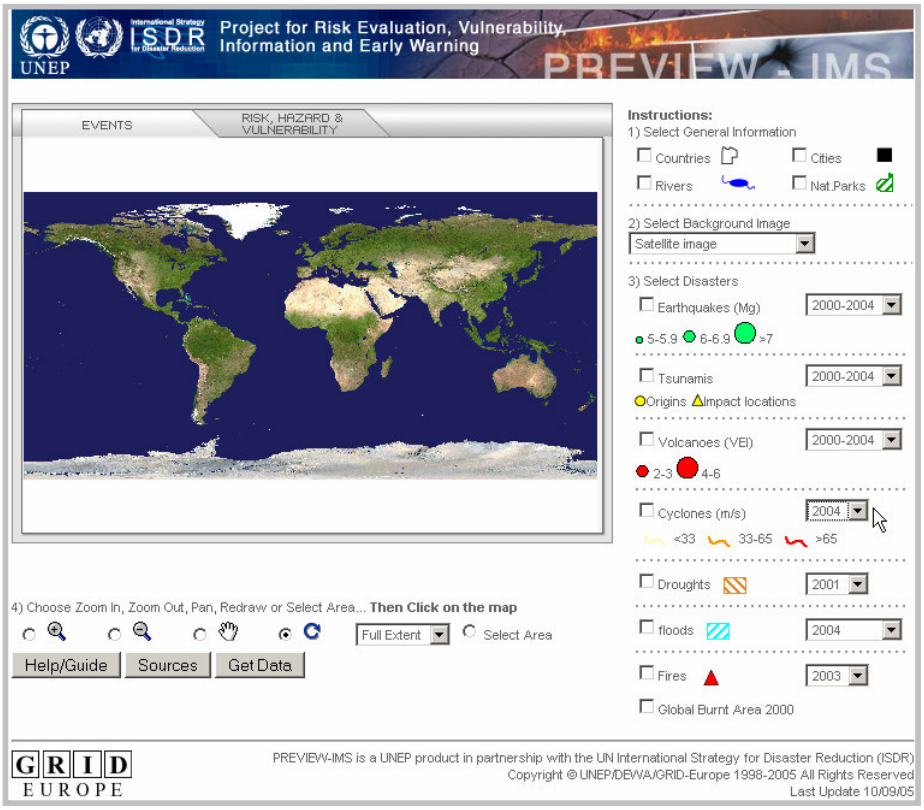

Figure 7: Update hazard and vulnerability information on the PREVIEW IMS application, Source: http://www.grid.unep.ch/activities/earlywarning/preview/

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United Nations International Strategy for Disaster Reduction (UN/ISDR) Africa and United Nations Office for Project Services (UNOPS)

Title of initiative:	Tsunami projects for the ten countries in the East Coast of Africa
Countries primarily supported:	Djibouti, Kenya, Madagascar, Comoros, Kenya, Mozambique, Seychelles, Somalia, South Africa and Tanzania
Duration:	From 1 August 2005 to 31 December 2006

Objectives

The overall goal of the initiative was to increase the understanding, knowledge and capacity of African countries in disaster risk reduction through a set of activities which include public awareness, education, advocacy and enhanced community participation.

The objectives of the initiative were:

- To promote multi stakeholder approach to disaster risk reduction; promote multi hazard early warning system at national level.
- To raise awareness on tsunami and other related disaster risks.
- To increase the understanding, knowledge and capacity of African teachers and school children on tsunami and other related coast hazards.

Achievements

In cooperation with the national government, African Union Commission, UNDP Country offices, Universities and community-based organizations, UN/ISDR Africa was able to raise the profile of disaster risk reduction in the region and especially among the above-mentioned ten countries along the Indian Ocean coast of Africa. UNOPS has provided operational support for the activities of the UN/ISDR Africa.

- **A consultative meeting on early warning and disaster reduction was held with all of the above-mentioned 10 African countries along the southwestern Indian Ocean Coasts (Nairobi, 17-19 October 2005)**

  Delegates (35 officials including delegates from the above-mentioned ten countries) agreed on regional priorities for action for the eastern coast of Africa including establishment of a regional centre or focal point, enhancement of technical observation networks, synchronization of national platform activities, capacity building, and sensitization of policy makers.

- **The ISDR Africa supported the African Union Commission in the holding of the First Ministerial Conference on Disaster Risk Reduction in Africa (Addis Ababa, 7 December 2005 preceded by the African experts meeting, 5-6 December 2005)**

  African ministers in charge of disaster risk reduction and other high ranking officials from 41 countries as well as other international, regional and non-governmental organizations participated in the conference, and renewed their political commitment in implementing DRR at the national level and strengthening partnership for disaster risk reduction activities.

- **Second Consultative Meeting on National Platforms for disaster risk reduction in Africa (Nairobi, 13-17 March 2006)**

  - The workshop was convened jointly with the International Federation of Red Cross/Red Crescent (IFRC) Nairobi Delegation.
  - The workshop had two parts, training on disaster risk reduction and a consultative meeting for national platforms in Africa with specific focus on mainstreaming disaster risk reduction into school curricula.
  - Over 50 participants representing 18 countries attended the workshop.

- **National public awareness workshops on disaster risk reduction for community leaders were held in four countries affected and at risk to tsunami (April 2006 -August 2006) in collaboration with leading national institutions**
  - Comoros: Three training activities (Grandes Comores, Anjouan Island, Moheli Island) were carried out in August 2006 for a total of 121 participants.
  - Kenya: A booklet was developed for primary students on coastal and marine disasters based on the research carried out by IGAD Climate Prediction and Application Centre (ICPAC) in July 2006.
  - Madagascar: A training was conducted in April 2006 for three regions in the East Coast of Madagascar (Atsinanana, Analanjirofo and Vatovavy Fitovinany) for a total of 120 participants.
  - Tanzania: Two training sessions for primary school teachers were conducted in August 2006 in Coast and Mtwara Regions for a total of 28 school teachers.

- **Development of Public Awareness Material on Earthquake and Tsunami**

  A booklet was developed in collaboration with African experts on geo-hazards. A total of 3,000 printed copies[82] were distributed to all affected African countries.

- **Production, Translation of a Training Manual, Workbook and Road Map on Disaster Risk Reduction**

  A training manual was developed by African experts on disaster risk reduction. The package of training material will be published into three languages (English, Portuguese and French) for the ten African countries in 2007.

- **Development of documentary on Best Practices on Tsunami in Africa**

  A public documentary was edited in Nairobi based on the ten hours of raw footage video taken in Djibouti, Kenya and Seychelles and remote information gathering and interviews for Somalia. The ten minute film will shed light on the actual happenings, good and bad practices and lessons learned.

- **Regional Workshop on Tsunami, Related Coastal Risks and Education for Coastal Risks in Africa**

  A regional workshop was organized to introduce disaster risk reduction into school curricula for the ten African countries along the East Coast (11-13 May 2006, Nairobi). Kenya, Seychelles, Mozambique, Madagascar, Djibouti, South Africa and Comoros were represented at the meeting. A draft school manual was developed by the participants.

- **Regional Consultative Workshop for the Media on Disaster Risk Reduction for countries of the East coast of Africa**

  A two-day consultative meeting on Media and Disaster Reduction for Countries along the East Coast of Africa was convened (13-14 June 2006, Nairobi) highlighting a role of media in disaster risk reduction at national level. Journalists from Tanzania, Comoros, Mauritius, Madagascar, Somalia, Zambia, Djibouti, Seychelles and Kenya attended the meeting.
- **National workshops for teachers of Coastal Schools on Tsunami and related Coastal Risks and national retreat for the elaboration of a school manual and teacher's handbook on Tsunami and related Coastal Risks**

  Seven countries[83] completed the teacher's training and retreat for elaboration of a school manual and teacher's handbook, as follow up of the regional workshop on Tsunami and Education, held in Nairobi from 11 to 13 May 2006.

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[82] English version (2,000 copies) and French version (1,000 copies) were printed.
[83] The seven countries are Kenya, Seychelles, Mozambique, Madagascar, Djibouti, Tanzania and Comoros. Only the government of Madagascar printed the manual.

- **National meetings of Consortium Partners to discuss the national proposals for the Indian Ocean Tsunami Early Warning System (IOTEWS)**

  The UN/ISDR Africa assisted Seychelles (28 June 2006), Tanzania (19 July 2006), Kenya (24 -26 July 2006), Madagascar (7 July 2006) and Mauritius (individual contact in lieu of a meeting) to call all relevant stakeholders for a meeting to discuss the national project proposal for the IOTEWS before the Bali Meeting in July 2006.

- **Sponsor Ministers and National Focal Points to the 11th Session of the African Ministerial conference on Environment (AMCEN) (25-26 May 2006, Brazzaville, Congo)**

  The conference urged, among other recommendations, that Governments in Africa integrate disaster risk reduction into development policies and programmes. The conference requested the partners of the African Ministerial Conference on the Environment to provide assistance in carrying out the Programme of Action for the implementation of the Africa Regional Strategy for Disaster Risk Reduction. The UN/ISDR Africa office assisted one minister and five national focal points for disaster risk reduction to participate in the conference.

- **Technical assistance and partnership-building for the development of fishing boat owner's and farmer's insurance schemes in the Seychelles**

  The UN/ISDR Africa office has provided technical assistance as well as partnership fostering to the Government of Seychelles for the development of insurance schemes for two of its most vulnerable communities namely fishing boat owners and farmers to facilitate a shift from *ex-post* to *ex-ante* disaster financing.[84] The government has planned to provide financial resources to the "Agricultural Insurance Funds".

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[84] More information is available in the "Disaster Reduction in Africa - ISDR Informs (Issue 6, 2006, p. 7-9)". (http://www.unisdr.org/africa/af-informs/issue6/Issue6-2006-english-ISDR-informs.pdf)

United Nations International Strategy for Disaster Reduction (UN/ISDR) Asia and the Pacific and United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)

Title of initiative:	Strengthening UN/ISDR presence in Asia and Pacific
Countries primarily supported:	Indian Ocean countries
Duration:	From June 2005 to 31 December 2006

Objectives

- The overall objective of the initiative was to coordinate regional efforts for the establishment of sustainable early warning systems and the strengthening of preparedness plans and resilience to disasters by the countries affected by the 26 December 2004 tsunami.
- Specific objective was to contribute to the assessment, evaluation and strengthening of Early Warning Systems and disaster preparedness in the countries affected by the 26 December 2004 tsunami in South and South East Asia.

Achievements

- **Public Awareness and Education**
  - A public awareness and education workshop for media and broadcasters was jointly hosted by the UN/ISDR Asia and the Pacific, UN/ISDR-PPEW and the UNESCAP in Bangkok, 7-8 September 2005. Forty participants from national institutes, broadcasting agencies, NGOs, UN agencies and international organizations such as IFRC devised plans to implement public awareness campaigns and identify synergies.
  - A publication, "Disaster Reduction in Asia and Pacific – ISDR Informs"[85] was produced by the UN/ISDR Asia and the Pacific in consultation with the members of the ISDR Asia Partnership on Disaster Reduction.[86] It included a special report entitled "The 2004 Indian Ocean Tsunami: One year after". The English version (3,000 copies) and its translated versions (2,000 copies of each of the Chinese, Bahasa Indonesia and Russian) were distributed to key in-country partners in the affected countries in the region.
  - A publication of the UN/ISDR, "Living with Risk" was translated into Bahasa Indonesia through the assistance of the Indonesian Society for Disaster Management (MPBI). A board game "Riskland Game" (2,500 copies), Hyogo Framework of Action and UN/ISDR's Education Campaign brochures were translated into Thai by the national Disaster Warning Centre of Thailand and disseminated to UN, technical institutions, Ministry of Education, local schools in disaster prone areas and other partners throughout Thailand.
  - Three trainees from Vanuatu, Fiji and Sri Lanka participated in a training course on "Applications of Remote Sensing and Geographic Information Systems for Natural Hazard Management and Disaster Reduction".
  - Support materials and comic books on tsunami and earthquake disaster preparedness developed by IDEP Foundation in Indonesia were distributed to 11,000 tsunami and earthquake affected coastal communities and schools at risk in Bali, Indonesia.

[85] http://www.unisdr.org/asiapacific/ap-informs/ap-informs.htm

[86] The ISDR Asia Partnership on Disaster Reduction was started in 2003 by Asian Disaster Preparedness Center (ADPC), Asian Disaster Reduction Center (ADRC), UN Development Programme (UNDP), UN Economic and Social Commission for Asia and the Pacific (UNESCAP) and UN Office for the Coordination of Humanitarian Affairs (UNOCHA). At the World Conference on Disaster Reduction (January 2005, Kobe, Japan), the UN Member States requested an UN/ISDR's presence in Asia and the Pacific. As a result, ISDR Asia and the Pacific (hosted by UNESCAP) was established in Bangkok, Thailand, in June 2005.

- **Coordination and Partnerships-building**

  - The UN/ISDR Asia and the Pacific was established in Bangkok to support multi-partner activities in the region which targeted national-level disaster risk reduction efforts and the implementation of the Hyogo Framework for Action. The office has been operational since June 2005, supporting tsunami early warning activities through advocacy, partnership-building as well as information sharing and exchange of experiences.
  - The UN/ISDR Asia and the Pacific, ISDR Asia Partnership members and ASEAN secretariat jointly celebrated the International Day for Disaster Reduction on 11 October 2006 in Bangkok. The event included a roundtable with journalists, an exhibition, and a handing-over ceremony of UN/ISDR's Field Libraries to ADPC, NDWC and UNESCAP. A local tsunami-affected school children were invited to test UN/ISDR's on-line and board games and a presentation on disaster risk reduction was made in cooperation with UNIS.
  - The UN/ISDR Asia and the Pacific and UNESCAP, in cooperation with UNESCO/IOC and ISDR Asia Partnership members, convened a workshop "Regional Workshop on Mitigation, Preparedness and Development for Tsunami Early Warning Systems" in Bangkok, 14 - 16 June 2006. Over 130 experts from 25 Indian Ocean countries shared experiences in integrating tsunami early warning systems into disaster risk reduction and development processes.
  - Based on the outcomes of the above-mentioned workshop, draft terms of reference (TOR) were drafted to establish Working Group 6 on Mitigation Preparedness and Response of the Intergovernmental Coordination Group (ICG) for the Indian Ocean Tsunami Warning System. The outcomes of the workshop and the proposed TOR were endorsed by the ICG in its meeting in Bali, Indonesia, 31 July - 2 August 2006.[87]
  - As a follow-up to the above-mentioned regional workshop (14-16 June 2006), a scientific review[88] was undertaken by Dr. Sarath Abayawardene (with support from UNESCAP for three selected tsunami-affected communities in Sri Lanka (Galle, Ampara, Jaffna) on natural hazards early warning and forecasting related services. In this review, socio-economic profiles of community-based disaster risk management of these three communities in Sri Lanka have been compiled through field surveys.
  - The UN/ISDR Asia and the Pacific facilitated the development of a Strategic National Action Plan (SNAP) for Thailand as a key component of UNDP Thailand's project on end-to-end warning system and preparedness for tsunami and other natural disasters.
  - The UN/ISDR Asia and the Pacific also supported UNDP Maldives with the organization of a national consultation for the development of a national plan for early warning.

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[87] http://www.unescap.org/unis/press/2006/jun/g28.asp
http://www.unisdr.org/ppew/tsunami/ICG-IOTWS-3.htm
http://www.unisdr.org/ppew/tsunami/pdf/Workshop_outcome_report14-16_June.pdf
[88] Reports are available at TEWIS: http://unisdr.unbonn.org/initiative_viewer.php?initiative_id=53

United Nations International Strategy for Disaster Reduction (UN/ISDR) Geneva

Title of initiative:	Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami[89]
Countries primarily supported:	Indian Ocean countries
Duration:	From 1 February 2005 to 31 December 2006

Objectives

The objective of the initiative was to link the available technical capacities on tsunami early warning with humanitarian and emergency management capacities.

Achievements

- **Integrated Risk Management**
  - The initiative supported initial consultation process and development of a draft document for consultation, "Words Into Action (November 2006)"[90] for the implementation of the Hyogo Framework. About 2,000 copies were printed and distributed to the members of the Inter-Agency Task Force on Disaster Reduction, focal points for the Hyogo Framework for Action and national platforms and permanent missions to United Nations in Geneva. A revised guideline document was presented at the Global Platform for Disaster Risk Reduction scheduled in June 2007 in Geneva.

- **Public Awareness and Education**
  - Three short video clips (3-10 minutes) on disaster risk reduction, "Everybody's Business"[91] (English, French and Spanish), "Power of knowledge: Story of a little boy from Semilieu, Indonesia"[92] (English) and "Lessons save life: Story of Tilly Smith"[93] (English, French and Spanish) were produced to emphasized the importance of integration of disaster risk reduction into every day decision making and how the critical factors such as traditional knowledge and education contributed to saving lives when the Indian Ocean Tsunami hit in December 2004.
  - Three television documentaries for BBC Earth Report[94] were produced jointly with Television Trust for the Environment (TVE),[95] and were broadcasted by BBC in October-November 2006. The topics covered were; the role of education on disaster risk reduction in South East Asia, Central Asia and the Caribbean; Tsunami recovery process in Thailand, Indonesia and Sri Lanka; and lessons learned from major disasters in Congo, Cuba, Bangladesh, Japan, Iran and French Alps. These documentaries were also aired by BBC WORLD.

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[89] The title is the same as the overall multi-partner, multi-donor initiative led by the UN/ISDR although only specific activities of the UN/ISDR Geneva are mentioned in this section.
[90] http://www.unisdr.org/eng/hfa/docs/words-into-action-consultation-draft.pdf
[91] About 100 copies were produced in English for distribution to major partners and the media. In collaboration with UNESCO, the clip has been translated in French and Spanish.
http://www.unisdr.org/eng/media-room/media-room.htm
[92] http://www.unisdr.org/eng/media-room/mr-videos.htm
[93] http://www.unisdr.org/eng/media-room/mr-videos.htm
[94] http://www.tve.org/earthreport, http://www.tve.org/earthreport/archive/doc.cfm?aid=1809, http://www.tve.org/earthreport/archive/doc.cfm?aid=1801, http://www.tve.org/earthreport/archive/doc.cfm?aid=1659 and http://www.tve.org/earthreport/archive/doc.cfm?aid=1661
[95] TVE is an UK-based independent, non-profit organization.

- Thirty five Disaster Reduction Field Libraries[96] were delivered to the countries most affected by the tsunami[97] to enhance basic knowledge on tsunami, early warning and disaster risk reduction.[98]
- A bibliographic catalogue of publications, "ISDR-Biblio: Issue 1: Tsunami – 2006"[99] was produced. About 1,000 copies were distributed to UNIX centers, UN libraries and permanent missions to UN in Geneva and at various tsunami related meetings.
- A publication "Learning from disaster recovery – guidance for decision makers"[100] was produced by the International Recovery Platform (IRP) supported by ADRC, UNDP and UN/ISDR to provide a systematic analysis of disaster recovery experiences including the lessons from the Indian Ocean Tsunami of December 2004, Hurricane Katrina of August 2005 and the India/Pakistan earthquake of October 2005.
- An online interactive game, "Stop Disasters" [101] was developed by a UK production company, Playerthree Limited, with substantive inputs by the UN/ISDR to teach children 13 to 18 years of age how to protect cities and villages against natural hazards through disaster risk planning and management. It was tested by experts from the Conseil en communication ludo-éducative in Paris and in schools in Jamaica, Australia, India, Vietnam and Africa, in collaboration with IFRC, ACTION AID, UK PLAN INTERNATIONAL, Emergency Management Australia, USAID, and SEEDS. The game is being translated into several languages[102] with the support of additional donors.

➢ **Community-based Approaches**

- An international workshop "Strengthening the resilience of local communities to cope with water related natural hazards"[103] (Copenhagen, 16-18 November 2005) was hosted by the Government of Denmark. About 40 representatives from disaster risk management authorities, practitioners, and NGOs from Bangladesh, India, Indonesia, Malaysia, Sri Lanka and Thailand identified practical steps for the integration of community concerns into public policies.

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[96] The Field Library is in a form of blue metal trunk on wheels packed with books and journals.
[97] African institutions (IGAD, African Union, SADC, SADRC), Bangladesh, Indonesia, India, Islamic Republic of Iran, Kenya, Malaysia, Maldives, Mauritius, Myanmar, Oman, Seychelles, Somalia (Somali Embassy in Nairobi), South Africa, Sri Lanka, Tanzania, Thailand, Yemen.
[98] http://www.unisdr.org/eng/library/field-lib/fl-introduction.htm, and http://www.unisdr.org/eng/library/field-lib/field-library-catalogue.htm
[99] http://www.unisdr.org/eng/library/biblio/isdr-biblio-1-tsunami-2006.pdf
[100] http://www.undp.org/bcpr/iasc/content/docs/Learning_from_Disaster_Recovery_Exec_Summary_May2006.pdf
[101] The game can be accessed for free at: http://www.stopdisastersgame.org.
[102] Currently, French, Spanish and Chinese versions are available.
[103] Press release is available at:
http://www.unisdr.org/eng/media-room/press-release/2005/pr-200534-Building-Safer-Coastal-Communities.pdf

United Nations International Strategy for Disaster Reduction (UN/ISDR) Platform for the Promotion of Early Warning (PPEW) Bonn

Title of initiative:	Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami[104]
Countries primarily supported:	Indian Ocean countries
Duration:	From 1 February 2005 to 31 December 2006

Objectives

The objective of the initiative was to link the available technical capacities on tsunami early warning with humanitarian and emergency management capacities.

Achievements

- **Core System Implementation**
  - A special session "Indian Ocean disasters: risk reduction for a safer future" was organized at the World Conference on Disaster Reduction (WCDR) (January 2005, Kobe, Japan). It resulted in a "Common Statement" which emphasizes the importance of improving national systems and regional cooperation mechanisms for disaster reduction and disaster relief and the need for establishing tsunami early warning systems in the Indian Ocean region.[105]
  - A scoping meeting on the development of tsunami early warning systems, with specific reference to the countries in the Indian Ocean region, was organized by the UN/ISDR secretariat and the UNESCO/IOC in Kobe on 22 January 2005 immediately after the WCDR. About 100 participants namely delegates from governments and UN organizations as well as other experts were represented in the meeting.

- **Public Awareness and Education**
  - A publication "Developing Early Warning Systems: Checklist"[106] was developed to support governments and communities in implementing effective people-centred early warning systems. The checklist was presented at the Third International Conference on Early Warning (Bonn, Germany, 27-29 March 2006). The English version has been translated into 19 languages.[107]

- **Coordination and Partnership-building**
  - A publication "Lessons for a Safer Future" [108] was produced by drawing on the experiences of numerous organizations and individuals during and following the Indian Ocean Tsunami of December 2004.
  - The initiative supported one liaison officer specialized on advocacy and public information from July 2005 to December 2006 to work for the Office of the UN Special Envoy for Tsunami Recovery, former U.S. President Bill Clinton. The UN/ISDR secretariat jointly with WMO and UNESCO/IOC assisted the Special Envoy in promoting development of tsunami early warning system and disaster risk reduction in the Indian Ocean region within a global multi-hazard framework.

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[104] The title is the same as the overall multi-partner, multi-donor initiative led by the UN/ISDR although only specific activities of the UN/ISDR-PPEW are mentioned in this section. The activities related to the UN Special Envoy for Tsunami Recovery as well as the Indian Ocean Consortium were supported by UN/ISDR's New York Liaison Office.

[105] The full text of the common statement is available on: http://www.unisdr.org/wcdr/intergover/official-doc/L-docs/special-session-indian-ocean.pdf

[106] http://www.unisdr-earlywarning.org

[107] The 19 languages are Afrikaans, Arabic, Bengali, Burmese, Chinese, Farsi, French, Hindi, Indonesian, Malay, Portuguese, Russian, Sinhalese, Somali, Spanish, Swahili, Tamil, Thai and Urdu.

[108] http://www.unisdr.org/ppew/tsunami/pdf/Lesson-for-a-safer-future.pdf

- The initiative also facilitated the development and launch of Indian Ocean Tsunami Consortium consisting of the ISDR System partners (UNESCO/IOC, WMO, UNOCHA, UNDP, UNEP, IFRC, and the World Bank), and the Office of the Special Envoy for Tsunami Recovery. The Consortium was launched during the Third International Conference on Early Warning (EWC III) (Bonn 27-29 March 2006) at a session "Roundtable Indian Ocean Tsunami Warning and Response Systems". As of 31 August 2006 eleven countries[109] submitted national plans to address their needs and gaps for capacity building for reducing tsunami risks and to request support of the Consortium in mobilizing necessary financial resources.
- The UN/ISDR secretariat participated and/or provided substantial inputs to the UNESCO/IOC-hosted five major coordination meetings on the Indian Ocean Tsunami Warning System.[110] Among other items, UN/ISDR secretariat contributed to the establishment of the Sixth Working Group on Mitigation, Preparedness and Response for the Intergovernmental Coordination Group (ICG) to support strengthening national and regional mitigation, preparedness and response capabilities of tsunami early warning within a multi-hazard framework. The Sixth Working Group was formally adopted in the coordination meeting in Bali, Indonesia in August 2006.

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[109] Comoros, Madagascar, Maldives, Mauritius, Mozambique, Pakistan, Seychelles, Somalia, Sri Lanka, Tanzania and Thailand
[110] (1) Paris, France (3-8 March 2005), (2) Grand Baie, Mauritius (14-16 April 2005), (3) Perth, Australia (3-5 August 2005), (4) Hyderabad, India (14-16 December 2005) and (5) Bali, Indonesia (31 July - 2 August 2006)

Photo credits:

Photo 1-3:	UNDP India, 2006
Photo 4-5:	UNDP and Disaster Management Center Sri Lanka, 2006
Photo 6:	UNEP, 2006
Photo 7-8:	UNESCO/IOC, 2006
Photo 9-11:	AIDMI, 2006
Photo 12-14:	ADRC, 2006
Photo 15-16:	CRED, 2006
Photo 17-19:	SEEDS India, 2006

Cover photos: AIDMI (left), GFZ (right top), GTZ (right bottom)