

# PROCEEDINGS

International Decade for Natural Disaster Reduction (IDNDR)

## PROGRAMME FORUM 1999

5 - 9 July 1999, Geneva

DIPCN PROGRAMME FORUM 1999



"Partenariats pour un monde plus sûr au XXI<sup>e</sup> siècle"

# PROCEEDINGS

International Decade for Natural Disaster Reduction (IDNDR)

## PROGRAMME FORUM 1999

5 - 9 July 1999, Geneva





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# INTRODUCTION

This document is a collection of the proceedings based on reports by the rapporteurs of the International Decade for Natural Disaster Reduction (IDNDR) Programme Forum 1999, held from 5 to 9 July 1999, in Geneva, Switzerland. Proceedings of the World Meteorological Organization (WMO)/UN Education and Science Organisation (UNESCO) Sub-Forum on Science and Technology have been published in a separate document by the concerned organizations.

The IDNDR Programme Forum 1999, convened by the IDNDR Secretariat, in collaboration with WMO and UNESCO was officially opened by the United Nations Secretary-General, Mr. Kofi Annan. It was conceived as the substantive closing event for IDNDR with the objectives to:

- ♦ Exchange information on the achievements of the IDNDR programme;
- ♦ Identify remaining gaps and future research needs in the field of disaster reduction;
- ♦ Propose a feasible and effective disaster reduction strategy for the 21st century; and
- ♦ Agree on a future framework for action in the context of the United Nations.

Despite a decade of dedicated efforts, the number and costs of natural disasters continue to rise, given the increasing vulnerability of our societies to natural hazards. More than ever there is a need to strengthen and broaden disaster prevention programmes and, above all, to obtain political commitment from governments, international agencies, civil society and the private sector for a proactive management of risk and application of science and technology at all levels to mitigate the impact of natural disasters.

In this respect, the Programme Forum provided a valuable contribution by facilitating a global multisectoral and inter-disciplinary dialogue. This resulted in the adoption of the strategy "A Safer World in the Twenty-First Century: Risk and Disaster Reduction" and the "Geneva Mandate on Disaster Reduction". Both these documents constituted a major input into the United Nations deliberations on disaster reduction issues and the decision to establish successor arrangements to the IDNDR. Following the Economic and Social Council (ECOSOC) Resolution 1999/63, the General Assembly Resolution (A/54/219) endorsed the recommendations of the UN Secretary-General's report (A/54/497) to adopt the International Strategy for Disaster Reduction (ISDR) as the overall guideline for action, and to establish:

- ♦ an Inter-Agency Task Force, with representation from all relevant United Nations bodies, civil society and the NGO community and regional entities to serve as the main forum within the United Nations for defining strategies for international cooperation at all levels on disaster reduction, based on the ISDR,
- ♦ an inter-agency secretariat for natural disaster reduction as a distinct entity to implement the ISDR and to provide support to the work of the Task Force.

The Task Force and the secretariat are placed under the direct authority of the Under-Secretary General for Humanitarian Affairs and financed from extra-budgetary resources through a specific trust fund.

The proceeding of the Programme Forum provide a useful guide to various activities and policies that should be put in place to create a safer world for ourselves and for future generations. They are addressed to all parts of the disaster reduction constituencies.



# BUREAU FOR THE PROGRAMME FORUM

## **President:**

H.E. Ambassador Akao, Japan

## **Vice Presidencies:**

- Africa (Ethiopia)
- Latin America and Caribbean (Ecuador)
- Europe (Spain)
- Commonwealth of Independent States (CIS) (Russian Federation)

## **Rapporteur General:**

Mr. R. Hamilton, Chair of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

## **Special Rapporteurs:**

- H.E. A. Tevodjere, Minister of Planning, Benin
- Mr. Wang Ang-Sheng, Chinese Academy of Sciences, China
- Prof. M. Erdik, University of Istanbul, Turkey, and Member of United Nations STC on Natural Disaster Reduction
- Dr. S. Yodmani, Executive Director, Asian Disaster Preparedness Center (ADPC)

## **Secretary:**

Mr. Ph. Boullé, Director, IDNDR Secretariat



TIME

ROOM I

ROOM IV

HALL

ROOM III

DAY 1: Monday 5 July 1999

CLUSTER: ACTION TOWARDS THE 21ST CENTURY

8:30 - 9:30			Registration
9:30 - 9:45	- Message of Welcome to Delegations - Designation of the Bureau - Administration Announcements, Organization of the Conference		
9:45 - 11:00	Regional Approaches to Disaster Reduction : Networking, Synergies and Coordination		
11:00 - 11:30			COFFEE BREAK
11:30 - 13:00	Regional Approaches to Disaster Reduction : Networking, Synergies and Coordination (continue)		
13:00 - 14:00		LUNCH BREAK (FREE TIME)	
14:00 - 14:30	Success Stories		

## OFFICIAL INAUGURATION OF THE PROGRAMME FORUM

15:00 - 15:30	Addresses by Mr. K. Annan, UN Secretary-General and Prof. G.O.P. Obasi, Secretary General of the WMO		
15:30 - 16:00	Keynote Addresses by High level Dignitaries		
16:00 - 17:30	- Introductory Session and Opening Debate Presentation of the Coping Studies: - "Public Perception of Disasters, Economic Impacts and Education Needs" - "Disaster Resilient Infrastructure" - "Disaster Reduction Technology"		
17:30 - 18:00	Wrap-up Session		
18:30 - 19:30	"Open Public Forum : Community Based Disaster Reduction"		

DAY 2: Tuesday 6 July 1999

CLUSTER: EDUCATION AND SOCIO-ECONOMIC CONCERNS

9:30 - 11:00	Educating Future Generations		
10:00 - 10:30			
10:30 - 11:30	Civil Society and Partners		COFFEE BREAK
11:30 - 12:00		Disasters, Economy and Trade	
12:00 - 13:00			
13:00 - 14:00		LUNCH BREAK (FREE TIME)	
14:00 - 14:30	Success Stories		
14:30 - 15:30	Assessment and Projection of Social and Economic Impacts		
15:30 - 16:00		Health Dimension in Disaster Reduction.	
16:00 - 16:30	Empowerment of Local Communities		COFFEE BREAK
16:30 - 17:30		Sub-Session on Health Dimension in Disaster Reduction	COFFEE BREAK
17:30 - 18:00	Wrap-up Session		
18:30 - 19:30	"Open Public Forum" : Networks and Partnerships		

WMO/UNESCO Sub-Forum on  
Science and Technology

Opening

◆ Extra Tropical Storms

◆ Severe Local Storms &amp; Tornadoes

LUNCH BREAK (FREE TIME)

◆ Drought

◆ Fire Weather

◆ Extreme and Persistent

Temperatures

◆ Dust and Sand Storms

# AGENDA

DAY 3: Wednesday 7 July 1999		WMO/UNESCO Sub-Forum on Science and Technology	
CLUSTER: SCIENTIFIC AND TECHNOLOGICAL CONCERNS			
9:00 - 9:30	Toward Integrated Risk Reduction	Urban Mega Disasters	COFFEE BREAK
9:30 - 10:30	Information Technology for Assessment and Simulation Capacities	Applying Technology for Sharing Information	COFFEE BREAK
10:30 - 11:00			
11:00 - 11:30	Success Stories	LUNCH BREAK (FREE TIME)	
11:30 - 12:00	Safe Human Settlements in Disaster-Prone Areas	Towards Earthquake Safe Cities: How to Reduce Earthquake Damages	
12:00 - 13:00			
13:00 - 14:00	Early Warning Systems: An Integrated Process	Geological Hazard Assessment - How Science tries to stop hazards from becoming disasters	
14:00 - 14:30			
14:30 - 15:30	Wrap-up Session		
15:30 - 16:00	"Open Public Forum": Early Warning		
16:00 - 16:30			
16:30 - 17:30			
17:30 - 17:45			
17:45 - 18:30			
DAY 4: Thursday 8 July 1999			
CLUSTER: DEVELOPMENT AND ENVIRONMENTAL CONCERNS			
9:00 - 9:30	Disaster Reduction within Development - Disaster Reduction and Recovery for Sustainable Human Development	Protection of Natural Resources	
9:30 - 10:30			
10:30 - 11:00	Land Use Planning	Vulnerability of Ecosystems and Natural Disasters	COFFEE BREAK
11:00 - 11:30			COFFEE BREAK
11:30 - 12:30			
12:30 - 13:00			
13:00 - 14:00	Success Stories	LUNCH BREAK (FREE TIME)	
14:00 - 14:30	Capacitating Developing Countries	"Open Public Forum": Integrated Risk Management	
14:30 - 15:30			
15:30 - 16:00			
16:00 - 16:30			
16:30 - 17:30			
17:30 - 17:45			
DAY 5: Friday 9 July 1999			
CLUSTER: ACTION TOWARDS THE 21ST CENTURY			
9:30 - 11:00	Climatic Variabilities and Extreme: El Niño, la Niña		
11:00 - 11:30	The Disasters of the Future		COFFEE BREAK
11:30 - 13:00			
13:00 - 14:00	Success Stories	LUNCH BREAK (FREE TIME)	
14:00 - 14:30	Programme for the Future		
14:30 - 16:00			
15:00 - 17:30	CLOSING SESSION		
	<ul style="list-style-type: none"> <li>- Presentation of the Conclusion of the Programme Forum by the Rapporteur General of the Programme Forum</li> <li>- Conference Statement</li> <li>- Strategy for the 21st Century</li> <li>- Closing statement by the President of the Programme Forum</li> </ul>		



# OFFICIAL INAUGURATION OF THE PROGRAMME FORUM

## ADDRESSES:

**MR. KOFI ANNAN, SECRETARY-GENERAL OF THE UNITED NATIONS**

**"DESPITE DEDICATED EFFORTS, NUMBER AND COST OF NATURAL DISASTERS  
CONTINUE TO RISE"**

*Following are the remarks of United Nations Secretary-General Kofi Annan on the occasion of the closing of the International Decade for Natural Disaster Reduction, delivered at the International Conference Center of Geneva on the 5 July:*

"As the International Decade for Natural Disaster Reduction draws to a close we have achieved much, but we continue to confront major challenges. It is a tragic irony that 1998, the penultimate year of the Disaster Reduction Decade, was also a year in which natural disasters increased so dramatically.

At the same time, the International Decade has seen major achievements, for that, the IDNDR team here in Geneva, and their partners in and outside the UN system, deserve our gratitude.

There have been major advances in scientific cooperation. Around the world, an interdisciplinary scientific community of meteorologists, geologists, seismologists and social scientists is working ever more cohesively. Despite its limited financial resources, IDNDR has also brought together governments, NGOs, other international organizations and the private sector to work with the scientific community on disaster reduction strategies.

Much has been learnt from the creative disaster-prevention efforts of poor communities in developing countries.

And yet, ladies and gentlemen, we confront a paradox. Despite a decade of dedicated and creative effort by IDNDR and its collaborators, the number and cost of natural disasters continue to rise.

The cost of weather-related disasters in 1998 alone exceeded the cost of all such disasters in the whole of the 1980s. Tens of thousands of mostly poor people have died. Tens of million have been temporarily or permanently displaced.

1998 was, in fact, a truly disastrous year.

In the Caribbean, hurricanes George and Mitch killed more than 13,000. In fact, Mitch was the deadliest Atlantic storm in 200 years. A cyclone in India in June got less publicity. But it caused comparable damage, and an estimated 10,000 deaths.

India, Nepal and Bangladesh were hit by major floods, with more than four thousand killed. Two thirds of Bangladesh was inundated for months: millions were made homeless. But the greatest single disaster of 1998 was China's catastrophic Yangtze flood. Thousands were killed. Millions were displaced. The cost has been estimated at 30 billion dollars - yes, 30 billion dollars.

In Afghanistan, major earthquakes killed more than 9,000 people. In Brazil, Indonesia and Siberia, fires ravaged tens of thousands of square kilometers of forest.

The developed states suffered far less; even so, a single ice storm in January in Canada and the northeast of the United States left 2 billion dollars worth of damage in its wake.

The cost of disasters in the 1990s was some nine times higher than in the 1960s, and it is becoming increasingly clear that the term "natural" for such events is a misnomer.

No doubt there will always be genuinely natural hazards - - whether floods, droughts, storms or earthquakes. But today's disasters are sometimes man-made, and nearly always exacerbated by human action - - or inaction.

Obviously disasters like Mitch can exacerbate poverty. But poverty can also exacerbate disasters

It is no accident that 90 percent of disaster victims worldwide are in developing countries. Poverty and population pressures are forcing growing numbers of poor people to live in harm's way - - flood plains, earthquake-prone zones and unstable hillsides. Their extraordinary vulnerability is perhaps the single most important cause of disaster casualties.

And as cities in developing countries grow ever larger, as urban communication, energy and transportation systems grow ever more dense and complex, the risk of high cost losses is ever greater.

Disasters can also be made worse by faulty development practices. Massive logging operations reduce the soil's ability to absorb heavy rainfall. That in turn makes erosion and flooding more likely. The destruction of wetlands reduces the land's capacity to absorb heavy runoff.

Extreme climatic events may also be caused in part by global warming, which is in turn partly caused by increased carbon emissions from burning fossil fuels. Can it really be a coincidence that 1998 was the warmest year recorded since worldwide measurements were first taken some 150 years ago?

Much remains to be achieved. The programmes initiated during the decade point the way.

We must, above all, shift from a culture of reaction to a culture of prevention. The humanitarian community does a remarkable job in responding to disasters. But the most important task in the medium and long term is to strengthen and broaden programmes which reduce the number and cost of disasters in the first place.

Prevention is not only more humane than cure; it is also much cheaper. Disaster reduction and disaster relief are complementary, and yet quite different. Each is vital. Neither should be subsumed by the other.

Achieving prevention, as the IDNDR team and their partners have tirelessly argued, requires better early warning of impending disasters to give vulnerable populations time to move out of

harm's way. It means better policies to mitigate the effects of natural disasters. But above all, it means greater efforts to reduce vulnerability in the first place.

Unfortunately, such efforts rarely receive much publicity and thus too often fail to engage the attention of top policy makers.

Early warning is critical. But it will achieve little unless we use it for a combined effort by all sectors to plan ahead and build up people's capacity to respond rapidly at the local level.

And if we are to make real progress, we need a better understanding of the scientific and technical requirements of prevention. And we need to apply them resolutely in all our policies on development, housing and land use.

The scientific community understands the importance of the connection between natural disasters, climate change, and land use. The challenge now is to communicate this understanding more effectively to citizens and policy makers.

Prevention policy is too important to be left to governments and international agencies alone. To succeed it must also engage civil society, the private sector and the media.

We know what has to be done. What is now required is the political commitment to do it.

Of course the United Nations is not alone in the disaster prevention field. But it has a special leadership role thanks to its universal character, its broad policy agenda, its capacity for acting as an honest broker and its vital role as a forum for global dialogue.

Real progress will require Member States, NGOs and International Organizations to work together on advocacy, networking and consensus building, creating the sorts of global coalition that we saw in the campaigns to ban landmines and establish the International Criminal Court.

Among our most pressing tasks is to create clear guidelines for future action at all levels.

Above all, let us not forget that disaster prevention is a moral imperative, no less important than reducing the risks of war.

I applaud your extraordinary work over the past decade, and I share your determination to work even harder in the years ahead. Thank you all."

5 July 1999

**PROF. G.O.P. OBASI, SECRETARY-GENERAL  
OF THE WORLD METEOROLOGICAL ORGANISATION**

Distinguished Secretary-General of the United Nations,  
Your Excellencies,  
Distinguished guests,  
Ladies and Gentlemen,

It is indeed an honour and a privilege for me to address this Forum, on a subject of increasing concern to humanity. On behalf of the World Meteorological Organization (WMO) and on my own, I wish to thank the organizers of this Forum and particularly, Mr Philippe Boullé, the Director of the International Decade for Natural Disaster Reduction (IDNDR) Secretariat, for inviting me to address the Forum. It gives me great pleasure to also express my thanks and appreciation to Mr Kofi Annan, the Secretary-General of the United Nations, for gracing this occasion with his presence, and for his leadership, commitment and support to all efforts aimed at reducing the impact of natural disasters, for the welfare of humankind.

Your Excellencies, Ladies and Gentlemen,

You will recall that in 1987, the United Nations adopted Resolution 42/169 on IDNDR, and decided to designate the 1990s as the International Decade for Natural Disaster Reduction. This came about as a recognition of the very severe damages resulting from natural disasters that affect the fragile economic infrastructure of developing countries, especially the least developed, land-locked and island developing countries, and thus hampering their development process. Indeed, in 1979, hurricane David that struck Dominica had set back the Gross Domestic Product of that country by at least five years. The objective set for the Decade was therefore to reduce, through concerted international action, especially in developing countries, the loss of life, property damage, and social and economic disruption caused by natural disasters such as earthquakes, windstorms (tropical cyclones, tornadoes etc ) tsunamis, floods, landslides, volcanic eruptions, wildfires, grasshopper and locust infestations, drought and desertification and other calamities of natural origin.

The initiatives of the UN General Assembly was timely because, as we now know, all the disaster-causing events had occurred with higher frequencies and intensities during the Decade in all parts of the world.

Your Excellencies, Ladies and Gentlemen,

It has long been known that over 70 per cent of all natural disaster-causing phenomena are meteorological and hydrological in origin. For this reason, the primary responsibilities of all national Meteorological and Hydrological Services (NMHSs) are the provision of information and services for the safety of life and property of the citizens of their respective countries. As WMO works very closely with these Services, the primary objectives of its Programmes are such that the NMHSs have access to global data and information that are needed for timely warnings aimed at reducing the loss of life, property damage and social and economic disruption caused by natural disasters. It is to be recalled that such activities were in fact initiated by the predecessor of WMO, namely the International Meteorological Organization (IMO) whose establishment in 1873 was prompted by the need for weather forecasts to improve safety at sea.

Even in recent years, natural disasters associated with meteorological and hydrological phenomena are costing the world economy about US\$50 billion per annum. These disasters have also caused suffering to more than two billion people since 1965 and three million lives have been lost. We only need to recall a few of the recent disasters caused by Hurricane Mitch (1998) in Nicaragua, Honduras and Guatemala; the adverse impacts of the 1997/98 El Niño in Ecuador and Peru; the flooding of the Yangtze River in China (1998) and those of River Oder in Poland, Czech Republic and Germany (1997); the tsunami affecting Papua New Guinea (1998); the forest fires in Indonesia and the associated smoke in South East Asia (1997). The list is a very long one.

Mr Secretary-General, Your Excellencies,

A key concern of the Decade is the application of science and technology to mitigate the impact of natural disasters. As a scientific and technical Organization, WMO has therefore been in the forefront of such applications especially in the mitigation of weather-, flood- and climate-related disasters.

Furthermore, WMO has been very much involved in the planning of IDNDR and has maintained an active role in the implementation of the resolutions and decisions of the United Nations General Assembly as well as the Yokohama Strategy and Plan of Action on natural disaster reduction. In particular, the WMO Congress, the highest policy-making body of the Organization, adopted in 1991 a Plan of Action for the IDNDR. In this connection, WMO continues to give high priority to the collection, processing and exchange of data on natural hazards of meteorological and hydrological origins for national, regional and global use, particularly for the security of property and safety of life. The infrastructure maintained by WMO and the NMHSs for generating data and information in support of natural disaster reduction include, among others, the following:

(a) A global network of about 10,000 surface stations, 700 ocean buoys, 7300 ships and 1000 upper air stations, complemented by over 45000 aircraft observations per day and those from a constellation of ten geostationary and polar-orbiting meteorological satellites, weather radars and automatic weather stations, within the context of the WMO World Weather Watch (WWW) Programme;

(b) A global network of hydrological stations, being further enhanced through the World Hydrological Cycle Observing System (WHYCOS);

(c) A network of over 340 stations under the Global Atmosphere Watch (GAW) for the monitoring and prediction, among others, of transboundary air pollution including radioactivity, changes in the atmospheric concentration of greenhouse gases, and the depletion of the protective ozone layer;

(d) A network of World and Regional/Specialized Centres as well as national Centres of Meteorological and Hydrological Services, providing routine and emergency forecasts and warnings of hazardous meteorological and hydrological conditions such as tropical cyclones, severe storms, droughts and floods;

(e) A series of five Regional Tropical Cyclone bodies which coordinate forecasts and warnings on tropical cyclones and related phenomena such as floods and storm surges in the



respective areas. These bodies are of particular importance to the implementation of relevant components of the Barbados Programme of Action in support of the Small Island Developing States (SIDS);

(f) Specialized Centres for issuing warnings of tropical cyclones, floods, droughts, locust infestations, forest fires and other environmental hazards; and

(g) A network of 23 Regional Meteorological Training and Research Centres. For example, during the Decade, WMO specifically organized training courses for over 1,000 meteorologists in tropical cyclone forecasting and offered over 3,000 fellowships on subjects related to disaster mitigation.

In order to enhance the capacities of national Meteorological and Hydrological Services to provide timely warnings and advisories of weather- and climate-related natural disasters such as tropical cyclones and droughts, WMO has provided, during the Decade period, approximately US\$200 million of technical assistance in support of national and regional development projects.

In addition to the long-term activities, WMO has developed and implemented the following projects, specially geared to the goals of the IDNDR:

- ◆ *Tropical Cyclone Warning System for the South-West Indian Ocean Region* - to upgrade substantially the warning system through the application of meteorological satellite and computer technology, and the transfer of scientific knowledge;
- ◆ *Comprehensive Risk Assessment* - to promote a comprehensive approach to risk assessment in order to help reduce loss of life and property caused by flooding and other natural disasters;
- ◆ *System for Technology Exchange for Natural Disasters (STEND)* - to identify and facilitate the transfer of technology for use in reducing the impact of natural disasters. In addition, WMO's Hydrological Operational Multipurpose System (HOMS) helps in technology transfer related to flood forecasting;
- ◆ The development, jointly with the International Council for Science (ICSU), of a *pilotless aircraft to improve the observation of tropical cyclones*

Furthermore, the WMO World Weather Watch network also supports other comprehensive early warning programmes dedicated to specific hazards, such as the communication of information and warnings about volcanic ash clouds in cooperation with International Civil Aviation Organization (ICAO), dissemination of tsunami warnings in cooperation with UNESCO's Intergovernmental Oceanographic Commission (IOC), and the communication of information about nuclear accidents, in cooperation with the International Atomic Energy Agency (IAEA). WMO has also collaborated with the World Tourism Organization in the preparation and publication of a handbook on natural disaster reduction in tourist areas.

Mr Secretary-General, Your Excellencies,

The advent of increasingly powerful computers, improved observational capacity using satellite-based sensors, telecommunications and enhanced research efforts have led to improved understanding and prediction of weather and climate systems. Such advances have enabled the provision of skillful weather forecasts and warnings, of up to about 10 days in advance in the extra-

tropical regions. Such information has been useful in minimizing the negative consequences of natural disasters on water resource management, energy use, transportation, agricultural production and many other socio-economic activities.

In addition, intensive monitoring and data collection of the equatorial central and eastern Pacific Ocean, carried out during the Tropical Ocean and Global Atmosphere (TOGA) Project (1985 - 1994), resulted in a breakthrough of knowledge in El Niño prediction. These developments in El Niño prediction of a few seasons to a year ahead have been successfully used in many regions for early warning of El Niño-related extreme weather and climate events and the associated socio-economic impacts. Such prediction capability now form crucial components of early warning and disaster preparedness activities in many regions of the world where strong El Niño signals have been detected. In this regard, *the International Seminar on the 1997/98 El Niño event: Evaluation and Projections*, held in Ecuador in 1998, recognized the importance of such capability in support of sustainable development. It is to be recalled that the 1997/98 El Niño caused global damage of at least US\$34 billion. That Seminar also agreed on the need for the establishment of an International El Niño Centre which Ecuador is prepared to host.

It is to be noted, however, that the performance of the new generation of climate models used in seasonal prediction needs further improvement in some regions of the world, such as in the tropics, where relatively more research have to be carried out, and where the networks of surface and upper air observations are often sparse. In addition, considerable research is still required to fully understand the processes involved in the space-time evolution of most of the systems which result in natural disasters, especially those which are local or sub-regional in nature such as hailstorms, lightning, thunderstorms and tornadoes.

A scientific challenge for the next century is to further explore and enhance those advances in science and technology relevant to the mitigation of natural disasters. To date, the prediction of weather-related disasters with good lead-time and adequate preparedness is still the best disaster mitigation option. Indeed, studies of the economies of disasters showed that for every dollar spent on prevention and preparedness, between US\$ 100 and 1000 are required for an equivalent effect after a disaster. In addition, it is not possible to attach a monetary value on the life of a human being.

In its efforts to continually improve the capability of skillful prediction of weather and climate including natural disaster-causing events, WMO in collaboration with the IOC of UNESCO and ICSU has been implementing a *Climate Variability and Predictability (CLIVAR) project* under the World Climate Research Programme. The project is building upon the achievements of TOGA. Also, WMO Congress has recently instituted a new research project entitled *World Weather Research Programme* mainly to better understand the intensive weather phenomena that are responsible for disasters.

Mr Secretary-General, Your Excellencies,

Intensive weather and climate phenomena that result in natural disasters constitute a normal component of the global climate system. They had occurred in the past and will continue to occur in the future. What will be required is to further understand their nature. For instance, it has been noted that since the early 1970s, El Niño phenomena have been more frequent than La Niña. Associating some of these observed extremes to global warming is still a question of scientific debate, due to limitations of data, and the scientific knowledge for the detection and attribution of observed climate variability and climate change signals.

*The Second Assessment Report of the WMO/UNEP Intergovernmental Panel on Climate Change (IPCC)* issued in 1995 contained an assessment of the impact of climate change on phenomena that can result in natural disasters. While more research is required, it is expected that a warmer climate will result in a more intense hydrological cycle leading to increased drought conditions in some areas and floods in others. The Third IPCC Assessment Report which is expected to be issued in the year 2001 will provide further insights into the subject.

Mr Secretary-General, Your Excellencies, Ladies and Gentlemen,

This Forum is expected to propose a cost-effective strategy as well as guidelines and a programme of action for a coordinated and comprehensive approach to the reduction of the impact of natural disasters, as a contribution to sustainable development in the 21st century. In undertaking these tasks the Forum should take the following into account.

Firstly, the need to critically assess the current state of the science and technology used in natural disaster reduction and prevention, identifying improvements made during the Decade and, most importantly, making suggestions for future operational and research programmes to ensure continued progress. Some of the areas of focus should include the enhancement of current scientific ability to forecast geophysical events that cause natural disasters, and the strengthening of scientific and technological infrastructure, including observational networks, to support nations in natural disaster mitigation. Particular emphasis should be placed on existing national, regional and international capacities to determine vulnerability, undertake preparedness actions, provide warnings and promote awareness through public education programmes.

Secondly, the Forum might wish to propose how best the regional centres, especially those in developing countries, which monitor and provide early warnings should be further supported. As many of the disasters have regional and global dimensions, the resources required are sometimes beyond the capacity of many countries. A good example of the global dimension of natural disasters is the worldwide occurrence of extreme weather, hydrological and climate events, causing disasters which are observed during El Niño/La Niña episodes. In this connection, an El Niño International Centre could be established, to be hosted by Ecuador as earlier indicated.

Thirdly, as the major early warning tools in the 20th century were products of research including the current ability to provide skillful prediction of El Niño, the Forum should propose how best to enhance support for continued research at national, regional and global levels. WMO will continue to provide the international coordination of relevant research through its *Atmospheric Research and Environment* and its *World Climate Programmes* to enable the scientific community and all Member countries to maximize the benefits from all research results which may be useful for early warning and disaster preparedness.

Fourthly, there is a need to identify an intergovernmental mechanism for addressing earthquakes and volcanic eruptions so that the occurrence of these phenomena are better addressed.

Mr Secretary-General, Your Excellencies,

The implementation of the action plans for the Decade has resulted in significant awareness for enhanced collaboration between the scientific and technical agencies and the humanitarian and development agencies, particularly within the United Nations System. In our view, the humanitarian and development components have to be coordinated by the Office for the

Coordinator of Humanitarian Affairs (OCHA), and the United Nations Development Programme (UNDP), while the scientific and technical aspects is to be coordinated by an Inter-Agency Secretariat supported by all relevant UN Specialized Agencies and Programmes. Such an arrangement will ensure the enhancement of the scientific and technical programmes in support of the mitigation of natural disasters.

As we move into the next millennium, there will be increasing concern on how to more effectively address the wide-ranging effects of natural disasters. Although some progress have been made during the Decade, much more remains to be done. In some circles, it is still believed that the answer to such questions is in the enhancement of humanitarian assistance. Such belief is based on the philosophy that natural disasters are acts of God and not much can be done about them. Our view is that science and technology can make the required difference. This is the case with Bangladesh where in 1970 about 300,000 people lost their lives when struck by a tropical cyclone. A similar intense cyclone that struck in 1994 caused a loss of less than 500 people due to enhancement of scientific and technological support in mitigation efforts.

I hope therefore that this Forum will look back on the significant difference made by science and technology, over the Decade period, and formulate with conviction, appropriate strategies to address the related concerns of humanity in the 21st century.

Thank you.

**H.E. AMBASSADOR N. AKAO, PERMANENT REPRESENTATIVE OF JAPAN  
PRESIDENT OF THE PROGRAMME FORUM**

***"A Message from the Yokohama Conference to The Programme Forum in Geneva  
and Beyond to the 21st Century"***

Distinguished delegates, Ladies and Gentlemen,

First of all, I am very much honoured to be given this opportunity to chair the IDNDR Programme Forum, which will bring the International Decade for Natural Disaster Reduction to its conclusion by recalling what we have originally aimed, reviewing what we have eventually achieved and refining where the needs are to be carried out for the future. I would also like to express my heartfelt appreciation for the excellent job done by the United Nations IDNDR Secretariat in arranging this Forum, and for the efforts and work that have been put into this Forum by national delegations as well.

I had the honour to serve as chairman of the 1994 World Conference on Natural Disaster Reduction, the mid-point in the Decade, which was hosted by Japan in the city of Yokohama. The Conference, which was attended by delegations from 155 countries and territories, United Nations agencies, academia, private business and NGOs, turned out to be a great success with the adoption of the "Yokohama Strategy and Plan of Action for a Safer World" and the "Yokohama Message".

At the outset of this today's Programme Forum, allow me to share with you what I believe the Yokohama message was, as it formed the directions and priorities in the field of natural disaster reduction in the second half of the Decade.

The Yokohama Message stated "disaster prevention, mitigation, preparedness and relief are four elements which contribute to and gain from the implementation of sustainable development policies." "Prevention is better than cure." This is the essence of the Yokohama Message.

As you have heard, the message is too simple to forget it; but it is also very difficult to realize. It was well prepared, with the audience five years later in mind, but it certainly did not mitigate our work during the second half of the Decade. On the contrary, much work has been undertaken to let the message materialize. Let me give you some highlights of how Japan followed up the Message, in my capacity as head of the Japanese Delegation.

For cross-border regional cooperation, Japan opened the Asian Disaster Reduction Center in the city of Kobe last July, the city now remarkably recovering from a devastating earthquake in 1995. The Asian Disaster Reduction Center will serve as one of the central organizations of multilateral cooperation in the disaster-prone Asian region by promoting information exchange and joint research among Asian countries.

For technology transfer and training, Japan has been engaging in human resource development programmes in developing countries in the light of the pressing need for disaster prevention technology. We have provided cooperation for training programmes in flood control and sabo (landslide prevention), and technical cooperation in areas such as seismic engineering and meteorology.

Japan has also made significant contributions in financial terms and in human resources to the IDNDR Secretariat. This continuous support includes the "RADIUS" project which develops techniques for forecasting and preventing earthquake damage in urban areas, the outcome of which will be disclosed at one of the sessions of this Forum.

I am confident that all of you, with the Yokohama Message in your mind, have dealt with the mitigation of natural disasters in the latter half of the Decade. In my capacity as chairman of this Forum, I strongly encourage you to present to us what you have achieved in the coming five days. Each of the presentation and the subsequent discussion will, I believe, bring this Forum to a success.

Distinguished Delegates, Ladies and Gentlemen,

The need for concerted international efforts for disaster reduction does not end because the ten year programme of IDNDR comes to its conclusion.

The international community will need to build on the achievements and intentions of the International Decade for Natural Disaster Reduction and continue to share their experiences and disaster prevention technology so as to further progress in mitigating the damage from natural disasters in the twenty-first century.

We know that the Secretary-General is putting forward proposals for setting up an appropriate platform that would bring about concerted global action to continue the work done by IDNDR. As we can see from the presentations of regional and national IDNDR achievements, the importance of the functional continuation of the existing international framework as well as the regional institutions beyond the Decade is being emphasized.

Natural disaster is a real problem. More than twenty lives were lost in Hiroshima quite recently, a dreadful reminder of the power of nature.

As we end the Decade and proceed into a new millennium, we still are not able to eliminate natural disasters, nor the devastating damage they cause. Nature is sure to take advantage of yet another new vulnerability of ours, namely the concentration of population and industry.

But let us not be discouraged by this. Let us not let disasters prevent us from working together, sharing our experience and taking further steps. I am happy to reaffirm that Japan will continue to play an active role in disaster prevention cooperation through the ADRC as well as through bilateral and multilateral ODA.

Five years ago, we came together at the seaside metropolis of Yokohama.

Today we gathered in the mountainous lake city of Geneva. Let mother nature inspire you, to take part in active discussion of the issues coming up in this Forum, to lay the groundwork for pooling the wisdom and energy towards the common goal of mitigating natural disasters, so that very soon in the next century, we will be able to give a sigh of relief.

Thank you

**Mr. M. LEGGERI**, DEPUTY PERMANENT REPRESENTATIVE TO THE UN ON BEHALF OF **H.E. AMBASSADOR FULCI**, PRESIDENT OF THE ECONOMIC AND SOCIAL COUNCIL (ECOSOC) OF THE UNITED NATIONS

The President of ECOSOC, Ambassador Fulci, has asked me to convey to you this message:

"Ladies and Gentlemen,

You are gathered here in Geneva this week to review IDNDR's achievements over the past ten years and to formulate an action programme for disaster reduction in the twenty-first century. This is a challenging task.

Holding a substantive Forum as a component of ECOSOC already represents an important innovation. I am convinced that the quality and depth of your presentations and discussions will greatly facilitate the work of ECOSOC, providing a sound basis for decision-making on future arrangements.

1998 has again placed natural disasters visibly on the international agenda. The message that this Forum is sending to the world is that disaster reduction is feasible and possible. Vulnerability can be reduced; natural phenomena need not turn into disasters that kill and impede severely on economic wellbeing. Technological tools for disaster reduction are continuously improving, and their social and humanitarian implications are becoming ever clearer.

I am impressed by the variety of issues to be discussed during this meeting. This variety testifies to the universal and multi-sectoral character of disaster reduction, and to the commitment of the international community to effective and concerted action.

I therefore look forward, like all my colleagues, to receiving the results of the Programme Forum and your strategy of action for the future. I wish all partners of the IDNDR Framework for Action a successful conference."

**MR. R. HAMILTON**, USA, CHAIR OF THE UNITED NATIONS SCIENTIFIC AND TECHNICAL COMMITTEE ON NATURAL DISASTER REDUCTION AND RAPPOREUR GENERAL OF THE PROGRAMME FORUM

Good afternoon, Ladies and Gentlemen,

Mr. Secretary-General, Excellencies,

I appreciate the opportunity to join in welcoming the participants to the Programme Forum, the final event of the International Decade for Natural Disaster Reduction.

I am participating in this opening session in my capacity as Chair of the IDNDR Scientific and Technical Committee, the 25-member group of experts who have been responsible for reviewing overall programs of the Decade.

I should note that the STC has completed its report to the Secretary-General assessing progress during the Decade and identifying challenges for the future, and that report is available at this meeting.

At this opening session, hoping to stimulate your interest in the report, I would like to briefly mention the five challenges:

- First, to integrate disaster prevention and mitigation into overall economic planning; it is not logical to do otherwise.
- Second, to anticipate the vulnerabilities being created by increasing population concentrations in large urban centers, that is, megacities, with their dependencies on complex infrastructures.
- Third, to reduce the vulnerability of ecosystems and environmental resources to natural hazards, which directly affects livelihoods and the quality of life.
- Fourth, to improve disaster prevention and mitigation capabilities in developing countries, so they can better manage their own risks.
- And fifth, to assure effective coordination and implementation of programs.

On this last point, I commend the United Nations for focussing world attention on the importance of natural disaster reduction, and I urge the UN to lead us into the 21st century.

Along these lines I make one recommendation: prevention and mitigation of natural disasters should not be subordinated to emergency response and recovery.

History shows that humanitarian crises always absorb all the available resources, leaving nothing for long-term prevention and mitigation strategies.

Moreover, the nature of emergency response, dealing with short-term housing, food, and health needs, is inherently different from prevention and mitigation, which deal with land use, building practices, and warning systems.

Coordination of natural disaster prevention and mitigation should be separate from but linked with, coordination of emergencies.



Finally, I would like to take this opportunity to thank all those who have contributed to making the IDNDR a successful program, especially the Secretariat, those Member States that have provided the financial resources and that have conducted programs, and the experts who have given their time to the STC

I welcome you to the Programme Forum.

Thank you.

**MR. CH. KERT, FRANCE, PRESIDENT OF THE NATIONAL COMMITTEE FOR IDNDR, MEMBER OF THE FRENCH PARLIAMENT**

[Translated from French]

Mr. Chairman, Mr. Secretary-General, Excellencies, Ladies and Gentlemen,

You have put a number of questions to me. You have asked me how France has taken up this Decade, the last before the end of this century, one that is so important in terms of scientific progress, the last decade in a millennium where we will have to build a new world. How has France taken up its destiny during this decade, faced with an increase of major risks, the ignorance and fear of some, and the economic constraints. The experience of IDNDR calls for establishing a more responsible prevention society, one that is characterized by greater solidarity, one more open to the rest of the world and in particular to developing countries.

During the last decade, France has realized that globalization, demographic pressure, urban growth phenomenon and the changes in our economies have inexorably led us to increasing vulnerability of our modern societies. We had theoretic systems but they had not been wide spread in implementation. We have noted greater impetus between 1992 and 1995 to bridge the gaps, which has enable France to make progress.

We have had a very specialized scientific approach. We then have considered science of nature, engineering, social and human sciences, thus changing our way of thinking. Experts and governments have accepted to opening up to local groups, local communities and the civil society. Politicians and technical experts have understood each other better.

In the last three years, France enjoys a strong symbolic presence for the evaluation of risks with a planning commissioner in the executive and a parliamentarian responsible for technological and scientific choices in the legislative. Frances wanted its National Committee to open up. A specific working group was set up along with demonstration projects with respect to what can be done at the urban level and specific projects organized in Point-à-Pitre, Nice and Grenoble where a major meeting was held recently.

We have concentrated on cooperation in the European sphere and international cooperation such as that in the Caribbean and in the Mediterranean, in particular concerning the protection of forest, and I think, Ladies and Gentlemen, that together we have been able to deal with the problems better. It is a good idea to meet together in Geneva. First of all we emphasize the essential need to see prevention integrated completely in our programmes together with land use and development programmes for a sustainable development of human establishments.

Can we accept people not realizing what risks represent? No. We therefore need to exchange experiences, to share our risk stock, to realize more about risk and hazards. We need to mobilize our efforts to prepare individuals in terms of prevention by looking at the role of NGOs and civil society given that they all have their specific responsibilities. We need to look into the proposals to establish a World Prevention Fund comparable to the World Environment Fund as a prevention policy necessitates financial resources.

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And, very frankly, that are the two major ideas which have been present throughout our work. First, the emergence of a new idea of risks associating science, education, technology, new communication and, media, and second, a 21st century culture enabling us to build a world characterized by greater solidarity and, we hope, more fraternity. People have to be familiar with disasters, which they have suffer, sometimes even personally.

We hope that the coming century will be characterized by our greater role. Societies will remain fragile and vulnerable. It is because they are asking still today about risks that we need to provide a reply

Martin Luther King hoped that people would be able to have three meals per day to fulfill their needs. So we need to have freedom and equality to feed our minds. We saw that we can all work together to prepare the Forum in Geneva. We all saw that people needed knowledge in order to promote their individual security, which is the greatest need. And we note today that in one way or another we have to continue our efforts. We need to have international focal points outside and within the United Nations system to maintain an interagency mechanism in order to encourage international cooperation.

In the way of conclusion I would like to say that the Forum is very important. Let us give a face, with a pronounceable word, to our struggle for the coming decades. Let us act together to find the financial resources enabling us to continue our efforts. And let us be courageous enough to believe that everyone will be able to have access to this new culture, the culture of risks. New solidarity is opening up its doors broadly to this new culture and we can call this the oath of Geneva.

Thank you.

**H.E. FAN BAOJUN**, PEOPLE'S REPUBLIC OF CHINA,  
VICE CHAIRMAN AND SECRETARY-GENERAL OF CNCIDNDR,  
VICE MINISTER OF CIVIL AFFAIRS

Mr. Chairman, Ladies and Gentlemen,

First of all, please allow me, on behalf of the Chinese delegation to convey our warm congratulations to the opening of this Forum.

The aim of IDNDR is to effectively mitigate natural disasters through concerted efforts worldwide. Over the decade, the United Nations system has been playing a positive role and scored outstanding achievements in promoting IDNDR activities in a far-reaching way and raising the public awareness of natural disaster prevention. The Chinese Government highly appreciates these achievements.

The Chinese Government attaches great importance to natural disaster management and reduction work. While devoting itself to the economic construction, it has established the significant position of natural disaster reduction in the national economic construction and social development. Since its establishment in April 1989, the China National Committee for IDNDR (CNCIDNDR) has done a great deal in formulating the national plan and policies for natural disaster reduction, organizing and coordinating relevant departments and NGOs as well as providing guidance to local governments to carry out disaster reduction activities. In April 1998, the Chinese Government promulgated the "National Natural Disaster Reduction Plan of the People's Republic of China (1998-2010)", which clarifies the guiding principles, tasks and measures for natural disaster reduction, and put forward major actions to be taken.

The Chinese government has strengthened the legal construction of natural disaster reduction. Since 1989, several laws have come into force, such as "The National Earthquake Prevention and Disaster Reduction Law of the People's Republic of China"; "The National Fire Fighting Law of the People's Republic of China" and "The Flood Control Law of the People's Republic of China". These laws have gradually provided a sound legal basis for natural disaster reduction.

In the 1990's, China has experienced many severe natural disasters such as floods, earthquakes and droughts. In particular, the great 1998 floods along the valleys of the Yangtze River, Nen River and Songhua River have been seldom seen in history. Confronted with threats from natural disasters, the Chinese Government and the Chinese people struggled together as one to achieve one victory after another in the fight against natural disasters.

During the unyielding struggle against natural disasters, an operational mechanism for comprehensive natural disaster reduction with Chinese characteristics has come into being and been improved, which could be described as "overall decision-making and coordination at various levels with a due division of labor; well-planned organization and mass participation by the whole nation; guiding by science and technology and stress on prevention; and promoting beneficial measures to remove disaster risks and ensure development." In June 1999, the United Nations and the Chinese Government successfully held the "International Workshop on Natural Disaster Management".

In natural disaster reduction, we have also received extensive support and help from the international community. Here I would like to express our heartfelt gratitude. In our future work, we will fully implement "The National Natural Disaster Reduction Plan" and enhance comprehensive capacity in natural disaster reduction. We will actively take part in international cooperation in natural disaster reduction and make due contributions to international natural disaster reduction.

Mr. Chairman,

With the approaching of the 21st century, we are still confronted with a very severe natural disaster situation. Based on the IDNDR achievements, it is necessary for the international community to make more concerted efforts to mitigate natural disasters. For this purpose, I would like to make the following proposals:

1. Retaining the existing UN institutions for natural disaster reduction so as to continuously promote and coordinate international actions on natural disaster reduction.
2. Formulating an information-sharing plan for the international disaster reduction, fully utilizing science and technology to set up a global information network of natural disaster reduction and gradually realizing the sharing of information in the field.
3. Establishing "the UN Funds for International Natural Disaster Reduction" aiming at supporting major disaster reduction projects and actions, education and training programs. Meanwhile, the developed countries should take effective measures to increase assistance to the developing countries in natural disaster reduction, particularly help the developing countries improve their capacity in natural disaster reduction.
4. Establishing monitoring and early warning systems for major natural disasters worldwide to enhance the mankind's capacity in responding to these disasters.
5. Establishing an effective mechanism for the liaison and coordination of experts specialized in natural disaster reduction so as to promote exchanges and cooperation among them.

Mr. Chairman, this Forum is a significant event in IDNDR in reviewing the past and looking to the future.

I am confident that this Forum will surely lay a solid foundation for the cause of international natural disaster reduction in the coming century.

Finally I wish the Forum a full success.

Thank you, Mr. Chairman.

**H.E. A. FISCHER**, VICE PRESIDENT OF COSTA RICA AND CHAIR OF THE IDNDR MEETING FOR THE AMERICAS

[Translated from Spanish]

Ladies and Gentlemen,

It is for me a great honor to participate, as representative of the Latin American and the Caribbean nations, in the closing event of the International Decade of Natural Disaster Reduction. It is also a true pleasure to be in a country as exceptional as Switzerland always generous, which has opened up its hospitality to us.

We are here to analyze the achievements of one of the most important platforms of interaction for prevention of natural disasters at the regional and international level. Thanks to this Decade, the international community today is aware of the need for an approach based on medium and long term development, as well as the establishment of a prevention culture in the social sphere.

The Decade has contributed to the universal legitimization of this issue, to the development of a technological and political framework and to the opening up of regional

fora among partners and nations. And above all, it has highlighted the need for the promotion of integrated multi-sectoral strategies for the reduction of disasters, in a framework of national development plans, as a fundamental part of the process to improve the life standards of our people.

For this reasons, we hope that, with the assistance of all parties present, the United Nations system shall continue to play the role of international coordinator for prevention, mitigation and preparedness face with all types of disasters and this beyond the Decade which is coming to an end in order to ensure the permanency of the results that have been achieved and to extend the possibilities of a positive impact.

We stress the need to benefit from the achievements.

We have thus respectfully appealed to the United Nations system to maintain its leadership role in this area.

We want to continue to support the necessary substantial changes in the behavior of the citizens; to incorporate an integral perspective of risk management and prevention in the development plans of our countries; the social appropriation of information in order to lead to concrete decisions and actions.

Under this leadership we hope to achieve further knowledge on natural phenomena and scenarios on which impact may be achieved.

Ladies and Gentlemen,

It is absolutely necessary to continue along the path already embarked upon so that the Decade may overcome the causes, which generate vulnerability and risks, especially for those who live in poverty still today.

We must continue to promote land use planning; we have to avoid the repetition of mistakes; we need to convince people not only of social but also economic advantages of preventive measures.

Faced with the achievements made by the Decade, internationally and in particular in the Latin American and Caribbean region, we express our great interest to keep alive the working platform established during these past years.

Costa Rica is firmly convinced in appeals to the United Nations system to analyze the possibility of keeping open the Regional Office for Latin America and the Caribbean with the view to giving continuity to prevention, mitigation and preparedness projects

Of course the agenda is broad and ambitious. But even higher are our aspirations to achieve worthy and secure live for all of our people.

Certainly, there will be unavoidable responsibilities within each and every one of our countries. We trust that in the United Nations system we can keep alive our hopes.

Thank you.

# COPING STUDIES

*The coping studies are available upon request  
to the Secretariat for the ISDR*

- Moderator:** Mr. D. Warner, Deputy Director for the External Relations and Special Programs, The Graduate Institute of International Studies, and Coordinator of the Coping Study Project
- Rapporteur:** Mr. R. Slooff, Consultant, IDNDR Secretariat
- Speakers:**
- ◆ Prof. W.J.R. Alexander, Department of Civil Engineering, University of Pretoria, South Africa, and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction: *"Public Perception, Economic Aspects and Education Needs - An African Perspective"*
  - ◆ Prof. Dr. H.E.M. Minor, Director, Laboratory of Hydrology and Glaciology of the Swiss Federal Institute of Technology, Zurich, Switzerland: *"Disaster Resilient Infrastructure"*
  - ◆ Prof. S. Herath, International Center for Disaster-Mitigation Engineering (INCEDE), Institute of Industrial Science, University of Tokyo and United Nations University (UNU): *"Technology for Disaster Reduction"*
- Respondent:** Prof. Dr. O. Renn, Center of Technology Assessment in Baden, Württemberg, Stuttgart, Germany
- Content:** Having a better understanding of what might be disaster risk in the 21st century constitutes a crucial element for formulating a credible future approach to disaster reduction. To this end, the Graduate Institute of International Studies and its Program for the Study of International Organization(s) (PSIO) has been mandated by the IDNDR Secretariat to organize and coordinate three coping studies under the overall theme of "Risk and Society" in collaboration with renowned international institutions active in the field of disasters. The aim of these studies is to identify remaining gaps in disaster reduction, formulate strategic approaches to meet the requirements for improvement, and identify research needs in relation to the possible disasters of the twenty-first century.

## **"Public Perception, Economic Aspects and Education Needs, An African Perspective"**

*Prof. Alexander, Dept. of Civil Engineering, University of Pretoria, South Africa*

Within the socio-economic context of disaster vulnerability in the African region, the study seeks to identify the prime causes for poverty - related high levels of disaster vulnerability, both inside and from outside the continent. It analyses critically the highly response oriented external aid Africa receives to reduce disaster impacts and concludes that without greater attention from policy - makers and more support from donor agencies for anticipatory / preventive approaches in disaster reduction, many African countries will not be able to escape from the poverty - vulnerability - environmental degradation - poverty deadlock.



## **“Disaster Resilient Infrastructure”**

*Laboratory of Hydrology and Glaciology of the Swiss Federal Institute of Technology, Zurich, Switzerland*

This study examines the state - of - the - art in infrastructure design and construction to reduce physical disaster impacts from a number of natural hazards: wind loads, snow avalanches, ice avalanches, rock falls, landslides, impulse waves, earthquakes, forest fires and floods. It advocates a more extensive use of these technologies, in particular in new development of schemes, resettlements, transportation infrastructures, etc. It concludes that the promotion of disaster reduction through disaster resilient infrastructures is best secured through regional planning.

## **“ Technology for Disaster Reduction”**

*United Nations University (UNU) in cooperation with the International Center for Disaster Mitigation Engineering (INCEDE), University of Tokyo*

This study emphasizes the importance of disaster reduction technology in all phases of a disaster cycle- mitigation, preparedness, response, recovery and reconstruction. The degree of mitigation efforts made through disaster reduction technologies and land use planning is crucial in determining whether a given natural hazard would turn into a disaster and, if so, its magnitude. It provides an impressive overview of such technologies such as remote sensing and geographic information systems, global positioning systems, telecommunication technologies, disaster information systems, etc. The study also stresses that in adopting such technologies, decision - makers should be conscious of their sustainability in long-term planning and of the need for increasing disaster mitigation capacity.

**Respondent:** Mr Renn presented the subject of handling natural disasters from a novel risk assessment and evaluation perspective which distinguishes between managing disaster risk itself, addressing uncertainty about risks, and reducing the vulnerability to damage from such risks. He proposed to adopt three broad classes of management strategies for coping with natural disaster that take the different degrees of probabilities of hazards and their potential for damage into account. Political actions required to apply the three types of management include the development of “benign” technologies, the establishment of “self-learning” organizations and the linking of economic incentives to risk avoidance behaviour. He proposed to establish an International Panel on Risk Assessment and Management.

**Conclusions:** On the one hand, increasing environmental degradation, urbanization and industrialization will render natural disasters increasingly important and, hence, the need to press for sustainable development policies more forcefully. On the other, progress being made with technology development and availability will change the nature of disasters as well as the manner in which humankind will deal with their reduction.

# EDUCATION AND SOCIO-ECONOMIC CONCERNS

## EDUCATING FUTURE GENERATIONS

- Task Manager:** UNESCO in collaboration with the Canadian IDNDR Coordination Committee
- Moderator:** Mrs. K. White, President of Black & White Communications Inc., Executive Director of Risk & Society Initiative, Board Member of Canadian IDNDR Coordination Committee
- Rapporteur:** Mr. J. Bruce, Canadian Climate Program and former Chair of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction
- Speakers:**
- ◆ Mrs. K. White, : "Education for the Future: The Risk and Society Initiative Model"
  - ◆ Dr. A. Holloway, Project Co-ordinator, Sustainable Livelihoods Project, University of Cape Town and University of the Western Cape, South Africa, and Member of the United Nations STC on Natural Disaster Reduction: "Developing National Policy and Political Mechanisms Sustainable Public Education Good Practices and Lessons Learned"
  - ◆ Mr. N.K. Jain, Secretary General, Global Forum of NGOs for Disaster Reduction (GFNDR) and Director of the Joint Assistance Centre, India "Building a Permanent Network for the Education Sector: a Case Study from GFNDR"
  - ◆ Mr. J. Faye, Responsable de l'information, Ministère de l'Environnement, Paris, France, : "The Culture of Risk Creating a Research Agenda in Support of an Education Curriculum for Youth and Minorities"

**Content:** Education has a key cross-cutting role in disaster reduction by extending citizen engagement to the creation and maintenance of sustainable human communities.

Education should be delivered through alternative media using experiences of local communities and emphasizing the need for vulnerable people not to be passive in the face of hazards since their collective action can reduce the impact of these hazards. Films and videos, for instance, are good means of education and prove to be more interactive in their development than printing material, given that they require the investment of the stakeholders. Also, activity-based learning such as community walks, hazard mapping and community poster competitions could be very pedagogic tools as long as they are planned on a long-term basis.

The Internet technology offers great opportunities to build and share resources. Development of research (risk communication and policy) together with scientific assessments of risk and vulnerability provide a basis for effective programme design for education at both national and international level as exemplified by the Risk & Society Initiative.

Building networks for education and training sectors in disaster reduction is also essential for successful education strategies. National solidarity and international cooperation are paramount ingredients for the education of the future actors of prevention (architects, urbanists, etc...) to reduce vulnerability to hazards.

**Conclusions and Recommendations:**

- ◆ Education for disaster reduction must be integrated in the programme of the successor arrangement to the IDNDR which should foster regional and international co-operation, exchanges of resources and good practices.
- ◆ Education in disaster and risk reduction must be advocated nationally and internationally.
- ◆ Creative and strategic use of multi-media is essential to successful disaster reduction education
- ◆ The education sector (formal and informal) should use emerging information and communication technology and integrate evaluation methodologies to measure increased resilience, citizen engagement and improved decision-taking in the field of risk. Community memory and local knowledge are also effective tools for community-wide awareness raising.
- ◆ Education programme should include training of teachers at all levels, institutional and logistic support as well as the engagement of politicians and the media.

## **CIVIL SOCIETY AND PARTNERSHIPS - The Public-Private Partnership 2000: A unique U.S. experiment in collaboration among governments, NGO's and private enterprise**

**Task Manager:** Public Private Partnership 2000 (PPP-2000) a cooperative endeavor of nineteen federal agencies composing the Subcommittee for Natural Disaster Reduction, the Institute for Business and Home Safety, and other private sector organizations

**Moderator:** William H. Hooke, Chair of the Subcommittee for Natural Disaster Reduction, Washington D.C., USA

**Rapporteur:** Ms. E. R. Padovani, Senior Scientist, Disaster Information Coordination, U.S. Geological Survey, USA

**Speakers:**

- ◆ William H. Hooke: *Introduction: "The Public-Private Partnership 2000: A unique U.S. experience in collaboration among government, NGOs and private enterprise"*
- ◆ Mr. D. Sullivan, Executive Vice President and Chief Administrative Officer of the State Farm Fire and Casualty Company: *Keynote address and Introduction of the Subject*

### **Panel presentations:**

- ◆ Mr. M. Armstrong, Director of the Mitigation Bureau, Federal Emergency Management Agency (FEMA), Washington D.C.: *"FEMA's leadership in fostering a new national outlook to disaster reduction"*
- ◆ Prof. W. Iwan, California Institute of Technology, California: *"The Role of Structural Engineering in Natural disaster Reduction"*
- ◆ Prof. H. Kunreuther, Wharton School, University of Pennsylvania, Philadelphia: *"The Role of Finance and Economic Considerations in Shaping the U.S. National Policy for Disaster Reduction"*
- ◆ Ms. G. Craven, USAA Property and Casualty Group (retired): *"The Crucial Role of Building Public Awareness and Reshaping Public Values"*
- ◆ Ms. M. L. Carrido, President and Chief Executive Officer of MLC & Associates Inc. Irvine, California: *"Benefits of Public-Private Partnership in Establishing a Disaster Recovery Business Alliance"*

**Content:** United States participation in the IDNDR consisted of a diverse range of partnerships, encompassing governments at different levels, private enterprise, and NGOs. The Public-Private Partnership 2000 (PPP 2000) is a unique U. S. experience in collaboration among governments, NGOs, and private enterprise. In a monthly forum, it seeks to surface major, complex issues in the context of the United States national agenda. Instead of attempting to resolve these issues, it brings stakeholders together and fosters the development of collaborations that will prove enduring and able to address challenges in a sustained way over a period of time. The PPP 2000 works toward six goals, namely 1) establishing natural disaster reduction as a public value; 2) focusing on pre-event mitigation measures with respect to both structural and non-structural aspects; 3) advancing national real-time warning capabilities; 4) building national capabilities for financing pre-event mitigation and spreading risk; 5) improving information access; and 6) developing international collaborations as well as focusing on domestic issues. It attempts to move beyond improving public awareness, by having the ultimate goal of making natural disaster reduction a public value.

The United States' Federal Emergency Management Agency (FEMA) leads the U.S. from a focus on emergency response to a multiple culture. Through the National Mitigation Strategy, and Project Impact, FEMA has brought local and community level resources to bear on national disaster reduction across the United States.

Structural engineering in natural disaster reduction as well as emerging financial measure to manage the financial risk associated with natural disasters are important aspects of prevention.

The formation of "Disaster Recovery Business Alliances (DRBA)" - community partnerships involving local government, business, and private citizens -- develops strategic approaches to disaster mitigation at the community level to help private enterprises - corporations normally competing with each other - to work together toward common goals of strengthening critical infrastructures needed to minimize business disruption.

**Conclusions and Recommendations:**

Structural engineering in natural disaster reduction as well as emerging financial measure to manage the financial risk associated with natural disasters are important aspects of prevention.

## ASSESSMENT AND PROJECTION OF SOCIAL AND ECONOMIC IMPACTS

- Task Manager:** UN Economic Commission for Latin America and the Caribbean (ECLAC)  
**Moderator:** Mr. R. Zapata, Chief, International Trade Unit, ECLAC  
**Rapporteur:** Mr. H. Kunreuther, Wharton School, University of Pennsylvania, Philadelphia, USA
- Speakers:**
- ◆ Mr. R. Zapata: *"The Latin American Experience: Concepts and Progress - An Integrated Socio-Economic Perspective for Disaster Reduction"*
  - ◆ Mr. C. Ertuna, Chief, Environment and Natural Resources Development Division, ESCAP: *"The Asian Experience: impacts of recent disasters, responses and the Bangkok Declaration"*
  - ◆ Mr. O. Laye, Team Leader on Environment, ECA: *"The African Experience: socio-economic conditions and disaster risk management in Africa"*
  - ◆ Dr. R. Enderlein, ECE: *"The case of floods in Eastern Europe as an example of vulnerability increased by socio-economic and political transitional processes"*
- Content:** The United Nations Economic Commissions in Asia (ESCAP), Africa (ECA), Latin America (ECLAC) and Europe (ECE) reported on their work including regional experiences and insights in terms of social and economic impact of disasters as well as the linkages between socio-economic development, vulnerability to disasters and risk reduction policies.

### Conclusions and Recommendations:

#### *Asia*

- ◆ Enhancing the sharing of information and experiences as well as the coordination of activities within the UN system at the regional and sub-regional levels
- ◆ Integrating disaster preparedness and mitigation activities into economic and social development process
- ◆ Increasing public awareness and participation
- ◆ Strengthening regional networking and transfer of technologies
- ◆ The UN Secretary-General to support mechanisms for bringing about concerted regional and global action
- ◆ Continuing existing regional institutions and framework similar to the IDNDR Secretariat beyond the Decade.

#### *Africa*

- ◆ Coordinating Private sector, NGOs, universities as well as research and development institutions with local communities for relief and rehabilitation activities and also for the reduction of vulnerability to disasters
- ◆ Including private sector in conceiving, designing and implementing community based programs
- ◆ Mobilizing mitigation activities according to a strategy instead of haphazardly as it is the case currently
- ◆ Enhancing resources for hazard mapping, risk evaluation, information system development and early warning systems
- ◆ Establishing a regional coordinating center for disaster issues in Africa

#### *Eastern Europe*

**Enhancing construction for dams, bridges and other infrastructure susceptible to floods**

- ◆ Enhancing cooperation between countries for transboundary risks associated with river floods
- ◆ Shifting paradigm when evaluating alternative policies by assessing the price for security and the need to accept some risk, bearing in mind that there is a high price to pay for zero risk.
- ◆ Including in risk management strategies land-use planning, structural measures, and warnings.
- ◆ Adopting a holistic approach regarding cooperation with key stakeholders within the country as well as between countries
- ◆ Reevaluating objectives concerning transboundary risks and proposing actions to be taken

***Latin America***

- ◆ Implementing an integrated risk management system with a pro-active rather than reactive strategy to reduce vulnerability to disasters
- ◆ Understanding and assessing direct as well as indirect impacts of infrastructures on a country in case of damage from a disaster
- ◆ Considering the role of mitigation in reducing both primary and secondary losses from disasters
- ◆ Taking into account technical, structural and management criteria when approaching the issue of reduction of vulnerability to and effects from natural disasters
- ◆ Giving priority to urgent rehabilitation needs (restore lifelines, provide production tools) at the beginning of the reconstruction phase
- ◆ Promoting regional co-operation and synergy as well as private sector and local community participation in order to reduce individual costs and increase economies of scale

## EMPOWERMENT OF LOCAL COMMUNITIES

- Task Manager:** Periperi, NGO network in Southern Africa
- Moderator:** Mr. A. Maskrey, Senior Human Resource Development Advisor, Disaster Reduction and Recovery Programme, Emergency Response Division, UNDP
- Rapporteur:** Mrs. Z. Delica, President, Global Forum of NGOs for Disaster Reduction (GFNDR) and Manager, International Consultancies Management, Asian Disaster Preparedness Centre (ADPC)
- Speakers:**
- ◆ Mrs. M. Ariyabandu, Duryog Nivaran: "Empowering vulnerable communities in South Asia"
  - ◆ Mr. F. Ramirez, LaRed: "Empowering vulnerable communities in Latin America"
  - ◆ Ms. L. Fidalgo, Periperi: "Empowering vulnerable communities in Africa"
- Content:** The active participation of local communities and organizations is an essential ingredient for successful disaster reduction policy and practice. The experiences of three regional NGO networks (Duryog Nivaran in South Asia, Periperi in South Africa and LaRed in Latin America) in the promotion of risk reduction at community level demonstrate that vulnerability of community is not a fatality. Vulnerable communities especially in developing countries have extraordinary, but often overlooked, resources to prevent losses from disasters. The merits of incorporating community based approaches for the reduction of risks to disasters are numerous despite the existence of barriers to their full realization.
- The hereafter conclusions were exemplified by case studies on
- ◆ local initiatives and coping strategies in Sri Lanka, Nepal, Bangladesh and Pakistan;
  - ◆ information on food Security and nutrition vulnerability mapping in Mozambique; and
  - ◆ reexamination of community participation in various countries of Latin America.

### Conclusions and Recommendations:

#### Merits of community based approach for the reduction of risks to disasters:

- ◆ Communities are rich in experiences of coping with disasters both in preparedness and emergencies. As they are knowledgeable about their own environments, they also are often able to predict unfavorable events.
- ◆ The community coping methods evolve with time, and suit best the local socio-economic cultural and political environment. Therefore, community inputs are more adequate for establishing effective and realistic planning and actions than external point of views.
- ◆ Community based initiatives are potentially more resource efficient, and better self sustained.
- ◆ Communities are often independent during disaster periods and able to increase their capacities to support their own priorities.
- ◆ Gender equity is more likely to take place as women capacities to cope with hazard is taken into consideration
- ◆ Empowered communities can remove some of the causes of vulnerability, thereby reducing the impact of future extreme natural events.

#### Barriers to community based approach for the reduction of risks to disasters:

- ◆ Community efforts lack effectiveness if they are not supported and treated as an important part of any integrated and sustainable disaster mitigation strategy
- ◆ Practices by states and many agencies are increasing the "dependent victim mentality" or "donor-recipient culture", weakening local capacities, destabilizing community organizations and preventing effective leadership
- ◆ Administrative barriers, relative absence of civil society concerns in most countries in Latin America and gaps in management planning between national and local levels constitute a major impediment to the full realization of a community based approach
- ◆ **Aviable information is not fully utilized as this is a crucial component for the reduction of vulnerability**



## DISASTER, ECONOMY AND TRADE - The Effects of Natural Disasters on the Development of Tourism

**Task Manager:** United Nations Conference on Trade and Development (UNCTAD)  
**Moderator:** H. E. Ambassador F. Cuello, Permanent Mission of the Dominican Republic in Geneva  
**Rapporteur:** Mr. R. Whiter, UNCTAD Consultant

### Panelists and Speakers:

- ◆ Mr. D. Diaz, Chief, Trade and Services, UNCTAD Division on International Trade in Goods and Services and Commodities: *"UNCTAD's Mandate on the Impact of Natural Disasters on Tourism"*
- ◆ Mr. P. Encontre, Economic Affairs Officer, Office of the Special Coordinator for Least Developed, Land-locked and Island Developing Countries, UNCTAD: *"Least Developed Countries, Land-Locked and Island Developing Countries"*
- ◆ Mr. R. Wither: *"The Effects of Natural Disasters in the Tourism Sector of Developing Countries"*
- ◆ Mrs. L. Valenty, Project Director, Secretaría de Integración Turística Centroamericana, Nicaragua: *"The Impact of Hurricane Mitch in the Central American Tourism Sector"*
- ◆ Ms. S. Scotland, Director, Antigua and Barbuda Tourist Office: *"The effects of Hurricane George on Antigua the role of the media in directing the impact on foreign markets"*

**Content:** The session concentrated on the tourism sector and the implications of trade and development on the vulnerability to natural disasters of Least Developing Countries (LDC) and Small Island Developing States (SIDS). Natural disasters have a strong impact on social and economic structures generally and in particular on tourism as commercial activities can be disrupted for a long time. Tourism, however, can play an important role in post disaster recovery programmes. UNCTAD sponsored a special study on the effects of Natural and Man-made Disasters on the Tourism Sector of Developing Countries. UNCTAD is also currently looking, as a special mandated task, into the support of new initiatives on post disaster recovery programmes to assist countries, especially LDCs and SIDSs, on the following aspects.

- ◆ parameters to estimate the impact of disasters on tourism
- ◆ guidelines to assist Government accelerate their recovery programmes.

Response to vulnerability issues is extremely complex and has to be dealt with at national levels. Handicaps for certain countries to recover from disasters include the lack of resources and remoteness while reconstruction costs are not a dominant cause for long term economic stability. It should be noted that there is little difference between countries predominately exporters of goods and countries predominately exporters of services.

Vulnerability of tourism to any disaster is due to the fragility of the markets. However, the diversity of small and medium Enterprises (SMEs) in the tourism sector contribute to its strength. The SMEs enable the tourism sector to recover quickly provided that trade opportunity are offered to destinations hit by disasters, and that mitigation of the social impact is achieved by the empowerment of the local communities to develop new tourism products.

The social impact of disasters is critical in most vulnerable developing countries and this was highlighted by the Mitch experience. The detrimental impact of Hurricane Mitch on Central American tourism was due primarily to a lack of preparedness of Central American states. Also, mitigation could have been enhanced by development plans.

Lessons learnt from 44 hurricanes striking in Antigua and Barbuda this century contributed to the 1998 recovery programme after the Hurricane George episode. Media played also an important role in influencing Antigua's markets at a time when an improving image was needed.

**Conclusions and Recommendations:**

- ◆ Tourism should be considered as an economic partnership between tourism destinations and source markets
- ◆ Negative social impacts on tourism should be mitigated by the creation of economic partnerships between destinations and source markets
- ◆ With regards to post disaster recovery strategies, the tourism sector should be included in national disaster management planning as tourism has a crucial role in generating foreign currency resources for the countries, a prime component in sustainable development.
- ◆ Support for recovery should be provided by trade development programmes rather than by direct aid provision.
- ◆ Governments of many developing countries could enhance their capacity to manage efficiently post disaster management plans by appreciating the economic importance of tourism
- ◆ Effective institutions should be established in developing countries in order to manage disaster recovery programmes
- ◆ Support for recovery should be provided by trade development programmes rather than by direct aid provision

## HEALTH DIMENSION IN DISASTER REDUCTION

- Task Manager:** The World Health Organization (WHO), in collaboration with the UK IDNDR Coordination Committee
- Moderators:** Dr. A. Denton, Chairman, UK IDNDR Coordination Committee, and Dr. R. Flores, WHO/EHA
- Rapporteur:** Prof. I. Davis, Cranfield University, UK
- Speakers:**
- ◆ Dr. P. Baxter, UK: "Health impacts of the recent volcanic eruption at Montserrat"
  - ◆ Dr. J. Larusdottir, WHO/SEARO: "Health impacts of Bangladesh flood in 1998"
  - ◆ Dr. S. Asahi, WHO/WPRO: "Health impacts of Kobe earthquake"
  - ◆ Dr. R. Saenz, WHO/AMRO: "Health impacts of Hurricane Mitch"

- Content:** Due to insufficient disaster prevention and inadequate health sector preparedness, natural disasters continue to cause injury, death and disease among vulnerable communities. This session reviewed health impacts of some of the following recent natural disasters:
- ◆ Volcanic eruption in Montserrat (1995-1999)
  - ◆ Flooding in Bangladesh (1998)
  - ◆ Earthquake in Kobe, Japan (1995)
  - ◆ Hurricane in Central America (1998)

Issues raised included whether losses due to human health could have been further reduced cost-effectively and how health impact reduction should be improved in the future, based on more preventive strategies such as the improved use of early warning.

Volcanic eruption threatened the Montserrat Island's population of 12,000 people over the period 1995-1999. Lessons learned from an extended period of disaster management contributed to the development of policies on early warning system, evacuation planning and emergency management. Gained experience confirmed the importance of:

- 1) close collaboration between scientists and authorities,
  - 2) the development of risk communication with the public, and
  - 3) the new approach adopted for the first time in volcanic risk management using "expert judgement" and quantified risk assessment.
- The session also underlined the problems faced by the authorities in maintaining for over 2 years a state of readiness to evacuate the population.

The devastating flood of 1998 in Bangladesh was one of the greatest floods to occur during the Decade. Key lessons from this event included

- 1) the importance of health information for effective flood management,
- 2) the need to maintain a disaster information system throughout the flood event, and
- 3) the need to decentralize resources prior to seasonal floods to aid rapid relief and recovery.

It should be reminded that flood mitigation is a multi-sectoral issue which includes environment management.

The Kobe earthquake was the first large scale sinister to hit the city in 50 years. It resulted in 6,430 deaths and affected 2 million people. Nearly 80% of the city's hospitals were damaged or collapsed. Kobe is a Japanese mega city with supposedly plenty of resources. However, in the first two days after the event, local communities had to handle their own health and medical problems. It showed that a sound multi-connected communication "fail - safe" system is vital. The disaster has confirmed that a pro-active health emergency plan is an essential element of a disaster contingency plan.

The full impact of Hurricane Mitch on the countries of Central America is still being calculated. Nearly 10,000 were killed, with a similar amount of missing people, nearly 13,000 wounded and 590 health centers affected. Experience showed the importance of providing equitable assistance with the active participation of local communities and the necessity to identify priorities to establish and implement an effective disaster recovering programme despite the chaos and confusion. In the aftermath of Hurricane Mitch rumours abounded concerning the risks of epidemics. This demonstrates the importance of providing accountable information to the communities affected by major disasters.

**Conclusions and Recommendations:**

- There is a need for:
  - pro-active health emergency planning
  - foolproof information communication systems
  - key role played by local communities in the early stages of major disasters
  - multi-sectoral response

## **SUB-SESSION ON HEALTH DIMENSION IN DISASTER REDUCTION: Capacity-Building and Supply Management for Health Impact Reduction**

**Task Manager:** UK IDNDR Coordination Committee, in collaboration with the World Health Organization (WHO)

**Moderator:** Dr E. Noji, WHO/EHA

**Rapporteur:** Dr. S.W.A. Gunn, President of the Mediterranean Club of Burns and Fire Disasters, Switzerland

**Speakers:**

- ◆ Prof. J.S.P. Lumley, UK: *"Training on the medical care in disaster situations: the UK experience"*
- ◆ Dr. C. De Ville, WHO/PAHO. *"Developing human resources for coordination and logistics: the experience in the Americas"*

**Content:** The current situation witnesses a growing impact of disasters with inadequate health response. Health response can be improved with training. However, there is a great difficulty in identifying organizations and finding trained individuals to respond to health disasters. This sub-session examined training systems for

- 1) Medical care in disasters as developed in the UK, and
- 2) Coordination of the logistics of health relief (SUMA), as developed in PAHO.

# SCIENTIFIC AND TECHNOLOGICAL CONCERNS

## TOWARD INTEGRATED RISK REDUCTION

**Task Manager:** National Department of Civil Protection (ONEMI), represented by Dr. Maturana, Director of ONEMI, Ministry of Interior, Government of Chile, and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Moderator:** Dr. A. Maturana

**Rapporteur:** Mr. S. Weber, Office of the Director General, United Nations, Geneva

- Speakers:**
- ◆ Prof. Wang Ang-sheng, Director of the Center for Disaster Reduction, China Academy of Sciences, and Director of Experts Group, China National Committee for IDNDR (CNCIDNDR): "*China Disaster Reduction Plan and Integrated Disaster Reduction*"
  - ◆ Dr. M. Saenz, Board of Directors of the National Emergency Commission, Government of Costa Rica, San Jose, Costa Rica: "*Basic Legislation and Information for Risk Management*"
  - ◆ Mr. N-G Camp'huis, Representative of the Equipe Pluridisciplinaire du Plan Loire Etat (EPALA), Orléans, France: "*Flood Reduction Strategy on the Loire River in France*"
  - ◆ Mr. L. Preciado Barragan, Secretariat of Housing and Urban Development, Government of Mexico City, in conjunction with Mr. L. Wintergerst Toledo, General Director of Civil Protection, Mexico City: "*Vulnerability Reduction through Urban Development Planning*"
  - ◆ Mr. D. Kurbanbekov, Head of the Ecology and Emergency Situations Section, Office of the President, Government of Tajikistan, Dushanbe, Tajikistan: "*Applied Risk Reduction in the Case of Lake Sarez, Tajikistan*"

**Content:** Discussions during the session centered around the ways in which an integrated risk reduction strategy as both a discipline and a goal is approached in a coordinated fashion given the increasing complex impacts of natural phenomena.

### **Conclusions and Recommendations:**

- ◆ ***Integrated strategies for risk reduction must take full account of local capacities and experience when devising practical measures for disaster reduction at the local or regional level.*** Local level participation in the decision-making is an essential element in this approach as it ensures local ownership of the effort and increases awareness of risk, respects local cultural, historic, political, and economic considerations, all the while improving the success rate of such initiatives.
- ◆ ***Multi-sectoral boards with executive powers must be established as the central coordinating body to steer the integrated strategy from planning to implementation.*** An important aspect of the board's work must be a regular reappraisal and adjustment process based on lessons learned and information sharing with other such boards in other countries
- ◆ ***A synergy between the national and local level decision-making bodies must be maintained not simply in times of crisis but on a regular basis through established channels.*** One such example in the case of Costa Rica is the collection and analysis of information regarding past disasters. The process of data collection begins at the district level within the country and is processed at the national level. As a result, the districts are able to pool their individual knowledge base and produce regional maps or risk studies essential to disaster reduction efforts.

- ◆ ***Risk assessment and risk mitigation must be integrated at the core of all development and environmental protection planning.*** The Mexican experience has shown that reducing the externalities of human activities such as pollution and poor land-use management in effect reduces the scale of the impact of some natural disasters. Also, maintaining a dialogue with the people in local communities is the most important element of risk awareness raising and is an activity which saves lives. Education, training of both high and mid-level decision-makers and building a culture of prevention are the foundation of integrated risk reduction efforts.
- ◆ ***Partnerships with the private sector are also an essential element of integrated risk reduction.*** With regard to engaging the private sector in risk reduction planning, the French experience along the Loire river has shown that forcing industries in flood zones to relocate is not an effective strategy. A more successful approach is to work with the industries to ensure that should a flood occur, neither the factories nor the environment stand to suffer beyond the “natural” inconvenience to business and agricultural continuity. Parallel to this, legislative norms should be established in order to prevent the further expansion of existing industrial areas in zones at risk from natural disasters.
- ◆ ***The integration of development, construction and planning activities within an overall strategy for disaster reduction has proven most effective in combating the effects of natural disasters.*** The experience in China has shown that an investment in prevention activities of 1 Billion Yuan can save as much as 20-40 Billion Yuan in damages and lost economic productivity.
- ◆ ***Emergency planning which clearly defines the roles of all governmental and non-governmental actors is essential.*** The Tajik experience has shown the progress that can be achieved in focusing the different elements of the Government dealing with natural disaster reduction on a given issue, in this case Lake Sarez. Creating a specific Lake Sarez Committee has been an effective way of avoiding the duplication of efforts and accomplishing a great deal with scant resources. The issue of Lake Sarez has also highlighted the importance of raising the awareness of the international community to problems of transboundary consequence and of developing international strategies, coupled with national programmes, to reduce the risk of large scale natural disasters.
- ◆ ***Educational and information policies for disaster reduction must be introduced into curriculum in schools and disseminated with the active participation of the media.*** China’s experience with frequent large scale natural disasters has underscored the prime importance of prevention activities and of the value of an educated and knowledgeable leadership and workforce. Educating the public gives the tools and knowledge needed to save people and is a necessary element of an integrated risk reduction strategy.

## INFORMATION TECHNOLOGY FOR ASSESSMENT AND SIMULATION CAPACITIES

- Task Manager:** Japan National Committee for the IDNDR
- Moderator:** Dr. Y. Ogawa, Deputy Director, Asian Disaster Reduction Center (ADRC), Japan
- Rapporteur:** Dr. S. Tanaka, Assistant Professor, Disaster Prevention Research Institute, Kyoto University, Japan
- Speakers:**
- ◆ Mr. J. Kondo, Chairman, Japan National Committee for the IDNDR: *Opening address: "Science Technology and Disaster Reduction"*
  - ◆ Mr. K. Mochizuki, Earthquake Disaster Countermeasures Division, Disaster Prevention Bureau, National Land Agency, Japan: *"Disaster Information System Against Earthquakes (DIS)"*
  - ◆ Mr. R. Kojiroi, Office of IDNDR, River Bureau, Ministry of Construction, Japan: *Video presentation: "If the banks of the Yodogawa River Broke Today - Flood Inundation Simulation (Predicted Underground Facility Damage)"*
  - ◆ Mr. N. Erdenesaikhan, Officer, International Cooperation Department, Ministry of Environment, Mongolia: *"Forest and Steppe Fire Monitoring in Mongolia using Remote Sensing Data"*
  - ◆ Dr. H. Hayashi, Japan National Committee for the IDNDR and Professor, Kyoto University, Japan: *"Development of Pictogram System for Natural Disaster Reduction through Internet"*
  - ◆ Mr. A. Hodges, Director General, Emergency Management, Australia: *"Technology and Disaster Management: Issues for the Next Decade"*

**Content:** This session introduced recent research topics and their implementation with regard to information technology for disaster assessment and simulation. Based on progress made in computer and network technology, new technologies for assessment just after disaster (real-time damage assessment) as well as post-disaster situation have been developed. Real-time damage assessment has proved useful for setting up an appropriate disaster response operation. Progress made in remote sensing and GIS technology will increase the role of information processing for disaster mitigation. However, barriers for applying these technologies include the costs of introducing information technology, the lack of specialists, and an inadequate recognition from policy makers. Professional skills in information technology is crucial in order to convey the appropriate knowledge of disasters to the public.

### **Conclusions and Recommendations:**

- ◆ training of specialists in information technology is a fundamental element to overcome barriers for applying technologies
- ◆ countries with advanced technologies should offer to train information specialists through multilateral and bilateral cooperation.
- ◆ institutional approach such as the Asian Disaster Reduction Center (ADRC) should be considered by the international community for the transfer of knowledge and technology to developing countries.



## SAFE HUMAN SETTLEMENTS IN DISASTER-PRONE AREAS

**Task Managers:** National Disaster Prevention Center (CENAPRED), Mexico

**Moderator:** Prof. A. Davenport, Chairman of the Canadian IDNDR Coordination Committee, and Dr. R. Meli, Director of CENAPRED, Mexico

**Rapporteur:** Dr. R. Meli

**Speakers:**

- ◆ Prof. A. Davenport: *Introduction*
- ◆ Dr. S. Alcocer Mexico: *"Reduction of Seismic Vulnerability of buildings: the Mexican Experience"*
- ◆ Mr. L. Ludvigson, UNCHS (Habitat): *"Safe Human Settlements in Disaster Prone Countries"*
- ◆ Dr. Yang Quinje, China: *"Disaster Resettlement and Rehabilitation in China"*
- ◆ Prof. A. Arya and Dr. T.N. Gupta, India: *"Vulnerability Atlas of India"*

**Content:** This session discussed recent technological advances aimed at reducing the vulnerability of human settlements in disaster-prone areas. Emphasis was given on the situation of developing countries, where the magnitude of the problems relating to human settlements prevents from achieving significant risk reduction activities for large portions of the population.

Regarding protection from extreme winds during hurricanes, floods resulting from heavy rains, and earthquakes, the measures proposed for vulnerability reduction ranged 1) from relocation of human settlements in extreme levels of risk to temporary evacuation related to effective warning systems, and 2) from construction of large infrastructure work to give protection from floods to rather simple improvements of existing houses to increase their safety. Problems arise when it comes to the feasibility of implementation of these measures. Poor human settlements have a great variety of needs related to their daily life, and normally no high priority is given to measures related to risk reduction for extreme and rare events. Solutions are especially difficult and complex when they require infrastructure works as these related to flood protection.

### **Conclusions and Recommendations:**

- ◆ In case of earthquakes, there is a need to thoroughly evaluate different building techniques by monitoring their performance under future earthquakes.
- ◆ Implementing non traditional technological solutions may prove difficult if not stated and solved at the community level by involving the concerned population both in the decision and the implementation process.
- ◆ As in poor human settlements the tendency is to give low priority to measures related to risk reduction for extreme and rare events, opportunities must be taken from post disaster situations where people have greater awareness of problems, and solutions applied for damaged housing can be more easily extended to other subtended but undamaged dwelling.
- ◆ Vulnerability reduction measures require generally long-term projects and can only be fully implemented when situations of extreme poverty are corrected.
- ◆ Comprehensive long-term plans for risk reduction must be envisaged, including warning and evacuation programs for settlements where the level of risk cannot be brought to acceptable levels in the short time.

## EARLY WARNING SYSTEMS: AN INTEGRATED PROCESS

**Task Manager:** GeoForschungs Zentrum (GFZ), Potsdam, represented by Prof. J. Zschau, Director, Division of Solid Earth Physics and Disaster Research

**Moderator:** Mr. P. Platte, Representative of the Division of Humanitarian Assistance, Federal Foreign Office, Federal Republic of Germany, Bonn, Germany

**Rapporteur:** Mr. J. C. Scott, President of the Center for Public Service Communications, Arlington, VA, USA

- Speakers:**
- ◆ Mr. P. Platte: *"Introduction and International Political Context of Improved Early Warning for Natural and Similar Disasters which have an Adverse Effect on the Environment"*
  - ◆ Dr. J. W. Zillman, President of the World Meteorological Organization and Director General, National Meteorological Service, Melbourne, Australia: *"The Fundamental Role of Early Warning in an Integrated System of National Disaster and Risk Management"*
  - ◆ Prof. B. Lee, Head of Department, Department of Civil Engineering, University of Portsmouth, U.K. and Chair of UK IDNDR Flagship Project on Early Warning. *"Experience from the U.K. Flagship Project Relating to Technology Transfer and the Relationships Between Engineering and Disaster Risk Reduction Capabilities of Early Warning"*
  - ◆ Mr. K. Kishore, Programme Officer, Asian Disaster Preparedness Center (ADPC), Thailand: *"Field Level and Local Realities and the Effective Applications of Early Warning: Guiding Principles of Effective Early Warning"*
  - ◆ Mr. J.C. Scott: *"The Concluding IDNDR Early Warning Programme Report and Future Action Plan for Effective Early Warning"*

**Content:** This session conveyed the important issues that have emerged during the IDNDR's global programme initiative of early warning considered as a basis by which global practices may become better coordinated and more effective. During the Decade, the focus on early warning has shifted from alerting and forecasting activity with a strong emphasis on technology transfer towards organizational relationships, human factors and international networking built up over a period of time, with an ongoing commitment and the enhanced role of public participation at local levels. Essentially, early warning is about the effective and informed communication among people of various disciplines, who work together on a global scale to understand an approach to hazards and the feasibility of protecting their common resources and economic assets within a community.

While early warning includes the technological aspects of hazard monitoring, forecasting and telecommunications as well as the scientific aspects of climatology, volcanology and seismology, it also involves elements that frequently do not get the attention they deserve, such as:

- ◆ **Context:** focusing attention on continuously changing vulnerabilities, considered spatially and temporally, across all sectors
- ◆ **Risk scenarios:** focusing attention across professional sectors, on consequence analysis and issues that are location specific, time specific, sector-specific and community-specific.

- ◆ **Appropriate actions targeted to specific vulnerable groups** to mitigate loss and damage that have been based on procedures pre-defined and established by local authorities or communities.

**Conclusions and Recommendations:**

- ◆ There is a crucial need to implement an “early warning concept of the second generation” that must be multi-disciplinary and inter-sectoral, comprising sociological, economical, political, organizational and scientific wisdom.

**Warning systems:**

- ◆ to realize their full potential, warning systems must be properly embedded in integrated and coordinated national natural disaster reduction programs.
- ◆ In order to avoid conflicting advice and dangerous public confusion in potentially life-threatening situations, there must be only one official source of warning information to the community at large
- ◆ detailed studies are needed on the cost-benefit characteristics of warning systems of different levels of sophistication to enable governments to optimally balance their use of the resources available for natural disaster reduction.
- ◆ regular public education in the interpretation and use of warning information is essential.
- ◆ the design and operation of warning systems must be based unambiguously on the commitment to cooperation and information exchange and the concept of partnership in the overall public interest

**The Flagship Programme of the UK National IDNDR Committee “Forecast and Warning”:**

- ◆ good geophysical forecasts must be translated into fully useful warnings that will be received, understood and acted upon in time by populations under threat.
- ◆ Effective early warning includes. maintaining relationships, developing redundancy, maintaining lifelines, legal framework with links to the political center and to national disaster plans, public awareness of hazards and warnings, and recognizing the gaps existing between the public awareness of hazard warnings and the predictive capacities of scientists.

**Guiding principles of effective early warning:**

- ◆ Risk scenarios should take into account social, economic and cultural aspects of vulnerability and should involve local stakeholders as well as employ local knowledge in understanding vulnerability and hazard patterns.

**IDNDR Early Warning Programme Action Plan for the Future:**

- ◆ the future program for natural and related risk reduction (the successor arrangement to the IDNDR) should establish a high level working group on early warning. Based on the combined global and multi-sectoral experience and drawing upon the conclusions of the International Conference on Early Warning Systems for the Reduction of Natural Disasters held in Potsdam, Germany in September 1998. The high level working group should focus broadly on technical as well as public policy issues. Its objective would be to institutionalize guiding principles of early warning at local community, national, regional and international levels and ensure that the momentum for a coordinated approach to improving early warning generated during the past decade carries into the 21st century.

## URBAN MEGA DISASTERS

**Task Manager:** Chinese National Committee for IDNDR (CNCIDNDR)  
**Moderator:** Dr. Y. He, Deputy Director-General of the China Seismological Bureau, China  
**Rapporteur:** Mr. D. Hollister, Asian Disaster Preparedness Center (ADPC), Bangkok, Thailand

**Speakers:**

- ◆ Mr. K. Nakashima, Secretariat of the Headquarters for Reconstruction of Hanshin-Awaji Area, Japan: "*Reconstruction from the Great Hanshin-Awaji Earthquake*"
- ◆ Dr. H. Yepes, Director, Geophysics Institute, Quito, Ecuador: "*Quito: Managing Earthquake Damage Scenarios and Volcanic Alerts*"
- ◆ Mr. D. Hollister: "*Disaster Reduction in Asian Cities- The Experience of the ADPC*"
- ◆ Dr. Y. He: "*Preparedness and Reduction of Urban Earthquake Disaster*"

### Panel Discussion

**Moderator:** Dr. P. Mouroux, Bureau de Recherches Géologiques et Minières (BRGM), France

**Panelists:**

- ◆ Mr. S. Mustow, UK IDNDR Coordination Committee
- ◆ Dr. K. Priyadi, Institute of Technology of Bandung (ITB), Project Manager of the Indonesian Urban Disaster Mitigation Project and the RADIUS case study in Bandung, Indonesia
- ◆ Dr. H. Yepes

**Content:** This session discussed the measures as well as the government and public functions to reduce the risk of urban mega disasters. While big cities are growing rapidly worldwide, so is the risk of mega disasters. As the big cities usually play an important role economically and politically, internally as well as internationally, disasters could cause serious damage to the country and the world as a whole.

Experiences of **Japanese urban communities** in the response, rehabilitation and recovery process showed that planning and construction must be more disaster resistant (i.e. more open space, lower densities, wider streets, more resistant construction of infrastructure, buildings and shelter). As a result, the emergency response plan procedures and methods of need assessment as well as decision making were revised to be more comprehensive and faster.

In **Quito, Ecuador**, starting a real integrated program of volcano and landslide vulnerability reduction without raising first public awareness on risks proved difficult. Raising public awareness can be done efficiently by establishing disaster scenarios which also help identifying physical as well as social and economic vulnerability reduction actions.

The **ADPC Asian Urban Disaster Mitigation's Program (AUDMP)** is one possible model program for initiating vulnerability reduction actions in Asian cities. The AUDMP implements programs to raise public awareness on vulnerability reduction, build on existing national and local capacities and identify simple and affordable vulnerability reduction techniques with a view to transfer the ownership of these programs to national and local networks, thus promoting networking at national and community levels.

-<sup>4</sup>Progress made during the decade in **China** in establishing a practical and action oriented policy as well as a legal framework resulted in a nationwide program of earthquake vulnerability reduction in many Chinese cities. The success of the program is based on the strong political will of the government to fund and implement vulnerability reduction programs in the cities of China. It is worth noting that half of all deaths worldwide due to earthquakes have occurred in China.

**Conclusions and Recommendations:**

- ◆ Mitigation and planning of response to urban mega disasters is a complex and difficult inter-disciplinary process which should:
  - integrate cross institutional approach with focus on what happens to a city in a disaster and what can be done about it
  - be built on strong political will and public demand
  - recognize that city-managers are usually overwhelmed with normal daily pressures, priorities, and needs
  - obtain the support of local, national, regional and international networks as well as advocacy groups
  - be based on a mutual understanding and collaboration among community, business, municipal officials, and scientific/engineering sector
  - be integrated into the normal development process
  - apply simple, cost effective solutions that are appropriate to the context and needs of the community.
  
- ◆ The process that leads to vulnerability reduction in cities include the following basic steps:
  1. identify the problem (hazard and vulnerability assessment)
  2. identify, analyze, prioritize and select solutions (mitigation measures)
  3. take action (implement the vulnerability reduction program)
  4. Ready-Fire-Aim (act immediately in concrete terms)

## APPLYING TECHNOLOGY FOR SHARING INFORMATION

- Task Manager:** Canadian IDNDR Coordination Committee represented by Prof. P. S. Anderson, Director of the Telematics Research Lab, Associate Director of the Centre for Policy Research on Science and Technology, Associate Prof. at the School of Communication, Simon Fraser University, Canada, and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction
- Moderator:** Mr. C. Littleton, President of the Quixote Consultancies of Australia and Member of the United Nations STC on Natural Disaster Reduction
- Rapporteur:** Prof. P. S. Anderson
- Speakers:**
- ◆ Prof. P.S. Anderson: *"The role of Internet in Disaster Reduction"*
  - ◆ Mr. Wang Ang-Sheng, Chinese Academy of Sciences: *"Technology Applications in Disaster Reduction in China"*
  - ◆ Ms H. Molin-Valdes, Head of the IDNDR Office in Costa Rica: *"CRID Experience in Latin America"*
  - ◆ Mr. J. Devine, Senior Advisor, United States Geological Survey (USGS), USA and Mrs. E. Padovani, Senior Scientist USGS, USA: *"Advances in Disaster Information Delivery and Hazard Awareness"*

**Content:** From the role of Internet in disaster reduction to the use of integrated information management systems for vulnerability reduction; this session explored the future trends in information sharing and management and their applications in the specific domain of disaster prevention.

Over the last decade, the availability of information on natural hazards and disasters has increased enormously. This has occurred through new studies of the phenomena, an explosive expansion of global channels of communication and, perhaps most significantly, through the widespread of new information technologies, including CD-ROM, spatial technologies and the Internet. In the evolution of computer networking and its application in disaster reduction, the emergence of the Internet has empowered organizations to collaborate across disciplines, jurisdictions and geographical regions.

In China, strides are being made through the application of information technology in interdisciplinary collection and coordination of scientific and social-economic data with a view to establish a national synthetic database that can support real-time disaster impact assessment.

The significance and importance of effective dissemination of collected information in disaster reduction activities within Latin America and the Caribbean is exemplified by the development of the Centro Regional de Informacion Sobre Desastres (CRID). This Center consolidates information for all organizations in the region, using a multi-sectoral approach. It also works with other libraries and centers to broaden regional participation and encourage ongoing assessment. CRID uses a variety of information technologies to collect and distribute information including CD-ROM based virtual libraries and the Internet.

In the field of disaster information collection, integration and delivery, most significant is the advances being made in the way disaster information can be integrated and delivered to users through changes and extensions to open Global Disaster Information (GDI) specifications. As a result, interoperable geospatial products and other information consumables can be shared across the disaster reduction community. Efforts are currently underway to initiate a Global Disaster Information Network. Potential benefits from such an initiative were illustrated in a presentation of how the integration of digital maps, aerial photography, satellite imagery and other data was used to map impacts and assist in reconstruction efforts in Central America following Hurricane Mitch.

**Conclusions and Recommendations:**

There is a need to:

- ◆ Promote use of networking technology to ensure more effective and efficient delivery of customized disaster information to the right people at the right time and in the right form.
- ◆ Recognize that no single information technology will be appropriate for everyone.
- ◆ Promote geoprocessing, geodata, telecommunications interoperability, robustness and scalability as key elements of emergency management information infrastructures.
- ◆ Improve effectiveness of exchange of hazard-related information through international clearing houses and meta databases.

## TOWARDS EARTHQUAKE SAFE CITIES: HOW TO REDUCE EARTHQUAKE DAMAGES

**Task Manager:** UN Centre for Regional Development (UNCRD)  
**Moderator:** Prof. M. Kobayashi, Manager, Disaster Management Planning, UNCRD  
**Rapporteur:** Dr. R. Shaw, RADIUS expert, International Consulting Division, OYO Corporation, Japan

**Speakers:**

- ◆ Dr. T. Katayama, Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction and Director General of the National Research Institute for Earth Science and Disaster Prevention, Japan: "International Cooperation in Disaster Mitigation: An Earthquake Engineer's Review on IDNDR"
- ◆ Mr. M. B. Karki, Secretary, Ministry of Science and Technology, Nepal: "Nepal's Experience with Earthquake Risk Management"
- ◆ Mr. K. Okazaki, IDNDR Secretariat: "The RADIUS Initiative: A practical approach to reduce urban seismic risk"
- ◆ Lic. J. M. Gastelum, Secretary General of Tijuana Municipality, Mexico: "The RADIUS case study in Tijuana, Mexico"
- ◆ Dr. M. Belazougui, Director of Centre National de Recherche Appliquée en Génie Parasismique (CGS), Algeria, Member of the STC: "Seismic Risk Assessment and Management in Urban Areas: The Addis Ababa (RADIUS Case Study) Example"

### Panel Discussion

**Panelists:**

- ◆ Dr. R. Shaw
- ◆ Dr. J. Ryrin, RADIUS Regional Advisor, Director of the Center for Earthquake Research Australia (CERA), Australia

**Content:** It is now recognized that a relatively low-seismic zone is facing high risk depending on the vulnerability of its structures. In developing countries, their exposure to risk of developing countries is gradually increasing due to the rapid growth of their population. This risk can be mitigated by a closer cooperation among the governments, local communities, businesses, NGOs and international organizations. Natural disaster mitigation is an essential part of the sustainable development and requires availability of funds. Infrastructure development and disaster management should match new demands as developing countries become more closely integrated into the global economy. In this respect, there is a need for small and realistic projects to undertake effective measures towards disaster reduction activities, such as the IDNDR RADIUS Initiative, the International Association for Earthquake Engineering (IAEE) and the World Seismic Safety Initiative (WSSI), all related to cities at risk. These type of initiatives could be reproduced in many other cities in the 21 century.

In Nepal, a project on earthquake risk management has been launched, with special emphasis on awareness raising. A significant aspect of this project is the establishment of an Earthquake Safety Day as a yearly event for raising awareness among all stakeholders. The HMG of Nepal is deeply committed to continue these efforts.



The RADIUS initiative is one of the IDNDR projects in the field of earthquake risk mitigation and is funded mainly by the Government of Japan. Nine cities worldwide have been selected as case studies, while more than 70 others are participating in information exchange programs. RADIUS case studies are built around three stages of earthquake risk management :

- 1) assessment (which leads to a scenario),
- 2) planning (which leads to the action plan or disaster plan), and
- 3) implementation (which leads to real actions).

For instance, The RADIUS project for the case study city of Tijuana was implemented by collecting data for the preparation of a damage scenario involving an earthquake estimated at M'6.5. Seismic awareness raising in the community was also an important aspect of the project, which is still in progress so as similar initiatives in cities in Africa, Europe, Middle-east and Asia. The success of the RADIUS initiatives requires that case study cities

- 1) share experience with other cities,
- 2) ensure community based participation at grass-root levels,
- 3) sustain efforts in disaster management, and
- 4) incorporate these efforts in future development planning.

The methodology applied by the RADIUS project is unique and could be of great benefit to other disaster prone cities in the world: small or mega cities, in developing countries or developed countries, threatened by earthquake or other disasters. The RADIUS project proved to be an excellent tool for an integrated international cooperation.

#### **Conclusions and Recommendations:**

- ♦ RADIUS type initiatives should be continued beyond the decade, as it can be applied to other types of disasters. Accumulated knowledge should be disseminated at national and regional level. Efforts provided should be institutionalized at local level in order to ensure sustainability.
- ♦ The success of this type of initiatives depends on the support of bilateral and international funding agencies through demonstration projects, case studies and pilot projects. An integrated international cooperation is highly desirable.
- ♦ Further initiatives are needed on the participation of people at the grass-root level to ensure capacity building within local communities.

## GEOLOGICAL HAZARD ASSESSMENT - How Science Tries to stop Hazards from becoming Disasters

- Task Manager:** International Council for Science (ICSU)  
**Moderator/ Rapporteur:** Prof. H. Th. Verstappen, Chairman ICSU-SC/IDNDR, International Institute for Aerospace Technology and Earth Sciences (ITC), Netherlands
- Speakers:**
- ◆ Prof. D. Giardini, Geophysical Institute ETH Zurich, Switzerland: *"The Global Seismic Hazard Assessment Programme /GSHAP"*
  - ◆ Prof. H. Kienholz, Department of Geography, University of Bern, Switzerland: *"Mountain Hazards: Tools for Risk Management"*
  - ◆ Mr. K. Hoshina, Director, SABO Technical Center, Japan: *"Countermeasures Against Volcanic Disaster of the On Mt. Unzen-Fugendake"*
- Content:** Hazard assessment is the first step to reduce the impact of natural disasters. This session discussed methodologies for seismic, mountain, and volcanic hazard assessment, taking into consideration how science can prevent hazards from becoming disasters.

**The Global Seismic Hazard Assessment Program (GSHAP)** was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program by the UN IDNDR. The GSHAP was implemented during the 1992 - 1998 period, with the support of and in coordination with other initiatives from various entities (ILP, ICSU, UNESCO, IASPEI, the European Council and European Community, NATO and INTAS). The GSHAP promotes a regionally coordinated and homogeneous approach to seismic hazard evaluation with the view to mitigate risk associated with the recurrence of earthquakes. It aims at improving national and regional assessments of seismic hazards for the use of national decision makers as well as engineers in order to allow more effective land use planning, building design and construction work in terms of disaster prevention. The GSHAP strategy has consisted in establishing a mosaic of key multi-national test-areas under the coordination of selected regional centers. In each region, multi-disciplinary working-groups have contributed to the assessment of probable seismic hazard (earthquake catalogues, seismotectonics, strong ground motion attenuation). These regional activities extended to whole continents resulted in the production of the Global Map of Seismic Hazard presented for the first time at the Programme Forum. This map counts 100 main contributors and more than 400 globally. Its publication along with the results of completed regional activities is under way. Regional reports, GSHAP yearly reports, summaries and maps of seismicity, source zones and seismic hazards can be found on the GSHAP home page <http://seismo.ethz.ch/GSHAP/>.

Many **mountain disaster** losses are the predictable result from interactions between the physical environment, including hazardous events, and the human structures. A modern strategy to cope with mountain hazards should foreseen comprehensive risk management and follow systemic approaches in the planning and realization of concepts. It is a general understanding that risk management includes two main categories:

- 1) Prevention strategies, and
- 2) Event management.

A major precondition for a comprehensive mountain risk prevention is to undertake in-depth risk analyses for the modeling of "mountain risk systems". These systems will indicate the appropriate timing for possible interventions according to the following measures:

- 1) Preventive intervention to the hazardous processes
- 2) Preventive intervention to the vulnerable elements (e.g. hazard zoning)
- 3) Integrate results of measures 1) and 2) in early warning and prevention systems
- 4) Monitor the above for efficiency purpose
- 5) Provision of suitable tools for education

**Mt. Unzen-Fugendake** resumed volcanic activity after an interval of almost 100 years. Pyroclastic flows and debris flows occurred repeatedly causing more than 40 victims, dead or missing. Disaster prevention projects are presently being conducted by the Unzen Restoration Project Office, Ministry of Construction. The occurrence of a pyroclastic flow cannot be predicted and its detection is ensured at the earliest possible stage by remote-controlled monitoring cameras. Debris flows, on the contrary, can be predicted to some extent by observing rainfall patterns causing debris flows through the use of radar rain/gauges. The Shimabara City Office undertook the creation of a hazard map of volcanic disasters due to lava flows, pyroclastic flows and debris flows. This map proved useful for the safeguard of lives and property in the area. The Unzen Restoration Project Office is currently carrying out the construction of sediment control dams as well as training against debris flows and other debris related disasters. New techniques of RCC and CSG methods were adopted and developed during construction including the introduction of remote controlled execution of constructions for test fields where it is extremely dangerous to work.

#### **Conclusions and Recommendations:**

- ◆ Specific elements of geological hazard assessment should include.
- ◆ Global assessment and coordination
- ◆ Dynamics of extreme events and their impact on society
- ◆ The engineering responses to disaster reduction challenge

## **CONCLUSIONS ON SCIENCE AND TECHNOLOGICAL CONCERNS BY : Prof. M. Erdik, Special Rapporteur for the day**

Within the context of risk reduction, science and technology are essential tools for achieving sustainable development while providing protection of lives and property. Science and Technology have also a major role to play in natural disaster risk assessment (hazard, vulnerability and loss).

Aware of the importance of the place of science and technology in future actions in the field of disaster reduction, the IDNDR recommends to:

- ♦ Foster scientific and technical endeavors;
- ♦ Disseminate technical information and;
- ♦ Devise guidelines to apply scientific knowledge towards the assessment and mitigation of natural disasters

Several papers presented under the overall theme "Science and Technological concerns" discussed techniques and applications on geologic, hydrologic and meteorologic hazards assessments. The international demonstration project "Global seismic Hazard Assessment Project" has standardized approaches to seismic hazard assessment and resulted in global probabilistic seismic hazard maps. The regions of the world prone to natural hazards are now delineated. Nevertheless, research should continue to advance our understanding of the physical phenomena associated with natural hazards and improve our predictive skills. Developments in space technologies, satellite imagery and computation power will provide assistance in this respect. In the coming decades, multiple hazards hitting complex urban environments will present new challenges for assessment and mitigation. Such hazards can occur simultaneously or in sequence to create cumulative and synergistic impacts.

Assessments of elements at risk including physic, social and economic vulnerabilities to various hazards, were the subject of a series of presentations. These assessments ranged from community to regional levels. Special mention should be made of a significant study on the delineation and quantification of vulnerabilities in India. Realistic risk assessments in the future should consider environmental vulnerability as an important factor, given that several natural hazards pose a threat to environment and ecosystems.

Loss assessment studies have been covered under the headings "Risk Simulation" and "Damage/Loss Scenario". The advances made so far in computer and Geographic Information System (GIS) technologies allow the development of virtual simulations of damaged caused by earthquake, flooding, meteorological changes, forest fire etc. Such simulations will with no doubts be in the near future an integral part of public awareness raising and political sensitization on risk mitigation.

As repeatedly shown during the Programme Forum presentations on science and technological concerns, an integrated, inter-sectoral and inter-disciplinary approach to risk mitigation is essential: all scientific and technical tools and efforts have to be integrated in social, economic and environmental actions for risk reduction within the context of sustainable development. An important role of science and technology in risk reduction lies also in the identification and application of structural measures for the modification of natural hazards (if and when possible) and the reduction of vulnerability. Although significant progress have already been made, structural engineers can still learn a great deal from physical damages after exposure to natural hazards. There is a need for focused researches to be carried out on the improvement of the content, application and enforcement of hazard resistant building codes.

During the decade as well as in this Programme Forum, themes such as risks associated with population concentrations, early warning and information technology have emerged as specific

scientific and technological issues to be considered in the risk reduction agenda of the future:

- ◆ **Risks associated with population concentrations** exposed to natural hazards are and will remain an important problem of risk management. At least three thematic sessions were dedicated to urban earthquake risk and earthquake-safe cities with examples of Japanese, Mexican and Chinese experiences and applications. An important project undertaken by the IDNDR Secretariat, the RADIUS Project, has conducted urban earthquake risk assessment studies and identified appropriate risk mitigation strategies for nine cities throughout the world. It is expected that in the coming years such urban risk strategies will be in place for all major urban areas exposed to earthquake and other hazards. A new project on twin cities prone to earthquake have already been formulated under the Earthquakes and Megacities Initiative with the view to encourage joint action in earthquake risk mitigation research and applications.
- ◆ **Early warning** is a process of scientific analysis for technical forecasting of a natural hazard. The Potsdam Early Warning Conference has called for the need to expand the use of technologies related to observation, analysis and communication for early warning purpose. For early warning can only be effective if science and technology are being taken into account as much as networking, organizational and social aspects. Although there is still room for improvements, early warning is successfully applied for most atmospheric and oceanographic hazards. Further developments are however necessary to achieve the same for earthquakes, flash floods and volcanic hazards.
- ◆ In addition to a specific thematic session, a substantial number of presentations discussed the issue of the application of the **information technology** in risk mitigation and disaster management, using keywords such as "Database", "GIS", "Satellite Imagery" and "Information Culture". Information technology stands to be the important tool of the future for risk assessment and risk management. The communication of information on natural hazards, risks and mitigation through the Internet has considerably increased our capability to reduce risks. What is needed now is to make the software and hardware pertaining to the information technology more users friendly in order to reach a larger audience. Current trends show that real time information will be of paramount importance for hazard detection and loss prevention. To this end information acquisition, processing and communication have to be further improved.

# DEVELOPMENT AND ENVIRONMENTAL CONCERNS

## DISASTER REDUCTION WITHIN DEVELOPMENT

### Disaster Reduction and Recovery for Sustainable Human Development

**Task Manager:** United Nations Development Programme (UNDP)  
**Moderator:** Dr. Y. Aysan, Acting Head, Disaster Reduction and Recovery Programme, Emergency Response Division (ERD), UNDP  
**Rapporteur:** Ms. M. O. Gonzalez, Disaster Management Specialist, ERD, UNDP

**Speakers:**

- ◆ Mr. L. de Boice, Deputy Director, Emergency Response Division, UNDP: "Keynote Presentation: disaster reduction and recovery for sustainable human development"
- ◆ Dr. A. Lavell, Consultant, Hashemite Charity Organization, Jordan, and Secretariat General, Latin American Social Science Faculty (FLACSO), Costa Rica: "The Impact of Disasters on Development Gains"
- ◆ Mrs. M. Ariyabandu, Programme Manager- Disaster Mitigation, Intermediate Technology Development Group, and Coordinator, Duryog Nivaran, Sri-Lanka, on behalf of Mr. M. Bhatt, Disaster Mitigation Institute (DMI), India: "Understanding Vulnerability"
- ◆ Dr. J. Pantelic, Urban Redevelopment Specialist, World Bank: "Sustainable Recovery and Reconstruction"

**Content:** This session focused on vulnerability accumulation within development processes and the economic impact of disasters on development gains; the understanding of vulnerability and the challenges for factoring vulnerability analysis into development decisions; and the mainstreaming of disaster reduction considerations into sustainable recovery and reconstruction processes.

During the current decade, the debate on disaster-development relations and the analysis of their practical implications for risk and disaster management finally came of age. The theme has now become an almost obligatory point of reference and reflection when discussing the topic of disasters. One of the results if not one of the causes of the growing concern for the development impact of disasters has been an increase in the number and types of institution involved with the disaster problematic. These are no longer limited to the humanitarian preparedness and response organizations as was essentially the case towards the end of the last decade. Increasingly over the last few years, a number of the major "development" institutions have become more closely involved with the problem.

#### Conclusions and Recommendations:

- ◆ any serious analysis of the disaster-development problem must use a temporal framework that guarantees that the full "life cycle" of a disaster can be closely examined, and not just the short-term period immediately after disaster occurs.
- ◆ large-scale events should not typify and dominate the problem of disaster. More concern should be given to the wide range of lower level damaging events that recurrently affect different regions, localities and communities throughout the world.

- ♦ the statistics produced to date on disaster impacts are not particularly conducive to any detailed analysis of the disaster-development problem. Other uses and attributes they may well have, but a comprehensive analysis of the disaster-development question is not amongst these.
- ♦ concentration on the question of the impacts of disasters on development basically serves as a distraction from the fundamental question, which is the impact of development on disasters. Only by resolving this latter question will we ever get anywhere in terms of risk and disaster mitigation, and, consequently, in terms of reduced disaster impacts.
- ♦ the basic problem is not that disasters may have important negative development consequences, particularly where their impact is large relative to the size of the affected economy. Rather, the real problem is the reduced size and/or level of development of the affected economy and society. Instead of satanizing hazards for their impacts on society, it would be probably more correct to satanize society for its impacts on hazards!
- ♦ the use of economic criteria and cost-benefit equations for attempting to justify risk mitigation and reduction may reap rewards for the modern sector economy, but this is not the case for the poor and traditional sectors that make up the majority of the victims of disasters. The attainment of securer living conditions for the poor and a substantial reduction in their vulnerability is more a case of ethics, equity and social justice, than economic rationale and efficiency.

## LAND USE PLANNING

**Task Manager:** The IDNDR Spanish National Committee jointly with the IDNDR French National Committee

**Moderator:** J. San Nicolás Santamaría, Director General, Civil Protection, Spain

**Rapporteur:** Mr. Ph. Masure, Secretary, IDNDR French National Committee

- Speakers:**
- ◆ Mr. F. Gillet, Pôle Grenoblois d'Etudes et de Recherches pour la Prévention des Risques Naturels, Conférence sur les risques naturels en montagne, France: "*Land Use Planning in Mountain Areas*"
  - ◆ Mr. P. Douard, Ministère de l'Environnement: "*Disaster Prevention, Land Use Management and Sustainable Development: conclusions from the Paris Conference*"
  - ◆ Mr. A. Mendes-Victor, Portugal, President, Centro Europeu de Riscos Urbanos (CERU): "*The Impact of Urban Risk on Environment Safety*"
  - ◆ Mr. C. Dueñas, Vocal Assessor, Civil Protection of Spain: "*Integrating Risk Analysis into Territorial Policy Planning and Land Use Management*"
  - ◆ Mr. E.J. Fernández, Under-Secretary, Ministry of Interior of Argentina

**Content:** This session was based on the outcome of the Paris Conference on Land Use Planning for Disaster Reduction, and analyzed the role of land use management for the reduction of vulnerability and the prevention of natural disasters.

### Conclusions and Recommendations:

- ◆ Natural disaster prevention needs a global approach taking into account physical and social concerns to conduct an appropriate land management at the national level.
- ◆ Prevention has to be integrated particularly into the land management of fragile lands or territories such as big cities, mountain areas, littoral and flood plains as well as degraded natural spaces.
- ◆ While there is no universal model given that preventive policies have to be adapted to local conditions (socio-economic, cultural, etc.), hazard mapping, land-use planning and management are basic tools for prevention.
- ◆ Prevention needs specific funds. It is proposed to create a special International Fund for Prevention, similar to the World Environmental Facility.
- ◆ The implementation of networks at international and regional levels promoting exchanges, common objectives and solidarity could represent a new form of balanced and efficient cooperation.



## CAPACITATING DEVELOPING COUNTRIES

### Livelihood Sustainability and Risk: Challenges for Developing Countries

- Task Manager:** South Africa  
**Moderator:** Ms. J. Love, Member of the Parliament, South Africa  
**Rapporteur:** Mr. G. Kilian, Director, Disaster Management, Department of Constitutional Development, South Africa
- Speakers:**
- ◆ Ms. J. Love: Introductory remarks and Presentation on "*Capacity Building in Government (National, Provincial and local Government): Overview and evolution of disaster management policies in South Africa (based on the White Paper on Disaster Management)*"
  - ◆ Ms. J. Kanyangwa Luma, National Programme Manager, FAO-FHANIS, Zambia: "*Presentation on capacity building by way of outreach programmes*"
  - ◆ Mr. N. Salazar, Director, Emergency Commission, INAMHI, Ecuador: "*La Leccion de El Nino 97 - 98*"
- Content:** This session focused on capacity building aspects in Africa as well as in other parts of the world. It emphasized the need for inter-disciplinary coordination that arises at intergovernmental, international and national levels.

Capacity building is an unfolding process (although not an indefinitely, on-going process) of securing the necessary "buy in" of all the relevant stakeholders: scientific, humanitarian and development agencies as well as those who have resources and those who do not. In this respect, ensuring the correct process is vital. The involvement of civil society - in particular private sector capital - is essential. Training and community awareness is also a critical ingredient. Moreover, the existence of NGO capacity (national and international) is crucial although not always understood until such capacity does not exist. As NGOs provide the possibility for flexible and timeous interventions, they should benefit from more support.

Other important aspects of capacity building include adequate resource, interaction with research and technological establishments, access of the press to accurate and timely information, and awareness through education at the earliest age possible.

While the world witnesses time and again the speed at which the natural resource base of a country can be devastated, it cannot afford anymore to have its limited resources destroyed considering that the population needs increase as rapidly as its growth. It should be acknowledged that it is in the interest of all to share resources such as information technology, which do not exist in many parts of the developing world. Information must be networked fully and issues relating to intellectual property cannot become obstacles to the provision of basic necessities for poor and destitute. Targeted subsidization for the poorest of poor is often the only way to reduce their vulnerability. In this respect, managerial capacity building is important.

**Conclusions and Recommendations:**

- ◆ It is important to reflect on the need for capacity building by all and the mutual benefits that would ensue. Projects need to be designed to help every country equally and adequate resources must be found to this end.
- ◆ The final declaration of the Programme Forum should emphasize the need to:
  - ensure sustainability of the coping mechanisms of the developing countries through direct investment in facilities (such as information technology and appropriate research) in order to assist in prevention and mitigation;
  - mobilize the private sector to engage in insurance operations (e.g. through the establishment of arrangements into which the private sector can invest).
- ◆ There is a need to identify:
  - the appropriate institutional arrangements for disaster reduction which would complement and not duplicate existing arrangements;
  - bases on which any future Programme of Action can be evaluated.

## PROTECTION OF NATURAL RESOURCES

**Task Manager:** International Union for Conservation of Nature (IUCN)  
**Moderator:** Mrs. M. Von Bieberstein Koch-Weser, Director General, IUCN  
**Rapporteur:** Mr. S. Winkler, Special Assistant to the Director, IUCN

**Speakers:**

- ◆ Mr. M. Araujo, former Minister for the Environment in El Salvador, and Mr. O. Arevalo, President of the National Country Confederation in El Salvador: "*Planning for the Next Hurricane: Watershed Management in Latin America*"
- ◆ Mr. J. Goldammer, Global Fire Monitoring Centre (GFMC), Max Planck Institute for Chemistry, Germany: "*Fire Disasters, Ecosystems and Societies Changing Vulnerabilities*"
- ◆ Mr. E. A. Sumardja, IUCN World Commission on Protected Areas, Regional Vice-Chair Southeast Asia: "*Burning Issues: Preventing Forest Fires in Indonesia*"

**Content:** Within an overall consideration of disaster reduction, the session focussed on maintaining and rehabilitating resilient environmental and social systems which form key building blocks for disaster preparedness and security

The impacts of floods and hurricanes have become more devastating with time, as they harm densely populated areas, agriculture, and urban and road infrastructure. In many places on earth we have seen repetitions of the cycle of physical reconstruction and nature's wrath in regular intervals. This has led to work on the fundamentals of greater resistance to natural hazards. Most investments into greater resistance have focused so far on engineering solutions concentrating on large infrastructural works better building standards, and the construction of shelters. However, these efforts are insufficient, as long as the reconstruction interventions are not better linked to the development and implementation of disaster preparedness strategies that include resilient infrastructure and resilient environmental and social systems.

Hurricane Mitch has been so devastating in Central America in 1998 because many of the natural systems, which used to buffer against devastation, have been drastically altered by human deeds over the years. However, viable alternatives to patterns of destruction of these systems are demonstrated by the very few Honduran watersheds where reforestation and soil conservation had indeed taken place as part of development assistance programs. In some of these better protected areas, there were no deaths at all among the affected population. As long as emergency assistance programs are not focusing on medium and long-term disaster preparedness it is to be feared that devastation will perpetuate when the Hurricane Mitchs of the future recur, or when El Niño strikes once again. True attention has to be given to investments in environmental reconstruction of upper watersheds, wetlands and mangroves to avoid a detrimental cumulative effect, as finite environmental resources are swept away forever - precious soil and ecological resources.

The fire and smoke episode of 1997-98 in South East and North Asia, the Americas and the Mediterranean helped focus world attention on what is an increasing problem. The application of fire in land-use systems and forest conversion was associated with the extreme drought caused by the El Niño-

Southern Oscillation (ENSO) event which created conditions for the escape and spread of often uncontrollable wildfires. In this respect, a series of studies have documented damages and losses caused by fire and smoke pollution. Weather conditions exacerbated by an unusually strong El Nino (perhaps itself enhanced by climate change) are part of the reason why the fires got so out of hand during the most recent episode of 1997-98. But the scale of the fires has more to do with human factors than with any natural causes. While some fires were set to cover up illegal logging, most of them were intended to convert forest to other land uses. The responsible stakeholders are not just small farmers. The activities of plantation and timber companies, misguided government settlement schemes and subsidy policies that encourage forest clearance and burning are responsible for much of the damage. Due to the lack of a proper base of knowledge and monitoring, it is unfortunately often not easy to distinguish well-balanced natural fires or the traditional and beneficial use of fire in maintaining land-use systems from those fires which have destructive effects on societies and the environment.

**Conclusions and Recommendations:**

- ◆ There is a need to develop a coherent disaster preparedness strategy on a country-by-country basis, linked to regional preparedness strategies based on river basin linkages. To this end, governments have to treat disasters as normal events, which deserve consideration in mainstream, long term planning. Also, basic structural improvements have to be put in place in order to make physical infrastructure, natural systems and water management as well as human communities more resilient.
- ◆ In many regions of the world the scale of destructive fire events is quite clearly beyond the capacity of many individual nations to cope. Political leaders, industrialists, ecologists and other people now need to work together to seek realistic and workable solutions. Policies at national and international levels need to be reformed and implemented to provide an improved legislative, economic and technical basis for controlling harmful anthropogenic fires. An internationally concerted action programme is required to facilitate access to and monitor fire-related information, to bridge the gaps between the wealth of scientific knowledge and the yet existing weaknesses in fire management and policy development.

## VULNERABILITY OF ECOSYSTEMS AND NATURAL DISASTERS

**Task Manager:** Department of Economic and Social Affairs (DESA), United Nations  
**Moderator:** Mr. M. Dengo, Chief, Water Management and Small Island Developing States (SIDS), DESA  
**Rapporteur:** Mr. A. Dahl, Coordinator for Earthwatch, United Nations Environment Programme (UNEP), Geneva

**Speakers:**

- ◆ Mr. M. Dengo: "*Mountains and Small Island Environments*"
- ◆ Mr. J. Rynn, Director, Centre for Earthquake Research in Australia: "*The Protection of SIDS*"
- ◆ Mr. J. Liévois, Geologist, Office National des Forêts, France . "*The Protection of the Mountainous Ecosystem*"
- ◆ Mr. S. Kulmakhanov, Chairman, Emergency Agency of the Republic of Kazakhstan: "*Natural Disaster Prevention: Mountain Ecosystems in the Republic of Kazakhstan - a Decade of Achievements*"

**Content:** The session focused on two geographic situations and ecosystems where vulnerability to natural disasters is particularly concentrated: mountains and small islands. Specific case studies addressed the use of forests to control rockfalls and avalanches in the Alps, reduction of mud flows and earthquake hazard mapping in Kazakhstan, and regional organization for disaster reduction in the South Pacific.

Good progress is being made in the identification and mapping of risks, including source and target areas, using GIS and modeling approaches. Research and field experiments are increasing the understanding of phenomena causing disasters as well as risk reduction methods.

Responses to the identified risks include ecosystem management for protection, as in forest management to reduce rockfall and avalanche, and engineering works to lower lake levels or trap mudflows before they reach urban areas. The institutional and human dimension of disaster reduction and response in vulnerable areas is not to be neglected, as well as empowering society to respond more effectively.

For small island developing states, regional collaboration is particularly important, since their capacity to respond to disaster impacts is limited.

### **Conclusions and Recommendations:**

- ◆ At national level, institutional arrangements, legislation/regulations and financing mechanisms need to be mutually reinforcing to cope with ecosystem management for natural disaster protection in vulnerable areas.
- ◆ In the field, a network of local practitioners is necessary to implement solutions and to bridge the communication gap between politicians, researchers/technicians and the public. This can build both a culture of risk awareness and a consensus on the response

## CLIMATE CHANGE AND NATURAL HAZARDS Experience in and from Switzerland

**Task Manager:** Switzerland

**Moderator:** Mr. A. Götz, Deputy Director, Federal Office for Water Management, Chair, National Platform for Natural Disaster, Switzerland (PLANAT)

**Rapporteur:** Mr. O. Lateltin, Executive Secretary, PLANAT

**Speakers:**

- ◆ Mr. A. Götz: Welcome and introduction, "Efforts made in Switzerland during the IDNDR", "Guidelines and Strategies for Natural Hazards Assessment"
- ◆ Prof. H. Wanner, Head of the Climatology and Meteorology Research Group, University of Bern, Switzerland, : "Climate Change and Variability"
- ◆ Dr. M. Zimmermann, Director, Geo7, Bern, Switzerland : "Natural Disasters and Response"
- ◆ Dr. B. Martinelli, Observatorio Vulcanologico, Pasto, Colombia: "International Cooperation and Transfer of Knowledge"
- ◆ Mrs. Ch. Langenberger, Member of National Council, Government of Switzerland: "Messages from Switzerland"

**Dialogue**

**Moderator:** Mr. F. Gillet, Pôle Grenoblois d'Etudes et de Recherches pour la Prévention des Risques Naturels, Conférence sur les risques naturels en montagne, France

**Content:**

The session discussed various aspects of climate change and natural hazards in Switzerland with emphasis on mountainous regions. Problems related to risk management in Switzerland and other regions of the world were also approached.

The earth's climate has a natural variability. Nowadays, it is however admitted that human activity has also a measurable effect on this variability, although the full proof of human impact on the warming of the atmosphere will hardly be achieved in the near future. Nevertheless, there should be no delay in implementing climate protection measures to prevent further extent of damage such as an increase in global warming due to emission of greenhouse gases. The effects of global climate change differ from region to region. In order to achieve an efficient reduction of these effects, there is a need for a "strategy of distinct measures" which would also benefit other fields (e.g. energy, traffic etc.).

Population in mountainous areas is particularly prone to global changes and their respective effects. Although changes of natural environment often occur slowly and are not always easy to recognize, studies conducted in various countries clearly demonstrated that in mountainous areas the effects of such changes (e.g. melting of permafrost) may occur suddenly and dramatically. Also, changing natural and socio-economic conditions challenge behavioral patterns based on long-standing experience to cope with nature and protection against hazards. That is why prevention of natural hazards requires an in-depth analysis of changing environment and the full cooperation of the affected population. Future land use practice should take into account the increasing vulnerability of the society with regard to natural hazards.

The large variety of natural hazards, the intense use of areas at risk and the high dependence on technical systems call for a re-evaluation of the natural hazard policy which should also include climate change aspects and reflect the need to move from protection against hazards to management of risks. Reduction of natural disasters requires the creation of a global concept for prevention encompassing natural hazards, socio-economic conditions and cultural values. Although the existing land-use planning defines the necessary safety objectives, a 100% safety with regard to natural disasters cannot be achieved. It is therefore important in the long term to discuss openly what level of risk would be considered acceptable for a given society. Switzerland is preparing its move from the fight against nature to a distinct management of risks ("risk culture") that will estimate changing hazard conditions and changing demands versus available capacities of the society to respond to these changes.

It is admitted that international collaboration in the exchange of scientific know-how and practical experience in the field of natural disaster reduction favors the accumulation of the necessary knowledge for the development and implementation of prevention strategies. Transfer of know-how should therefore be achieved through partnership based on a multilateral information network reflecting cultural differences with regard to natural hazards and their impacts. For it is important to foster through dialogue the understanding of differing behavior towards natural hazards and differing value systems on human life and property.

#### **Conclusions and Recommendations:**

- ◆ There is a need to move from protection against hazards to the management of risks;
- ◆ In Switzerland it has been proven that changes of economic and socio-cultural conditions are responsible for the increase of natural disasters, which in turn could be intensified by climate change. As a political answer to these changing conditions Switzerland is proceeding to the development of a "risk culture";
- ◆ Transfer of scientific know-how through partnerships is crucial for the development of prevention strategies;
- ◆ Global climate change entails local consequences. An effective climate policy requires the inclusion of the concept of prevention;
- ◆ In alpine countries, priority should be given to the reduction of vulnerability to natural hazards. In this respect, each individual can contribute to the building of a safer environment;
- ◆ Population growth, uncontrolled land use and negligence of the people in relation to nature increase the vulnerability of the society with regard to natural hazards;
- ◆ A 100 percent safety in terms of protection from natural disasters does not exist. Therefore, the level of acceptable risks as to be defined for each society;
- ◆ The existing scientific know-how and experience in the field of natural hazards should be shared at all levels (global, regional, local) in order to benefit all parts of the world.

# **SUCCESS STORIES**

**Task Manager:  
Australian IDNDR Coordination Committee**

**The purpose of these sessions was to focus on particular successful initiatives arising from the IDNDR**



1. **Moderator:** Mr. A. Hodges, Director-General, Emergency Management, Australia

**Rapporteur:** Mr. A. Hodges

**Content:** **AUSTRALIA:** "Partnerships and Education through IDNDR"

**JAPAN:** **Speakers:** Ms. P. Marks, Manager, Australian IDNDR Program  
"Establishment of the Asian Disaster Reduction Center (ADRC) -  
Disaster Reduction Cooperation through Information Sharing"

**Speaker:** ♦ Dr. Y. Ogawa, Deputy Director, ADRC  
♦ Mr. M. Murata, Senior Researcher, ADRC

**The Australian IDNDR Committee** gained considerable leverage in achieving IDNDR objectives by funding a relatively large number of projects at modest levels in partnership with other organizations and individuals. This was undertaken at international, national, state and local community levels. The result proved that with a modest outlay of funds a great deal can be achieved. A particular example is the way disaster reduction education has been widely implemented in classrooms at both primary and secondary school levels through assisting teachers and teacher associations in the preparation of curricula materials relevant to disaster reduction.

**The establishment of the Asian Disaster Reduction Centre (ADRC)** represents an international co-operative effort in which 26 countries have been involved. ADRC's objective is to accumulate and disseminate information on disasters and their reduction in the Asian region. A key aspect of the ADRC is the development of extensive databases which are Internet accessible. When fully implemented later this year the ADRC will provide a major base for extending the work of the IDNDR programme in the Asian region into the 21st Century.

It was noted in both presentations that the umbrella of IDNDR has provided an important focus for, and stimulus of, national and international activities concerned with disaster reduction.

#### **Conclusions and Recommendations:**

Should be recognized:

- ♦ the value of developing partnerships at all levels - from the broad international level to community based groups - to promote, develop and implement disaster reduction initiatives.
- ♦ the value of using the latest information technology such as electronic databases to store information, and the Internet to distribute information, as the basis for international cooperation in achieving disaster reduction.

- 2. Moderator:** Mr. B. Lancaster,  
Director of the South Australia State Emergency Service, Australia
- Rapporteur:** Mr. A. Hodges, Director-General, Emergency Management, Australia
- Content:** **BANGLADESH:** "*Cyclone Preparedness in Bangladesh*"  
**Speaker:** Lt. Col. M. Haris, Director General,  
Disaster Management Unit
- GERMANY:** "*Living with Floods*"  
Video presentation  
German National Committee for IDNDR

In **Bangladesh**, remarkable changes have been achieved in the awareness and self-sufficiency of coastal dwellers in cyclone-prone areas through the training and mobilization of nearly 33, 000 volunteers to provide a wide range of services including: public awareness and preparedness programmes before the cyclone season, relocation of threatened communities in approved shelters, dissemination of cyclone warnings at local level, rescue of victims, post-cyclone relief and coordination of post-event activities.

**The Video presentation by the German National Committee** proved that communities can tackle the problems of flooding through citizen's action groups provided with an adequate training. Their role is crucial in both prevention and response to floods.

Both presentations highlighted the benefits that flow from the involvement and empowerment of threatened, or potentially threatened, communities

**Conclusions and Recommendations:**

- ◆ Empowering local communities to address local problems
- ◆ Supporting emergency management activities through the use of trained, committed and resourced volunteers

- 3. Moderator:** Mr. D. Smith, Visiting Fellow, Centre for Resource and Environmental Studies, ANU  
**Rapporteur:** Mr. J. Paul, Director, Tasmania State Emergency Service, Australia  
**Content:** **ZIMBABWE:** "Public Awareness: Use of Forecasting as a Basis of Public Awareness"  
**Speaker:** Ms. S. Ndlovu, Deputy Director, Department of Civil Protection  
**CUBA:** "Achievements of the IDNDR National Committee of Cuba"  
**Speaker:** Mr. A. Castellanos Perez, Chief, Development Division, Civil Protection of Cuba

To minimize the risks associated with the extreme climatic events as a result of the El Nino phenomenon, **Zimbabwe** introduced a public education program which comprises seminars and media programs in English and local languages. The campaigns have been very successful in raising public awareness on the need for intersectoral collaboration to cope with risks. Due to the success of this program, a campaign is now planned for the cold dry season.

**Cuba** has implemented a national program including the Meteoro program involving some 4 million people and which provides an annual focus on community awareness at the onset of each hurricane season. Thank to this programme, 800 000 people together with their cattle and other animals have been evacuated on time during Hurricane George in 1998 which, as a result, claimed only six lives. Another major contribution has been the provision of medical expertise in disaster stricken areas and medical training in Havana. Although Cuba has limited economic resources, it has assisted other nations in Central America and the Caribbean during Hurricane Mitch and other disasters.

**Conclusions and Recommendations:**

- ♦ Designing community education programs to suit targeted communities.
- ♦ Involving all government agencies (sectors) in the development of programs.
- ♦ Recognizing the importance of mutual international cooperation between smaller nations.
- ♦ Conducting an annual pre-disaster season public education program.

4. **Moderator:** Ms. T. Casinader, National Program Manager, Bureau of Meteorology, Australia  
**Rapporteur:** Mr. D. Smith, Visiting Fellow, Centre for Resource and Environmental Studies, ANU  
**Content:** **CANADA:** *"The Establishment of the Institute for Catastrophic Loss Reduction - A Partnership between the Insurance Industry and Academe"*  
**Speaker:** Prof. A. Davenport, Chairman of the Canadian IDNDR Coordination Committee  
**MOROCCO:** *"Case Study from Morocco"*  
**Speaker:** Prof. A. El Mouraouah, National Research Centre, Morocco

**The establishment of the Institute for Catastrophic Loss Reduction** amounts to some C\$7.5M over five years. This partnership comprises the Insurance Bureau of Canada and the University of Western Ontario and has been agreed upon in April 1999. Two Research Professorships in the field of engineering and social science will be established at the University of Western Ontario and provide seed money for research in Canada and elsewhere will be provided. The Insurance Bureau of Canada will also formulate a National Mitigation Strategy. This exemplify cooperation in the form of a substantial financial investment shared by governments, the insurance industry and academe.

**Morocco** faces severe earthquakes such as the Agadir earthquake in 1960 which claimed 12,000 lives. Preventive activities undertaken by the country include a seismic monitoring network established in the 1990s and comprising today 70 state-of-the-art stations linked by telemetry to a seismic laboratory funded in part by the Arab Fund for Economical and Social Development, a UNESCO agency. These stations monitor and transmit data to a central location in Rabat, from which alerts can be issued to local and regional governments in the event of an earthquake. Detailed seismic measurements are also made for 92 large dams. Analyses are currently being undertaken to enable more effective risk management in case the building of a potential tunnel between Africa and Europe under the Straits of Gibraltar went into realization. This initiative illustrates a successful international cooperation for the monitoring, analysis and research in the field of seismic hazards.

**Conclusions and Recommendations:**

Enhance cooperation between nations, disciplines and sectors

5. **Moderator:** Dr. J. Rynn, Director, Centre for Earthquake Research in Australia  
**Rapporteur:** Mr. B. Lancaster, Director, South Australia State Emergency Service, Australia  
**Content:** **SOUTH PACIFIC AREA:** "IDNDR and the South Pacific Disaster Reduction Programme"  
**Speaker:** Mr. A. Kaloumaira  
**ARMENIA:** "the Armenian National Survey for Seismic Protection"  
**Speaker:** Prof. Dr. S. Balassanian, National Survey for Seismic Protection  
**MALI:** "Case Study Management of Disaster by the Local Community"  
**Speaker:** Mr. G. Konate, Responsible for Regulations, Ministry of Natural Resources, Mali

**Island countries from the South Pacific Area** are particularly vulnerable to natural hazards. During the Decade, they experienced tropical cyclones, earthquake, volcanic eruption, tsunami, flood and drought. These events have had short-term and long-term devastating impact. The IDNDR has provided the incentive to implement a disaster reduction program in the area. The programme developed a common strategy to all Pacific Island countries in a pro-active rather than a reactive approach which included Regional Disaster Management meetings, specific projects (25 in number), and in-country World Disaster Reduction Day activities. It ensued an increasing self-reliance thanks to the use of own resources and the adoption of the IDNDR principles of mitigation. The resilience of the societies and the reduction of vulnerability has been achieved across the region, not just by response alone, but also by implementation of effective measures with regard to early warning, prevention, preparedness and mitigation procedures.

Subsequent to the Armenian earthquake of 1988 and an assessment of various types of hazard concluding that 94% of state loss is connected with strong earthquakes, **the Armenian National Survey for Seismic Protection (NSSP)** was established in 1991 under the authority of the Government of the Republic of Armenia. The distinctiveness of the NSSP includes high governmental status, high responsibility in terms of seismic risk reduction and a unique structure. The NSSP implemented a seismic risk reduction strategy which is a comprehensive long-term state program for seismic risk mitigation including the development of new technologies to reinforce existing buildings. The NSSP experience has shown the possibility to implement advanced system for the protection of the population from large-scale disaster events in countries experiencing economical difficulties.

In 1998, very heavy rain hit a local area in **Mali** whereby one third of the houses were flooded, causing the displacement of over 300 persons. An effective assistance to the victims involving the local population solidarity was organized through the dissemination of information by six private radio-stations transmitting in the national languages to an audience mostly illiterate.

**Conclusions and Recommendations:**

- ♦ insisting on the information and education of all potential actors involved in the management of natural disasters
- ♦ enhancing partnership with civil society
- ♦ empowering local communities

# OPEN PUBLIC FORUM

## Task Manager: IDNDR Secretariat

### COMMUNITY BASED DISASTER REDUCTION

**Moderator:** Mrs. Z. Delica, President, Global Forum of NGOs for Disaster Reduction (GFNDR) and Manager, International Consultancies Management, Asian Disaster Preparedness Centre (ADPC)

**Rapporteur:** Prof. I. Nyambok, University of Nairobi and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Speakers:**

- ◆ Mr. Ch. Eikenberg, German National Committee for the IDNDR: *"Strengthening Local Disaster Preparedness Structures"*
- ◆ Mr. N.K. Jain, Secretary-General, GFNDR: *"Role of NGOs in Disaster Reduction"*
- ◆ Ms. A. Galperin, Senior Officer, Disaster Preparedness Department, International Federation of Red Cross and Red Crescent Societies (IFRC): *"Community based Disaster Preparedness Programmes in the International Federation of Red Cross and Red Crescent Societies"*

**Content:** **"Strengthening Local Disaster Preparedness Structures"**: Mr. Eikenberg reported on two co-operation projects between local authorities in civil protection involving Morocco and Germany on the one hand, and Uzbekistan/Kyrgyzstan and Germany/Netherlands on the other. Each project will last for two years and involves twinning towns from participating countries. In order to increase efficiency of delivery services, it has been decided to decentralize these projects, which require a long-term evolution of political structures. The scope of the projects includes identifying the participating twin-towns and setting out the objectives as well as activities such as training seminars and production of films. For the projects to succeed they must be linked to identified on-going projects and supported by strong partnership and transfer of technology. Funding is being shared among the participating countries with a contribution of the European Community Humanitarian Office (ECHO) for the second project.

**"Role of NGO's in Disaster Reduction"**: Mr. N.K. Jain stressed the need to give due recognition to NGO's role in disaster reduction by giving examples of NGO's success stories in Asia and Latin America. While communities are often included in disaster reduction planning, he noted that the role of NGOs is at times marginalized as in the case of disaster management training where high costs limit NGO participation. The Global Forum of NGOs for Disaster Reduction (GFNDR) was created after the Yokohama Conference and gathers NGOs from different orientations and origins with varied interests.

**"Community - based Disaster Preparedness Programmes in the International Federation of Red Cross and Red Crescent Societies (IFRC)"**: Ms. Galperin summarized the main objectives of these IFRC programmes as preparedness to response to cope better with the impact of disasters; prediction and prevention where possible; and disaster mitigation. Implementation of these programmes includes disaster awareness and public education as well as community organization and community microprojects. When planning interventions, prioritization is made on the basis of hazard, geographical location, vulnerable groups and nature of activities; co-operation with governments, NGO's and the private sector; and integration of preparedness into problems of everyday nature.

**Conclusions and Recommendations:**

- ◆ Local communities should be empowered to plan and initiate their own development programmes, including mitigation of disasters with, for instance, devolution of power to rural committees through legislation.
- ◆ The IDNDR Secretariat or the successor organization should broaden its contacts and activities to deal not only with governments and specialists, but all stakeholders at all levels.
- ◆ Co-operation between NGO's and governments is necessary and should be encouraged to enhance the value of data and information exchange.
- ◆ Community Representatives should be consulted at all times in disaster planning as their participation in decision making is imperative to enable successful community based disaster reduction

## NETWORKS AND PARTNERSHIPS

**Moderator:** Mrs. L. Benazza, Deputy Director, Ministry of Scientific and Technical International Affairs, Algeria, and President, Algerian National Committee for the IDNDR

**Rapporteur:** Prof. I. Nyambok, University of Nairobi and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Speakers:**

- ◆ Prof. I. Davis, Chairman, Applications and Implementation Working Group, UK National Coordination Committee for the IDNDR: "Audit of the UK Activity"
- ◆ Mr. E. Picado, the Central American Community Network for Risk Management, Nicaragua: *"For a Safer and more Dignified Community with the Participation of Everyone"*
- ◆ Mr. F. Parsizadeh, Director of Public Education Department, International Institute of Earthquake Engineering and Seismology (IIEES): *"Earthquake Public Education in Iran"*

**Content:** **"Audit of the UK Activity"**: Prof. Davis explained that the purpose of the U.K. audit is to review the effectiveness of the UK efforts during the IDNDR. The report focuses on the developing countries rather than Britain and involved quantitative and qualitative appraisals of the effectiveness and performance of policies, projects and activities. The overall outcome of the audit was quite positive in concluding that the IDNDR is an important initiative and should continue into the next millennium. While recognizing the major achievements of the IDNDR including building multi and interdisciplinary networks at both local and international levels, developing integrated research, enabling organization of conferences and publication of books and promoting the role of the private sector in risk reduction, the audit points out weaknesses in communication to capture the interest of the public (due in part to an acronym title which has not been easily recognizable), and to inspire the attention and concern of the media, industry, commerce and to some extent the Governments.

**"For a safer and more dignified community with the participation of Everyone"**: Mr. Picado explained that his organization, LaRed (based in Nicaragua) involves several Latin America countries, in particular national institutions, centers and NGOs. It focuses its activities on alleviating extreme poverty. To this end, the participation of local communities in disaster reduction is basic and relevant authorities should promote community networks and empower communities so that the latter can contribute to their own safety through proactive, sensible and up-to-date disaster reduction measures. Central America efforts in this field have been instrumental in developing policies, influencing decision making process, promoting strategic planning and defining appropriate land use policies. However communities could be even more involved in this process, especially those most vulnerable to natural and man-induced hazards. To this end, it is crucial that communities receive relevant education and training as it is an important aspect of disaster reduction efforts. Hurricanes, like Mitch, have made communities more aware of their vulnerability and highlighted the limitations in the assistance national governments can provide thus reflecting the increased need for communities



to work with one another. Prevention and raising awareness of disasters are vital and communities could benefit mutually from their experiences and success stories.

**“Earthquake Public Education in Iran”**: Mr. Parsizadeh pointed out that Iran has been known as one of the most active earthquake countries. That is why Iran has emphasized public education as a tool to increase awareness on seismic activities and their related hazards. The education programme which mainly targets children and adolescents is geared towards sensitizing the public on the necessary precautions to be taken in order to ensure safety of their homes, families and community. Additionally, in order to be suitable for various community groups, the programme takes into consideration the role of gender, age, education level, and socio-cultural background of the targeted community. Lastly, the media plays an important role in the programme.

**Conclusions and Recommendations:**

- ◆ alleviating poverty is of paramount importance for the reduction of natural disasters and should be given concerted efforts globally
- ◆ structured education programme for various groups in society should involve all levels of society
- ◆ partnerships should be enhanced to improve sharing of knowledge, exchange of experiences and international cooperation

## EARLY WARNING

**Moderator:** Prof. J. Zschau, Director, Division of Solid Earth Physics and Disaster Research, Geoforschungs Zentrum (GFZ), Potsdam, Germany

**Rapporteur:** Prof. I. Nyambok, University of Nairobi and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Speakers:**

- ◆ Dr. I. Obrusnik, Chairman, Czech Republic IDNDR National Committee. *"Integration of Warning and Forecasting Services"*
- ◆ Mr. F. Helloco, Engineer, Météo France: *"Early Warning for Flash Floods in France recent advances"*
- ◆ Prof. Shi Pei-jun, Chinese National Committee for IDNDR (CNCIDNDR). *"98' Flood Disaster in China"*

**Content:** **"Integration of Warning and Forecasting Services"**: Dr. Obrusnik gave a description of the practical applications of early warning in the Czech Republic. Integrated services have been used to convey information regarding impending hydrometeorological events and hazards. Precipitation-runoff models have become increasingly important. A structured flow chart showing how flood forecasting is practiced in the Czech Republic was presented.

**"Early Warning for Flash Floods in France: recent advances"**. Mr. Helloco presented the scope of Météo France's operations, incorporating 53 different announcing departments. Most of France's territory is covered with a radar network which is used to provide hydrological models and comparative analyses with other data-sets. Real-time experiments associating radar-rainfall with runoff models have provided encouraging results in the prediction of flash floods. However, further verification and validation of these results are still necessary to test the sensitivity of the experiments and to improve the alert procedures in the early warning programme.

**"98' Flood Disaster in China"**: Prof. Shi Pei-jun presented statistics on past and present precipitation levels and on fatalities and economics loss related to Yangze River floods. Co-ordinated efforts were made to bring the floods under control and to initiate a process of recovery and rehabilitation, using units of the Chinese military establishment and civil society to evacuate and relocate affected people, provide food, cloth and medical services, and to organize and mobilize relief donations. This experience brought into focus the need for a sound co-ordination mechanism, an enhanced role of local governments and the empowerment of local communities regarding natural disaster related to floods.

### **Conclusions and Recommendations:**

- ◆ using early warning as a means of empowering communities threatened by impending disasters
- ◆ warning has to be given in good time, be precise and prompt, and should convey reliable information
- ◆ education, telecommunication systems, multi-disciplinary approaches and networking with other organizations must be strengthened locally and regionally in order to enhance early warning efforts

## INTEGRATED RISK MANAGEMENT

**Moderator:** Mr. G. Deneufbourg, Secretary General, French National Committee for the IDNDR

**Rapporteur:** Prof. I. Nyambok, University of Nairobi and Member of the United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Speakers:**

- ◆ Mr. B. Koffi, Government of Côte d'Ivoire: "*The Protection of Natural Resources in the Côte d'Ivoire*"
- ◆ Dr. A. Mikayelyan, Chief Specialist, Northern Department of the National Survey for Seismic Protection of Armenia: "*Teaching Seismic Protection Skills at Schools of Armenia*"
- ◆ Mr. P. Patabendi, Team Leader, Team for Disaster Prevention and Sustainable Development (Team DPSD), Sri Lanka: "*Extreme Weather Events due to Climatic Changes*"

**Content:** "**The Protection of Natural Resources in the Côte d'Ivoire**": Mr. Koffi described the geo-ecological setting of Côte d'Ivoire and its varied physiography. Between 1955 and 1993, forests have been disappearing due mostly to bushfires aggravated by environmental degradation. The Côte d'Ivoire is therefore under pressure to find sustained ways of protecting its natural resources against disasters

"**Teaching Seismic Protection Skills at Schools of Armenia**": Dr. Mikayelyan explained that in Armenia, teaching of seismic protection is an essential aspect in the reduction of social and economic disruptions caused by earthquakes. Analysis of the 1988 Spitak earthquake revealed lack of adequate protection procedures especially for children. The Northern Department of the National Survey for Protection with financial support from UNICEF started a training programme designed for children and schools to be incorporated in school curricula. This initiative is a major step towards implementing a national programme for the prevention of potential damages through seismic events in Armenia

"**Extreme Weather Events due to Climatic Changes**": Mr. Patabendi explained that floods are the number one disaster in Sri Lanka. Climatic changes are mainly influenced by depressions in the Bay of Bengal and inter-monsoon rains and are often associated with typhoons and cyclones producing floods near the coasts leading to landslides.

### **Conclusions and Recommendations:**

- ◆ vulnerability, and in particular poverty, should be considered as a key factor in assessing environmental risks, especially in marginal areas
- ◆ integrated applications of science and technology should be part of preventive measures
- ◆ education is a prerequisite to building a culture of prevention

# ACTION TOWARDS THE 21ST CENTURY

## REGIONAL APPROACHES TO DISASTER REDUCTION: NETWORKING, SYNERGIES AND COORDINATION

- Task Manager:** IDNDR Secretariat
- Moderator:** Mr. J.-P. Massué, Executive Secretary of the EUR-OPA Major Hazards Agreements, Council of Europe
- Rapporteur:** Ms. H. Molin-Valdes, Head of the IDNDR Office in Costa Rica
- Speakers:**
- ◆ Ms. A. Fischel, Vice President of the Republic of Costa Rica: "*Regional dimensions of disaster reduction in Latin America and the Caribbean*" (The San Jose Declaration, June 1999)
  - ◆ Dr. I. Obrusnik, Czech Hydrometeorological Institute: "*Cooperation for the Prevention of Disasters in the Central European Region*" (the Prague Declaration on Disaster Reduction, June 1998)
  - ◆ H.E. K. Carnjana-Goonchorn, Ambassador Extraordinary and Plenipotentiary, Permanent Mission of Thailand to the United Nations: "*The Economic and Social Aspects of Disaster Reduction in Asia*" (Bangkok Declaration in Disaster Reduction, February 1999)
  - ◆ Mr. S. Balassanian, President, Nation Survey for Seismic Protection of Armenia: "*Future problems of disaster reduction in the CIS region*" (Yerevan Declaration on IDNDR in the CIS Countries, September 1998)
  - ◆ Mr. San Nicolás Santamaría, Director General, Civil Protection, Spain: "*Common problems and future needs in the Mediterranean Region*" (Valencia Declaration on Disaster Reduction, May 1999)
  - ◆ Mr. W. Hooke, Chair, Subcommittee for Natural Disaster Reduction, Washington D.C., USA: "*The United States approach to Disaster Reduction*"

**Content:** The session reviewed ten years of achievements in disaster reduction at the regional level, based on the official declarations adopted at the IDNDR Regional Meetings organized within the framework of the closing events of the Decade. It also formulated priority recommendations for future actions and provided specific examples of successful strategies for education and national disaster mitigation policy programmes for disaster reduction.

During this decade several major natural hazards have transformed into major disasters costing billions of dollars in economic losses and enormous psychosocial distress. While improved early warning mechanisms and organization for effective evacuation and response saved hundred thousands of lives, poverty, accelerated urbanization (mega-cities), environmental degradation and lack of development remain the main causes of natural disasters. When reducing vulnerability and risks associated to future disasters, should be taken into account the important consequences of disasters including air and water pollution, mass movement of people, migration and technological disasters. It should be noted that reconstruction processes represent a good opportunity for implementing the necessary disaster reduction measures and policies. The IDNDR impetuous as a stimulus for partnerships and improvement in public awareness and political sensitiveness proved very useful in this respect. Regarding future arrangements for the successor of the IDNDR, the Government of Costa Rica urged the United Nations to maintain the regional Unit for Disaster Reduction for Latin America and the Caribbean as a platform for information exchange, public awareness and coordination and offered to continue hosting this entity.

### **Conclusions and Recommendations:**

While each region and each country has specific characteristics and needs, they do share common concerns on major issues which were identified as priorities for future actions. These were:

- ◆ Public awareness and sensitizing, involving mass media, to influence behavior towards a culture of disaster prevention.
- ◆ Dissemination of existing and future information using new technologies to enhance disaster reduction
- ◆ Capacity building as a general priority and more specifically education at all levels including primary and secondary school curricula, university degrees, adult training, formal and non-formal education of groups with special needs.
- ◆ Strengthening and coordination of regional and international cooperation for disaster reduction within sustainable development as well as environmental and humanitarian assistance agendas.
- ◆ Improvement of national institutional and legal frameworks for disaster prevention policies by enhancing national capacities, human resources and equipment, especially for developing countries.
- ◆ Community empowerment and involvement, not only for response to disasters, but also for policy development towards risk reduction
- ◆ Support for the use of new technologies and information tools for disaster reduction.
- ◆ Importance of the specific role of the private sector and insurance for disaster reduction.
- ◆ Inclusion of technological disasters in disaster reduction national and international mandates.
- ◆ Establishment of regional centers or structures to act as advocacy and public awareness platforms for disaster reduction promoting annual or regular regional meetings and training.
- ◆ Sustained improvement of early warning systems and mechanisms.
- ◆ Need for a follow-up mechanism to IDNDR of a multi-disciplinary and inter-agency character within the UN system to continue the promotion of disaster reduction on a cross sectoral basis.

## CLIMATIC VARIABILITIES AND EXTREMES: EL NINO, LA NINA

**Task Manager:** United Nations Environment Program (UNEP) Nairobi, Kenya  
**Moderator:** Mr. A. Alusa, UNEP Atmosphere Programme  
**Rapporteur:** Mr. S. R. Jegillos, Director for Asia, Asia-Pacific Disaster Management Centre, Makati City, Philippines

**Speakers:**

- ◆ Mr. A. Alusa: Presentation of the UNFIP Funded Project on "Reducing Environmental Emergencies Through Early-Warning and Preparedness: the Case of the El Niño Southern Oscillations (ENSO)"
- ◆ Mr. B. Kinninmonth, WMO Consultant: "Detection, Monitoring and Forecasting of El Niño, La Niña events: the 1997/1998 Scientific and Technical Retrospective"
- ◆ Mr. M. Glantz, Environmental and Societal Impacts Group, National Centre for Atmospheric Research, Boulder, Colorado: "El Niño, la Niña socio economic impacts and approaches towards the reduction of their adverse effects on societies in the twenty-first century"
- ◆ Mr. F. Paliz, Director General, Division of External Affairs, Foreign Ministry, Quito, Ecuador: "The UN Inter-Agency Task Force achievements on El Niño"

**Content:** The 1997/98 El Niño event, followed by a La Niña phase, was amongst the strongest in recorded history. It has, thus, created a high level of awareness, in all domains, about such climatic variabilities and extremes and their relation to natural disasters, environment and sustainable development. This session reviewed the current state of understanding of climate variabilities and extremes with regard to El Niño and la Niña.

**"Reducing environmental emergencies through early warning and preparedness: the case of El Nino Southern Oscillation"** is a project involving 15 countries and implemented jointly by UNEP, the United Nations Foundation, WMO, NCAR, the United Nations University and IDNDR. The main purpose of this project is to enhance the understanding of issues at stake by:

- ◆ reviewing the current situation with regard to global, regional and national predictions as well as early warning and preparedness systems and assessing how these may be improved.
- ◆ assessing the vulnerability of socio-economic sectors and the information needs for decision-makers in these sectors.

The review and assessment will be carried out through studies at global, regional and national levels.

**The scientific and technical retrospective of the 1997-1998 El Nino event** conducted by WMO consists of a description of activities pertaining to global assessment, monitoring, and consolidation of information on El Nino 1997 - 1998 impacts. It showed that El Nino 1997-1998 had severe global impact on:

- ◆ People (Mortality: 24.000 persons; morbidity: 533.000 persons; affected : 111 Mio persons)
- ◆ Material (US 34 billion in losses)
- ◆ Land (56 million acres affected)

These impacts could be reduced by improving preparedness, early warning, international and national inter-agency cooperation, technology transfer and

capacity building. More specifically, there is a need for better coping strategies including the strengthening of global climate infrastructure as well as the coordination and integration of climate information, prediction, preparedness, early warning and response.

Studies conducted by the **National Center for Atmospheric Research, USA (NCAR)** highlighted that public awareness on El Nino is quite high and leads to interesting social responses which need, however, to be adjusted. In this regard, the following remarks should be considered:

- ◆ El Nino does not represent unusual behavior of the global climate
- ◆ El Nino is part of a cycle
- ◆ Every weather anomaly throughout the world that occurs during an El Nino year is not necessarily caused by that El Nino
- ◆ El Nino has a positive side as well
- ◆ There will continue to be surprises associated with further El Nino events
- ◆ The impact of global warming on El Nino is not yet known, speculation notwithstanding
- ◆ Forecasting El Nino is different than forecasting the impacts of El Nino
- ◆ Scientists do not agree on the list of the El Nino years
- ◆ Forecasting El Nino's onset does not tell us about its magnitude, duration, or impacts.
- ◆ Progress in monitoring El Nino is not matched by progress in forecasting
- ◆ El Nino has two faces: (a) as an event, and (b) as a process
- ◆ Lessons learned are not conclusive in terms of identifying characteristics and impacts of El Nino
- ◆ El Nino Information dissemination through media and web sites requires improvement: the media do not have a neutral interest in reporting El Nino and a pretty web site does not an El Nino expert make! "Buyer Beware".

The **United Nations General Assembly** endorsed a multi-disciplinary and coordinated approach to the phenomenon of El Nino by adopting the resolution 52/200 within the framework of IDNDR. This resolution calls for enhanced international cooperation to reduce El Nino impacts. As a result, an interagency task force on El Nino was established.

In 1998, the Government of Ecuador and the United Nations organized jointly the First Intergovernmental Reunion of Experts on El Nino in Guayaquil, Ecuador where was adopted the Guayaquil Declaration proposing the establishment of an international center of the study of El Nino in Ecuador. Since then, the international community has relentlessly contributed to a better understanding of the El Nino phenomenon.

**Conclusions and Recommendations:**

- ◆ A key aspect for the reduction of the impacts of El Nino is to improve information content and dissemination.
- ◆ The United Nations system has to remain the platform for the strengthening of international cooperation to reduce the impacts of the El Nino phenomenon while the international community should provide its technical and financial support in order to put into practice the mandates of the United Nations in this respect.

**Task Manager:** United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

## DISASTERS OF THE FUTURE

**Task Manager:** United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction

**Moderator:** Mr. R. Hamilton, Chair of the STC

**Rapporteur:** Mr. J.-J. Wagner, Vice Chair of the STC

**Speakers:**

- ◆ Mr. J. Bruce, former Chair, STC, Canada: "*Hydrology, Climatology and the future*"
- ◆ Mr. M. Perlo Cohen, Member of the STC, Mexico: "*The State, the Citizen and the Scientists*"
- ◆ Mr. Y. Brazhnikov, EMERCOM, Russia: "*Issues of a technogenic and Technological Nature*"
- ◆ Mr. P. Recalde, World Food Programme (WFP): "*Increasing Food Security through Vulnerability Analysis Mapping*"

**Content:** The objective of the session was to provide information on projections and expectations of experts with regard to natural hazards of the 21st century and to our capacities to reduce their expected impact through improvement of global mitigation.

The trend showing a yearly increase of the number of disasters is not going to decay despite the increased mitigation actions undertaken during the IDNDR; this is mainly due to a tremendous growth of the world population and its greater exposure to natural hazards. An aggravating factor is climate changes, which give rise to more extreme natural events. Unless countries, whatever their economic status, integrate mitigation (prevention and preparedness) strategies into a sustainable development, the present situation can only worsen in the future.

UN conventions and agreements such as the Agenda 21, a comprehensive sustainable development action blueprint, can be appropriately used to reduce disaster losses and especially the ones which maybe associated with consequences of **climate variations or changes**. Actions in the framework of convention like the ones on biological diversity or on desertification contribute to the harmonious equilibrium in nature and therefore limit degradations which favor greenhouse effects and consequently reinforce climate changes with all their consequences. It was suggested that a post decade task force should not only include UN Agencies but also NGOs and have good national liaison. Moreover, experts on climate changes should be part of this team.

**Natural disaster management within the framework of globalization in a rapidly changing world** has positive and negative aspects: easy access to the tremendous communication tools allows people to follow disasters around the planet in near real time, thus enhancing world wide awareness for mitigation, but leads also to a saturation of disaster pictures which become common matters in the eyes of the public. Important natural phenomena, such as Mitch, are transnational and could be, ideally, served by global strategies. Unfortunately globalization of capital flow tends to avoid endangered areas, especially when decision centers are located elsewhere. Global coalitions like IDNR are positive tools that should be developed in appropriate forms for the



future. The World Bank and the reinsurance companies have also started initiatives along those lines. A Global perspective should include local coalitions which are directly in touch with communities.

There is a **growing interaction between natural, environmental and technological hazards**. The vulnerability of the society at large to the result of this interaction could be reduced by improved forecasting as well as improved detection of chain of risks for better safety. In this respect, the IDNDR successor should take into account a multi risk management approach. Entities such as EMERCOM are ready to support this approach with the view to improve disaster reduction strategies for the future.

With regard to **food security**, global vulnerability assessment but also its monitoring are of paramount importance to efficiently solve situations, which could degrade into famine. An appropriate tool for this undertaking is the GIS (Geographical Information Systems) with a broad range of data such as rain forecast, distances between production centers and road network, and also human factors like women involvement in the local society. Used with good indicators and reliable methodologies, the vulnerability analysis mapping provides decision-makers with efficient management tools to reduce the vulnerability of the population with an early response.

#### **Conclusions and Recommendations:**

Although risks are on the rise, lessons learnt through IDNDR and the global awareness it created showed that there is no such thing as fatality in natural disasters. Therefore, actors at all levels should be pro-active in incorporating mitigation and reduction of impacts of hazards in the daily life and sustainable development undertakings.

# PROGRAMME FOR THE FUTURE - CLOSING CEREMONY

- Task manager:** United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction
- Moderator:** Mr. R. Mountain, Director, Office for the Coordination of Humanitarian Affairs (OCHA), Geneva
- Rapporteur:** Mr. R. Hamilton, Rapporteur General of the Programme Forum
- Speakers:** Rapporteur General and Special Rapporteurs

## **General Conclusions and Recommendations by the Rapporteur General of the Programme Forum:**

**Poverty:** The people that are most vulnerable to natural disasters are the poor, who have very limited resources for avoiding losses. Environmental degradation resulting from poverty exacerbates disaster impacts. Without greater attention from policy makers and more support from donor agencies for disaster prevention action, many developing countries, particularly in Africa, will not be able to escape from this situation. Innovative approaches are needed; emphasis should be given to the programmes to promote community-based approaches.

**Megacities and urban areas:** Concentrations of population in major urban centres (megacities), many of which are located in hazard-prone areas and in developing countries, are highly vulnerable to natural and technological hazards due to dependence on complex infrastructures and occupation of marginal land. Greater attention should be given to developing resilient and redundant infrastructures through regional and land-use planning.

**Communities:** Most disaster prevention and mitigation actions require community acceptance and initiative, which must be based on a credible assessment of risks and realistic estimates of costs and benefits. Communities are generally knowledgeable about their own environments and coping mechanisms, and often of ways to reduce vulnerabilities. Community leadership also enhances independence and self-reliance. National, regional and international efforts towards disaster prevention and mitigation are essential, but should be seen as supportive of community-based actions.

**Awareness:** Public awareness of natural hazards and risks, the driving force for prevention action, should be solidly grounded in the best scientific and technological information and methodology. The IDNDR has promoted this goal and is seen as a key factor in increasing political sensitivities towards the need for disaster reduction measures and policies.

**Warnings:** Warnings for some types of hazards have saved many lives and are steadily improving, which is a major achievement during recent years. This has been made possible by improvements in monitoring, analytical, and communications systems. Nevertheless, further advances are possible and should be pursued. Warnings can be used to avoid disasters rather than just respond to them. Special attention should be given to delivering the right message to the right place at the right time.

**Information:** Advances in information technology in recent years now provide enormous resources for decision makers. However, efforts are needed to distill this information into products that are tailored for the specific needs and delivered in a timely manner. Advances in communications technology make possible integration of real-time and archival data for emergency situations.

**Education and training:** Education and training for disaster reduction is a key, cross-cutting issue that must be an integral part of all programs. Creative use of films and videos, as well as of modern dissemination means, can be especially effective. Information must be seen as authoritative and credible, which can be achieved by linking experts with community leaders.

Education resources provided by regional and international organisations, including NGOs, can be particularly helpful.

**Partnerships:** Partnerships involving public and private organisations can be particularly effective in linking stakeholders and implementing plans. The private sector may be able to promote mitigation by providing incentives, for example, by ensuring compliance to building codes that would reduce insurance premiums as a condition for coverage.

**Risk management:** Risk management should be better integrated into overall developmental and environmental planning. Cost effectiveness of proposed action is an essential consideration. Post-disaster recovery and reconstruction provide the opportunity and resources to implement natural disaster reduction as an essential element of sustainable development. Improvements have been made in recent years in risk assessment and loss estimation methodology.

**Health:** Natural disasters require close collaboration between scientists and decision-makers to assure that authoritative information on potential or actual health problems is communicated. It is often difficult to achieve this goal in the face of uncertain and/or sustained situations. Effects of climate variability on health are of growing interest.

**Climate variability:** The successful prediction of the El Niño phenomena during 1997-98 signalled an improving capability for forecasting climate variability. As climate variation affects the occurrence of natural hazards, such as drought, heavy rainfall with floods and landslides, and tropical cyclones, this development carries great implications for natural disaster reduction. In advance of El Niño, some communities took preventive action that significantly reduced potential impacts.

**Environment and ecosystems:** Natural hazards impact the environment and environmental degradation can exacerbate disasters. Small Island States and mountain communities can be especially vulnerable. Hazard and risk assessments should be improved to guide prevention and mitigation measures, for protecting the environment.

**Research:** Substantive progress has been achieved in understanding the cause and effects of natural hazards. Nevertheless, further efforts are needed, especially with respect to risk assessment and warnings. Multi-disciplinary efforts are needed for many problems, especially to better integrate physical and social sciences.

**Building codes and practices:** In many cases, rather simple modifications to current building practices could greatly improve performance under hazard-induced stress. Retrofitting existing structures, however, poses a challenge due to cost. Emphasis is now being given to overall building performance, moving beyond the previous focus on life safety. Methods have been advanced for better housing construction using local materials, which should be more broadly communicated.

**Loss data:** Reliable data on natural disaster losses, other than human casualties, are very limited. Standard methods should be employed for collecting such data. National statistics on losses could be used to measure progress on disaster reduction.

**Framework:** The international and regional framework provided by the IDNDR has greatly assisted many nations in focusing attention on the threat posed by natural hazards and the means for mitigating their impacts. Of great importance, through the IDNDR many high-level decision-makers have become aware of the vulnerabilities and the opportunities to reduce them. It is of the utmost importance that such a framework is provided in the future beyond the decade.

## **STRATEGY: A SAFER WORLD in the 21st CENTURY**

### **Disaster and Risk Reduction**

IDNDR Programme Forum, Geneva, July 1999

#### **INTRODUCTION**

While hazards are inevitable, and the elimination of all risk is impossible, there are many technical measures, traditional practices, and public experience that can reduce the extent or severity of economic and social disasters. Hazards and emergency requirements are a part of living with nature, but human behaviour can be changed. In the words of the Secretary General,

"We must, above all, shift from a culture of reaction to a culture of prevention. Prevention is not only more humane than cure; it is also much cheaper... Above all, let us not forget that disaster prevention is a moral imperative, no less than reducing the risks of war".

#### **VISION**

To enable all communities to become resilient to the effects of natural, technological and environmental hazards, reducing the compound risks they pose to social and economic vulnerabilities within modern societies.

To proceed from protection against hazards to the management of risk through the integration of risk prevention into sustainable development.

#### **GOALS**

- I. Increase public awareness of the risks that natural, technological and environmental hazards pose to modern societies.
- II. Obtain commitment by public authorities to reduce risks to people, their livelihoods, social and economic infrastructure, and environmental resources.
- III. Engage public participation at all levels of implementation to create disaster-resistant communities through increased partnership and expanded risk reduction networks at all levels.
- IV. Reduce the economic and social losses of disasters as measured, for example, by Gross Domestic Product.

#### **OBJECTIVES**

1. Stimulate research and application, provide knowledge, convey experience, build capabilities and allocate necessary resources for reducing or preventing severe and recurrent impacts of hazards, for those people most vulnerable.
2. Increase opportunities for organizations and multi-disciplinary relationships to foster more scientific and technical contributions to the public decision-making process in matters of hazard, risk and disaster prevention.
3. Develop a more proactive interface between management of natural resources and risk reduction practices.

4. Form a global community dedicated to making risk and disaster prevention a public value.
5. Link risk prevention and economic competitiveness issues to enhance opportunities for greater economic partnerships.
6. Complete comprehensive risk assessments and integrate them within development plans.
7. Develop and apply risk reduction strategies and mitigation measures with supporting arrangements and resources for disaster prevention at all levels of activity.
8. Identify and engage designated authorities, professionals drawn from the widest possible range of expertise, and community leaders to develop increased partnership activities.
9. Establish risk monitoring capabilities, and early warning systems as integrated processes, with particular attention being given to emerging hazards with global implications such as those related to climate variation and change, at all levels of responsibility.
10. Develop sustained programmes of public information and institutionalized educational components pertaining to hazards and their effects, risk management practices and disaster prevention activities, for all ages.
11. Establish internationally and professionally agreed standards / methodologies for the analysis and expression of the socio-economic impacts of disasters on societies.
12. Seek innovative funding mechanisms dedicated to sustained risk and disaster prevention activities.

#### **IMPLEMENTATION**

Conduct a national audit or assessment process of existing functions necessary for a comprehensive and integrated national strategy of hazard, risk and disaster prevention, projected over 5-10 and 20 year time periods.

Conduct dynamic risk analysis with specific consideration of demographics, urban growth, and the interaction or compound relationships between natural, technological and environmental factors

Build, or where existing, strengthen regional/sub-regional, national and international approaches, and collaborative organizational arrangements that can increase hazard, risk and disaster prevention capabilities and activities.

Establish coordination mechanisms for greater coherence and improved effectiveness of combined hazard, risk and disaster prevention strategies at all levels of responsibility.

Promote and encourage know-how transfer through partnership and among countries with particular attention given in the transfer of experience amongst those countries most exposed to risks.

Establish national, regional/sub-regional, and global information exchanges, facilities, or websites dedicated to hazard, risk and disaster prevention, linked by agreed communication standards and protocols to facilitate interchange.

Link efforts of hazard, risk and disaster prevention more closely with the Agenda 21 implementation process for enhanced synergy with environmental and sustainable development issues

Focus multi-year risk reduction strategies on urban concentration and mega-city environments.

Institute comprehensive application of land-use planning and programmes in hazard prone-environments.

Develop and apply standard forms of statistical recording of risk factors, disaster occurrences and their consequences to enable more consistent comparisons.

Undertake periodic reviews of accomplishments in hazard, risk and disaster reduction efforts at all levels of engagement and responsibility.

Study feasibility of specific alternative funding and resource allocation modalities that can ensure continued commitment to sustained risk and disaster prevention strategies.

## **RESPONSIBLE PARTIES**

Governments have the primary responsibility for protecting citizens from risks and disaster, however, local communities and elements of civil society most threatened by hazards emerge as key initiators of important risk and disaster prevention actions. They must work through partnership, and together, receive necessary encouragement and support to realize the vision of disaster resilience.

Regional/sub-regional and international collaboration is essential, especially with regard to the dissemination of experience and information, scientific and technical applications, continual advocacy and the coordination of strategies to assist in the development of national capabilities.

The United Nations system has a special leadership role in global risk and disaster reduction by its universal character, inter-disciplinary and multi-sectoral scope, and role as a forum for global dialogue. It should address global risk issues, ensure coherence among humanitarian aid, disaster prevention and development, and promote collaboration among countries.

## **REVIEW**

The strategy, *A Safer World in the 21st Century: Risk and Disaster Reduction*, should be closely monitored by the risk and disaster reduction community, and a global review of progress and accomplishments should be undertaken by all concerned parties within a period of five years.



# PRESENTATION OF THE CONFERENCE STATEMENT

## International Decade for Natural Disaster Reduction IDNDR International Programme Forum 5-9 July 1999

### **The Geneva Mandate On Disaster Reduction**

We, participants in the IDNDR International Programme Forum - Towards Partnerships for Disaster Reduction in the 21st Century, - recognise that the world is increasingly being threatened by large scale disasters triggered by hazards, which will have long term negative social, economic, and environmental consequences on our societies and hamper our capacity to ensure sustainable development and investment, particularly in developing countries.

We have to act decisively now, to guarantee a safer world for future generations. We must build on progress achieved during the IDNDR, so that risk management and disaster reduction become essential elements of government policies. The Yokohama Strategy (1994) and the strategy "A Safer World in the 21st Century: Risk and Disaster Reduction" (1999) chart the course. Political will is essential to ensure that appropriate policies and institutional arrangements foster a culture of prevention at all levels of our societies.

We shall adopt and implement policy measures at the international, regional, sub-regional, national and local levels aimed at reducing the vulnerability of our societies to both natural and technological hazards through proactive rather than reactive approaches. These measures shall have as main objectives the establishment of hazard-resilient communities and the protection of people from the threat of disasters. They shall also contribute to safeguarding our natural and economic resources, and our social wellbeing and livelihoods.

Furthermore, scientific, social and economic research, and technological and planning applications will be required at all levels and from a wide range of disciplines in order to support risk management and effective reduction of our vulnerabilities. In this connection, there is need for increased information exchange, improved early warning capacities, technology transfer and technical co-operation among all countries, paying particular attention to the most vulnerable and affected.

These last ten years have shown the multisectoral, interdisciplinary and cross-cutting nature of broad risk management and its contribution to disaster reduction. Continued interaction and co-operation on the above basis, among all disciplines and institutions concerned, are considered essential to accomplish commonly agreed objectives and priorities. This interaction shall be based on the strengthening of co-operation and partnerships engendered by the IDNDR Programme.

We stress the importance of developing and strengthening regional approaches dedicated to disaster reduction in order to take account of local specificity and needs. We emphasise in this respect, the need to support institutional initiatives and mechanisms for strengthening regional, sub-regional national and local capabilities, coordination, and applied research. We recognise the particular need for establishing an institutional arrangement to coordinate disaster reduction in Africa, and in this regard, invite existing and evolving mechanisms for inter-regional co-operation to accord priority to these concerns.

Appropriate financial resources will be needed to ensure the development and implementation of prevention and mitigation policies and programmes in all countries particularly developing countries. Innovative approaches should be explored including the funding of international initiatives. However, full use should be made of existing regional and national financial mechanisms involving those communities most directly exposed to risks. All bilateral and multilateral development assistance should include disaster reduction components.

We recommend to the international community and to the United Nations that, based on the proven success of the functional responsibilities and organizational arrangements during the IDNDR, the international co-operative framework for disaster reduction be maintained and strengthened. This framework should ensure partnership and synergy among all elements of risk management and disaster reduction, and promote a shift from a mentality of reaction to a culture of prevention. The growing threat of political, social and economic disruption caused by natural and technological disasters calls for bold action from member States of the United Nations in this regard.





# WMO/UNESCO SUB-FORUM ON SCIENCE AND TECHNOLOGY

*The complete proceedings of the WMO/UNESCO Sub-Forum have been published in a separate document by the concerned Organizations*

*(reference: 1999, WMO, ISBN 92-63-10914-1)*

## STATEMENT FROM THE WMO/UNESCO

### **SUB-FORUM ON SCIENCE AND TECHNOLOGY IN SUPPORT OF NATURAL DISASTER REDUCTION**

**(Geneva, 6-8 July 1999)**

One of the outstanding achievements of the International Decade for Natural Disaster Reduction (IDNDR) has been its major contribution to increased interaction and cooperation between the natural and social science communities working in disaster reduction and hence to enhanced application of science and technology to reducing the large and growing social and economic cost of natural disasters around the world.

Though science and technology have already contributed much to saving human life and reducing property loss and environmental damage from most forms of natural hazard of meteorological, hydrological, oceanographic and geological origin, their potential contribution over the next decade is even greater. But only if they are systematically and wisely applied within the broader social context of an integrated approach to natural disaster reduction which is the principal legacy and proudest achievement of the IDNDR.

In order to assist the global community to build most effectively on the foundation provided by the IDNDR, the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), as the two principal United Nations (UN) agencies concerned with the scientific and technological aspects of disaster reduction, convened a "Sub-Forum on Science and Technology in Support of Natural Disaster Reduction" as a special contribution to the UN IDNDR Programme Forum 1999 "Partnerships for a Safer World in the 21st Century".

The Sub-Forum reviewed the various ways in which science and technology contribute to the disaster reduction process including, in particular, through:

- ◆ assessment of vulnerability and enhancement of community awareness of the nature of the risk;
- ◆ operation of integrated warning systems; and
- ◆ preparedness and education programs.

In its review, the Sub-Forum took stock of recent progress and future prospects in each of these three aspects of the application of science and technology to reduction of the impacts of tropical cyclones, extra-tropical storms, storm surges, severe local storms and tornadoes, sand and dust storms, drought, extreme and persistent temperatures, fire weather, floods, landslides, avalanches, volcanoes, earthquakes and tsunamis. A synopsis of this review is contained in the Annex to this statement.

The participants in the Sub-Forum, who came from both the natural and social sciences and with both research and operational backgrounds in developing and developed countries were concerned that more could have been achieved during the "decade" if the channels of communication and mutual trust that have now been achieved could have been established earlier. They were also concerned at the substantial gap that still exists between the disaster reduction capabilities of the developed and developing countries. They believe, however, that the achievements of the past decade have provided a sound foundation on which to build an effective global strategy for natural disaster reduction in the 21st century.

### **Major Achievements**

Many of the most significant achievements in natural disaster reduction during the 1990s were largely a result of science and technology. Accuracy and timeliness of early warnings for many natural hazards have been improved. The ability to provide forecast time and location of landfall of tropical cyclones has been improved by 24 hours so that the accuracy of the 24-hour forecast in 1990 has been increased in 1999 to 48 hours in advance. The warning time for tornadoes in 1990 was around 8 or 9 minutes and this has nearly doubled to over 17 minutes by the end of the decade. During the "decade", information and understanding on specific natural hazards such as earthquakes and cyclones has, along with increased confidence of design engineers and insurance corporations, permitted improvements in building codes and standards in many parts of the world. A related achievement has been the significant increase of available maps of risk for many countries based on scientific studies and analyses of the climatology of natural hazards.

Perhaps the most visible achievement in the 1990s has been the creation of new disaster management bodies at all levels of government that now include scientists and engineers involved in the study and prediction of natural hazards. One of the major meteorological concerns of the 1990s has related to the longer time scales associated with seasonal to interannual climate variability and human-induced change. While the capacity to forecast these changes is still limited, the implications for natural disaster reduction are extremely significant with just a very small improvement in forecast skill likely to lead to major benefits for communities and national economies.

Another notable achievement of the decade has been the ability, through satellites, to detect, track and assess the intensity of tropical cyclones and major storm systems. It is almost a certainty that all tropical cyclones can now be detected at or before their development as a natural hazard.

Significant improvements have been made during the decade in the global observation system of the World Weather Watch (WWW) and the Integrated Global Ocean Services System (IGOSS). For example, the polar and geostationary satellite systems have been enhanced and the experimental buoy network in the tropical Pacific Ocean has been made operational providing essential observations for early detection of intense El Niño and subsequent La Niña phenomena. This achievement permitted prediction of drought and above normal precipitation several months in advance in Eastern Africa, and prediction of heavy rain in California in the United States. These predictions also led to special preparedness actions resulting in significant reduction in the losses from the associated flooding.

Overall, the achievements in scientific understanding and its application during the 1990s have provided significant increases in evacuation times, better building standards, and improved risk assessment.

### **Vulnerability and Awareness**

The Sub-Forum agreed that vulnerability assessment and reduction should form an integral part of the follow-up to the IDNDR. This should be achieved through use of advances in engineering as well as in the natural, social and human sciences.

Awareness raising on all types of natural disasters forms an essential element in early warning

systems, particularly also where warning periods are short. It encompasses the affected population as well as the political authorities concerned. Therefore, education and training of communities at large, the involvement of media and continuous interaction between scientists, sociologists, technologists and decision-makers and governmental authorities are indispensable vehicles for effective implementation. The partnership of scientific and technical practitioners with those working in social and humanitarian fields is essential notably in urban areas, involving the local population as well as tourists

In developed countries, it has been clearly demonstrated in recent years that the vulnerability of communities to natural hazards can be greatly reduced by the use of modern building standards in conjunction with risk zoning based on scientific and technical knowledge of the various hazards and their impact on the built environment. Indeed it is through such standards and risk zoning that much of the scientific and technical knowledge of the various hazard mitigation is applied in the community. In the building and construction area these standards are being developed by the International Standards Organization (ISO). These standards have the potential to greatly reduce community vulnerability to a number of major hazards in the long term but this will require that the development of these new international standards be given higher priority than the revision and upgrading of their individual national standards.

A related, but separate need is the development of cost efficient means of reducing the vulnerability of existing buildings and infrastructure and the financing of activities. This is required to address the reduction of vulnerability in the short to medium term. A high level of technical skills will be required to determine economic means of reducing the vulnerability, and high level of scientific and engineering expertise will be required for the innovative methods of risk financing that will be needed to securitise the investment in reducing the vulnerability.

### **Integrated Warning Systems**

Early warnings are an extremely important link in the chain of actions required to reduce the social and economic impact of natural hazards. Warnings of a natural hazard such as a flood delivered in a timely and clear manner to individuals or communities prepared to take action reduces the impact of the hazard.

All sectors must be involved in the warning process and serve population needs, environment and other national resources. Effective early warnings require unrestricted access to data that is freely available for exchange and they must emanate from a single officially designated authority.

Advances in science and technology during the last decade have demonstrated enhanced warning capabilities for many natural hazards in many parts of the world. For example, warnings of drought have been issued several months in advance which proved of great value for alleviating the impacts of the drought and food supplies. The forecast accuracy of tracks of tropical cyclones has shown significant improvement and average forecast lead times for tornadoes and flash floods have been substantially increased which reduces the loss of life.

Provided adequate assistance is available, many opportunities now exist to transfer these warning capabilities to all areas affected by the natural hazard especially in developing countries during the next decade.

The warning process is underpinned internationally by the World Weather Watch and IGOSS, the Tsunami Warning System and associated research particularly the World Weather Research Program. At the national level this process includes local and regional observational systems such as coordinated hydrological networks and radar, data processing capability and most importantly it depends on well-trained meteorologists to prepare forecasts and warnings and interact with media and emergency management officials.

### **Preparedness and Education**

A wide range of activities and bodies is encompassed by the terms "preparedness" and "education". They extend from the grass roots to the governmental level and involve individuals, families and communities at one extreme, and universities, ministries and government as a whole at the other. They take in classes, seminars, schools, links of various sorts such as between the forecasters and the audience for their forecasts; and they include research, not only into forecasting but also into the delivery and dissemination of forecasts and warnings and the responses, perception and reactions to them.

Developed and some developing countries have extended their preparedness and the meteorological, hydrological and other geoscience products supporting it into new areas during the "decade". They have forged closer dialogue between the scientific community and stakeholders in various areas of endeavour, such as agriculture, health and transport. They have made good progress with dialogue with social scientists, but this area still needs more attention. Catering for preparedness of the disadvantaged and disabled has also not progressed to the desired extent and greater use of plain and meaningful language is seen as highly advantageous in the better communication of forecasts and warnings. Indeed the language of preparedness measures and forecasts determine the way these messages are accepted. In many cases the use of a dialect could improve effectiveness and credibility. Confirmation of such messages is also an important consideration. Using mobile phones and pagers to propagate these messages and means other than radio and television have distinct benefits. Education and training applied in the direction of those scientists building the preparedness measures as well as those they are designed for. Indian experience of workshops between forecasters and the users of their forecasts pointed to the value of such exchanges. However, there are differences when carrying the message to adults as opposed to children

There are advantages attached to the education of school children in disaster preparedness - their parents benefit as well and this has been made evident during the IDNDR. Developing countries trying to build their preparedness face enormous costs and also the much greater costs of reconstruction in the wake of a disaster.

### **Future Actions**

The Sub-Forum recognized that, as a result of population increase and concentration and other factors, our societies are becoming more and more vulnerable and that our protective systems are not necessarily adapted to cope. Furthermore, considering that a disaster strategy which puts emphasis solely on relief and response is short-sighted and not cost-effective, the participants agreed on the need for greater emphasis on prevention across the whole continuum of hazards faced by humanity.

The Sub-Forum recalled that the 1994 Yokohama World Conference on Natural Disaster Reduction called for a construction of a "Culture of Prevention" which should be based on improved short-term and long-term monitoring mechanisms. Mitigation, preparedness and prevention measures must be proactive rather than reactive; they must provide the correct treatment while there is still time. Prevention must be rooted ultimately in culture and education which finds its expression in our everyday social behaviour. Hence, the threat of potentially irreversible events includes an ethical dimension which should be reflected in training, organization and motivation of communities at risk.

Capacity building and education at all levels have an important role to play in the development of a culture of prevention by ensuring a two-way flow of information between decision-makers and communities at risk.

The Sub-Forum emphasized the need for capacity building in vulnerability and risk assessment, early warning of both short-lived natural disasters and long-term hazards associated with environmental change, improved preparedness, adaptation, mitigation of their adverse effects and the integration of disaster management into overall national socio-economic development planning.

The participants agreed that a focused ongoing coordination structure is needed within the UN system in order to strengthen further the already close cooperation among intergovernmental and non-governmental scientific and technical bodies committed to natural disaster reduction. Such a mechanism is necessary to foster and sustain the vital international and national effort on the application of the natural and social sciences and technology in support of natural disaster reduction, particularly through the implementation of the relevant programmes of UNESCO and WMO.

## EXTRATROPICAL STORMS

**Speaker:** Mr. W. Appleby, Environment Canada, Atmospheric Environment, Canada

Large-scale, mid-latitude, storms are the main cause of blizzards, freezing rain and heavy snowfall in winter and can also cause intense rainfall, hailstorms, or spawn tornado families. The 1990s have seen an increase in the cost of natural disasters resulting from these storms. During 1989-90, a series of intense winter storms struck northern Europe causing over 200 deaths and billions of dollars in damage. In July 1996, a low pressure system dumped 200mm of rain in the Saguenay River region of Quebec in Canada and the resulting flash floods killed at least 10 people, 16,000 people had to be evacuated and losses were over US\$ 500 million. The 1998 flooding of the Yangtze River in China was the most costly disaster of the year, claiming 4,150 lives, affecting 223 million people and causing \$30 billion in damage.

Significant achievements during the Decade include improved forecast accuracy, resulting from improvements in numerical models, supported by enhanced observational systems and increased emphasis on user requirements and effective messaging. Using computer models, many extratropical storms can now be predicted well ahead of time and the timely issue of early warnings helps to mitigate their impacts.

For the future, it is critical that investments continue in surface and space-based observational networks, telecommunications and computer systems and numerical weather prediction along with related research and development. Since more people are living in vulnerable areas and, in many instances, they are taking inadequate precautions against extratropical storms, it is equally vital that emphasis continue to be placed on enhancing public awareness and understanding of hazards, early warnings and mitigation and preparedness actions.

## SEVERE LOCAL STORMS AND TORNADOES

**Speaker:** Dr. H. Brooks, NOAA/National Severe Storms Laboratory, USA

Severe convective weather such as tornadoes, hail, damaging wind gusts and flash floods presents a serious threat to life and property in many parts of the world. Destructive tornadoes have been observed in all continents except Antarctica and their occurrence is, probably, vastly under-reported. In the Pacific and the Caribbean, landfalling tropical cyclones often spawn tornadoes. During the past 20 years, devastating tornado occurrences have resulted in hundreds of fatalities in places as far apart as Moscow and Bangladesh. Severe hailstorms, flash floods and dangerous wind gusts are also very widely experienced and damage from these non-tornadic events can also be catastrophic. In the last 15 years, hailstorms have caused damage in excess of US\$500 million from Munich, Germany to Denver, USA and Sydney, Australia. A flash flood recently killed over 80 people at Biescas in the Spanish Pyrenees. Around the world, press reports are common of damage to buildings, aircraft, trees and crops caused by strong convective gusts.

Significant progress has been made in understanding and modelling severe convective storms. Though increasing numbers of tornadoes have been reported in the US and property damage has increased in recent years, the annual death toll has dropped significantly. The decrease in fatalities is due to improvements in scientific understanding of severe storm formation, in observing technology and in the preparation and communication of warnings along with aggressive and successful public awareness and preparedness programs. Notable accomplishments include more widespread application of weather radars, particularly Doppler, leading to significantly increased lead times for tornado warnings and improved detection of heavy precipitation, enhanced observational coverage through automatic weather stations, improved tools such as workstations, advances in numerical models and improved public awareness of severe weather, particularly tornadoes. This has already led to a doubling of warning times, jumping from about nine minutes in 1990 to over 17 minutes in 1999.

The success of the above integrated approach combining improved storm detection, forecasting and warnings delivery with enhanced public awareness and education and well-exercised preparedness and response measures, makes it clear that this strategy should be transferred to all regions at risk. Particular issues for the future also include the need to: improve climatological estimates of the threats presented by severe weather; address probable under-reporting of severe weather occurrences; transfer research results and advanced forecast techniques; and to lessen the vulnerability of buildings and structures to severe weather phenomena.



## DROUGHT

**Speaker:** Prof. L. A. Ogallo, Department of Meteorology, University of Nairobi, Kenya

Droughts are normal components of climate variability though their effects are, all too frequently, seriously exacerbated by human factors such as population growth, inappropriate agricultural and forestry practices, poor or no planning and war. The adverse impacts of severe droughts are well known - forced migrations of people and animals, shortages of food, water, energy and other basic necessities, environmental degradation and disastrous mass starvation necessitating the mobilization of huge international relief efforts. Developing countries, particularly in Africa, continue to be both particularly vulnerable and limited in their ability to implement costly mitigation and preparedness measures.

In most developed countries, a reduction in vulnerability to drought has been achieved through the ongoing application of scientific and technological capacity. Related measures include the use of historical climate records and scientific and technical knowledge as a basis for risk assessment and zoning, land use planning, selection of appropriate agricultural practices, design of water storage and delivery systems and the development of insurance schemes and other realistic disaster preparedness policies. More immediate mitigation and preparedness measures build upon systematic monitoring of climatic and hydrological systems to provide early warning of developing droughts.

These approaches are being transferred to developing countries through initiatives such as the establishment of Drought Monitoring Centres. The Centre in Nairobi, for example, has achieved commendable results in drought monitoring, seasonal weather forecasting and capacity building in the Eastern Africa sub-region. Its products are disseminated widely and used for agricultural and water resources management and form a crucial component of early warning systems for food security in the sub-region.

During the next century, an increase in vulnerability to drought may be expected as a result of development pressures and population increases. Global warming may, in addition, increase the frequency of recurrence of drought-producing weather conditions in some regions. It is vital, therefore, that very high priority continues to be given to programs aimed at reducing global and regional vulnerability to drought. Key challenges to be faced include the development of the essential scientific and technical capacity in vulnerable regions, the establishment and maintenance of adequate meteorological and hydrological monitoring networks, improving seasonal and inter-annual prediction, implementing effective public education and disaster prevention and preparedness policies and ensuring ongoing technology transfer. The Drought Monitoring Centres, in particular, need to be strengthened and their computing and modelling capabilities enhanced along with improving real-time transfer of data and products throughout the sub-region(s).

## FOREST FIRES

**Speaker:** Mr. B. Sol, Météo-France, Bureau Etudes et Développement, Direction interrégionale sud-est, France

Fighting forest and bush fires involves very large expenditures by communities and governments and the after-effects of large fires are generally felt for many years. Wild fires result in extensive damage to vegetation, human settlements and industries, along with closures of roads, railways and airports, evacuations of people, disruption or death of domestic animals and wildlife and occasional loss of human life. They can also create significant regional problems such as occurred in 1994 when fire razed over five million hectares of bush, plantation and forest in Indonesia, generating thick haze which severely affected Malaysia, Singapore and Brunei Darussalam. At times visibility was reduced to as low as 500 meters, disrupting air transport, causing poor air quality and an increase in eye irritation and respiratory problems.

Early identification of high fire hazard enables preventive or mitigating measures to be taken. As a result of research conducted over the past several decades, reliable techniques now exist for estimating the probability of forest fire outbreaks on the basis of meteorological conditions. Forecasts of high forest fire risk, made a day or two in advance, are of great value in initiating preventive measures such as forest closures, restrictions on logging and banning of open-air burning as well as in alerting and pre-positioning fire fighting personnel and warning the population. During active fires, wind, precipitation and humidity forecasts for fire sites enable fire-fighting crews to anticipate fire movement and behaviour, thereby increasing their efficiency and effectiveness and reducing overall costs.

The provision of timely early warnings of high fire risk and short range predictions of fire behaviour is critically dependent on the existence of adequate surface and space-based observational networks, reliable telecommunications and well-trained meteorological and forestry specialists. The establishment and maintenance of a close, ongoing, relationship between National Meteorological Services and forest fire agencies and the conduct of effective public education and awareness campaigns are also essential ingredients in achieving optimum effectiveness in fire prevention, preparedness and mitigation. Consequently, future efforts to reduce forest fires disasters should focus on the development of observational and communications infrastructure, specialized professional expertise, inter-agency liaison and coordination, skills in the conduct of public awareness campaigns and facilitate the transfer and implementation of operationally proven fire risk assessment techniques.

## EXTREME TEMPERATURES

**Speaker:** Dr. G. Jendritsky, German Meteorological Service, Freiburg, Germany

Many deaths result from cold waves and damage to crops, livestock, power supplies, transportation and other components of infrastructure can be enormous. Around 275 people died during the 1992 cold wave in India while similar conditions resulted in 298 deaths in central and eastern Europe during November and December 1998. Over 1 million farm animals died in China in 1986; extreme cold in late April 1991 destroyed the grape harvest in much of France and 40% of the Brazilian coffee harvest was destroyed in June-July 1994. Low temperatures alone, however, rarely cause disaster and other compounding factors are usually involved, such as freezing rain, heavy snowfall or high winds. For example, the 5 - 10 January 1998 Ice Storm, the worst in Canadian history, resulted from a prolonged period of freezing rain and left 4 million people without power, necessitated the evacuation of over 100,000, caused over US\$2.5 billion damage in Canada and the neighbouring US and took 23 lives.

Prolonged heatwaves also impose severe stresses on people and economies. About 1,500 lives were lost in China in 1988, over 2,000 died in Greece in 1997 and, in 1998, a record 3,028 people died in a heat wave in India. Economic damages in the Mexican event of 1966 were over US\$1.2 billion, reached US\$13 billion in the 1988 US drought/heat wave and exceeded US\$1 billion in 1992 in southern Africa. Urban populations, particularly the poor and elderly, are especially vulnerable as the heat island effect prevents nighttime temperatures from dropping sufficiently to provide relief.

Mitigation and preparedness for cold and heat waves requires the assessment of historical climate records, planning and design to accommodate extreme temperatures (especially in densely settled areas), implementation of early warning systems and ongoing dissemination of advice to the public. National Meteorological Services already contribute significantly by issuing early warnings of extreme winter weather and heat waves and supplying climatic analyses. An integrated heat watch/warning system, currently being extended internationally at the initiative of WMO, WHO and UNEP, is an example of technology transfer which will further assist in preparedness when tailored to local conditions.

To prevent further disasters, efforts must continue to enhance national and regional capacities to prepare for, warn of and withstand temperature extremes and related weather phenomena. In particular, heat watch/warning systems adapted to local conditions should be established in the most vulnerable megacities around the world.

## DUST AND SAND STORMS

**Speaker:** Dr. A. A. Hassan, Meteorological Authority, Cairo, Egypt

Sand and dust storms are natural events which occur widely around the world, in arid and semi- arid regions, temperate, tropical and sub-tropical latitudes. They are one of the most unpleasant weather phenomena and can be hazardous to transportation and navigation and for human health. Severe or prolonged dust and sand storms also result in major disasters. A dust storm which lasted for 5 hours near Jingchang, China caused 640 million yuan in economic damage over a wide area and injured and killed upwards of 300 people. In mid-March 1998, the Middle East was hit by choking sandstorms, claiming four lives, leaving 29 people injured, forcing the Suez canal, airports and seaports to close and bathing the region in an eerie yellow light.

The arid region around the Arabian Sea experiences the highest frequency of dust storms with over 30 per year occurring in the area joining Iran, Afghanistan and Pakistan. In Egypt, sandstorms -- called "khamsin (fifty)" for the number of days on which they can occur -- are a seasonal hazard and in 1997, 18 people died when that country was hit by the worst sandstorm in 30 years. Dust storms occur on a variety of spatial scales from mesoscale/regional to continental and remove large quantities of surface sediments and topsoil along with nutrients and seeds.

Timely early warnings of impending sand and dust storms are critical to preparedness for these, at times, disastrous events. National Meteorological Services in affected countries now prepare and issue such warnings when expected weather conditions favour their development. Longer-term mitigative measures are also being pursued such as the planting of trees and vegetation cover, modification of agricultural practices and public education initiatives.

For the future, efforts must continue to increase our understanding of duststorms and the factors which influence their development, movement and decay to improve our ability to provide early warnings of these events. In addition, longer term mitigative measures aimed at increasing awareness and reducing vulnerability and exposure must continue to be pursued.

## EARTHQUAKES

**Speaker:** Dr. A. Green, Institute of Geophysics, Zürich, Switzerland

**Speaker:** Dr. W. Hays, United States Geological Survey, USA

Earthquakes are amongst the most damaging natural phenomena to affect the earth. Over 1.6 million people have died in earthquakes during the 20th century while huge economic losses have been incurred. The moderate (Richter scale 6.9) 1995 earthquake in Kobe, Japan, for example, produced direct economic losses reaching a new record of over \$140 billion! Earthquake damage is, in general, related to the magnitude of the event, the quality of buildings and structures and the nature of the ground and secondary effects such as fires, landslides and tsunamis frequently contribute substantially. In 1960, a magnitude 5.9 earthquake caused approximately 12,500 deaths in Agadir, Moroccan where traditional stone and brick houses were situated on loosely consolidated sediments. In contrast, a magnitude 6 earthquake in the Canadian Shield in 1988 caused no deaths in a region where houses are usually wood framed with relatively light roofs. Unfortunately, around the world, earthquake vulnerability is increasing rapidly as a result of flaws in planning, siting, design, construction and use of buildings, dams, transportation links and other infrastructure. Seismologists consider that very strong (Richter >8) earthquakes will eventually occur in several areas of high population and development density, possibly producing losses up to an astounding \$2,000 billion! This provides a wake-up call for responsible risk management.

Earthquakes will, inevitably, continue to occur, particularly along the boundaries of tectonic plates, but we cannot predict exactly where, when or what will be their magnitude. In a few regions, however, useful early warning systems are possible for approaching seismic waves from distant earthquakes and such systems have been implemented in a few locations. Their effectiveness is dependent on very fast seismographic and computer-communications infrastructure capable of disseminating information in advance of the arrival of dangerous shear and surface waves (i.e. within seconds to a minute or so).

For the future, since every dollar spent on mitigation and preparedness is estimated to save ten dollars in recovery and reconstruction costs, continued emphasis on earthquake mitigation and preparedness makes economic sense. The basic scientific and technical information required to characterize earthquake hazard and community vulnerability is now readily available in all countries. The general level of seismicity across broad areas can be forecast for the next tens to hundreds of years and nearly all countries now have regional seismic hazard maps. The next step towards preparedness is to conduct detailed vulnerability studies.

As a result of the IDNDR, several major projects are underway aimed at improving worldwide earthquake mitigation and preparedness, such as the World Seismic Safety Initiative, RADIUS project and the Earthquake and Megacities Initiative.

For the future, reduction of vulnerability to earthquakes is, clearly, an urgent goal for the coming decades. It is, moreover, one that is realizable as policy makers and stakeholders now have many earthquake mitigation options available. These include insurance, construction codes and standards, remediation and retrofit, demolition of hazardous structures, relocations, siting and land-use criteria, training and exercises. The key to success will be to integrate risk assessment and risk management as an ongoing strategy aimed at avoidance of flaws in planning, design, siting, construction and use which create or increase vulnerability.

## LANDSLIDES

**Speaker:** Dr. P. Canuti, Earth Science Department, University of Firenze, Italy

Landslides occur in all regions of the world when masses of rock, earth, mine waste or debris move down slopes and result from rainstorms, earthquakes, volcanic eruptions and various human activities. They usually strike without warning destroying landscapes, buildings and homes, breaking electrical, water, gas, and sewage lines and disrupting roads and railways. Landslides and disastrous mudflows during the 1997 and 1998 hurricane seasons in Central America and the Caribbean caused untold damage and the tragic loss of thousands of lives in vulnerable communities. Landslides in the United States alone are estimated to cause an annual loss of about \$1.5 billion and at least 25 fatalities and many areas of the globe are even more vulnerable.

Mitigation of the impacts of landslides requires hazard and vulnerability assessments and the implementation of risk management policies and strategies including public awareness campaigns, planning and development regulations, and construction codes and standards. Landslide, mudflow and debris-flow problems are often caused by mismanagement including unwise land-use practices on ground of questionable stability, particularly in mountain, canyon, and coastal regions. Significant progress has been made in that geotechnical experts can identify areas vulnerable to land slippage and provide early warnings of landslide hazards and advice on preparedness measures, such as evacuations. Land-use zoning, in partnership with professional inspections and proper design, can alleviate many of the problems associated with landslide hazards. Additional disaster mitigation measures include planting ground cover on slopes, installing flexible pipe fittings to avoid gas or water leaks and building channels, deflection walls to redirect the flow and insurance.

For the future, achievement of a reduction in the tragic consequences of severe landslides and mudflows around the world requires continued emphasis on risk assessment and risk management, utilizing increasing scientific understanding of the factors which lead to landslides to develop and implement policies which will reduce exposure and vulnerability to these hazards.

## AVALANCHES

**Speaker:** Dr. P. Föhn, Swiss Federal Institute for Snow and Avalanche Research, Switzerland

Avalanches are a major hazard in many mountainous countries. They result in substantial loss of life, such as the 75 fatalities recorded in the European Alps during January-February 1999. Avalanche damage can also be very substantial, reaching 1 billion Swiss francs in Switzerland during the past winter, for example. Around the world, vulnerability to avalanches will continue to increase as winter recreational activities and facilities expand in mountainous regions.

Effective long term preventive measures to reduce avalanche vulnerability include hazard mapping, land use planning, development of protective forests and installation of protective structures. Short-term measures include avalanche forecasting, the issue of avalanche warnings, artificial releases of snow masses, road and rail closures and evacuations. Some governments already invest heavily in such avalanche protection measures because of their demonstrated cost effectiveness. Over the past 50 years, for example, about 1.5 billion Swiss francs has been invested in protective structures in Switzerland, in addition to the resources devoted to forecasting, hazard zoning and protective forests.

For the future, implementation of avalanche risk assessment and risk management is fundamental to the achievement of reductions in vulnerability. While this approach already in place in some countries, it needs to be extended to other vulnerable regions. In order to improve its application, needs also exist for continued research into snow pack physical processes, improved avalanche forecast and hazard mapping techniques, better technical and construction measures and enhanced risk management methods.

## TSUNAMIS

**Speaker:** Dr. C. McCreery, Pacific Tsunami Warning Center, USA

Earthquakes, volcanic eruptions or shifts in the sea bottom generate very large, fast-moving waves known as "tsunamis". These huge waves travel at speeds in excess of 1000 km/hr on the open sea but are of such long wavelength as to be barely noticeable. When they reach coastlines and, particularly, bays or inlets, however, they interact with the sea floor, reduce speed and build up to tremendous heights, presenting a major threat to people, animals and structures along the shoreline. Tsunamis have resulted in catastrophic natural disasters and the coastlines around the Pacific Ocean are particularly vulnerable.

Mitigation and preparedness efforts for tsunamis focus on the provision of timely early warnings combined with ongoing public awareness and education programs. The need to enhance mitigation and preparedness, led UNESCO's IOC to establish, in 1968, an International Coordination Group for the Tsunami Warning System In the Pacific. The Pacific Tsunami Warning Centre (PTWC) in Honolulu is the headquarters of the International Tsunami Warning System and works with regional and national centers in monitoring seismological and tidal stations around the Pacific Ocean to evaluate earthquakes for their potential to generate tsunamis. IOC also maintains an International Tsunami Information Center (ITIC) which is responsible for monitoring warning programs, recommending improvements, assisting Member States to establish national warning systems, fostering research and improving preparedness throughout the Pacific Ocean.

The Decade has seen numerous improvements in tsunami mitigation. Numerical modelling techniques have been improved and are now applied to runup mapping for hazard assessment and to forecasting. Historical data bases have been electronically archived and made readily accessible. New techniques have been developed for assessing the tsunamigenic potential of large earthquakes and improved observational instrumentation has been developed and deployed. Rapid telecommunications systems have been installed and educational materials prepared and disseminated.

For the future, progress needs to continue in all of the above areas. New local and regional warning systems should be established in the Pacific and other ocean basins that are without warning coverage. In particular, a more coordinated approach to the provision of warnings would be of benefit in the Mediterranean, the Caribbean and the Atlantic Ocean. Low cost automated techniques need to be developed for warning against local tsunamis and installed in regions at risk. Coastal regions at risk from landslide/submarine slump induced tsunamis need to be identified and strategies devised to help protect their communities. In addition, tsunami education needs to be institutionalized to maintain adequate awareness over the long time periods between destructive events.



## STORM SURGES

**Speaker:** Dr. T.S. Murty, Senior Scientist, Canada

The combination of strong onshore winds, low atmospheric pressure and high astronomical tides can result in exceptionally high water levels known as storm surges. Around the world, storm surges present a major natural hazard in many vulnerable coastal and island regions. Large storm surges, with amplitudes up to several meters, are generated by tropical cyclones and regularly cause great destruction in the Pacific, Atlantic and Indian Oceans, the Bay of Bengal and the Gulf of Mexico. In 1970, a tropical cyclone induced storm surge sweeping over the coastal wetlands resulted in catastrophic damage and the deaths of 300,000 people in Bangladesh while a similar tragedy in 1991 killed over 100,000. Storm surges caused by extra-tropical storms sometimes also result in deaths and in catastrophic damage, as experienced by low-lying countries around the North Sea on a number of occasions during the past several decades. In the future, sea level rise associated with global warming and land subsidence along vulnerable coastlines may increase the amplitude of storm surges and increase vulnerability to them. Concern also exists that a rise in sea surface temperatures may increase the percentage of tropical cyclones which reach coastlines, leading to an increase in the frequency of damaging surges.

Mitigation and preparedness for storm surges involves a combination of measures including risk assessments, vulnerability reducing initiatives, provision of early warnings of impending surge events and evacuation planning to remove people from exposed, low-lying, areas. Efforts to reduce vulnerability encompass structural measures, such as sea walls, barrages and dykes and risk zoning, land use and development planning. The provision of timely early warnings of storm surges combined with solid evacuation plans is, however, critical to disaster reduction in the face of these most dangerous events.

During the Decade, great progress has been made in implementing early warning systems and in timely dissemination of warnings to the public as well as in public awareness and education. This is reflected in the dramatic decline in deaths due to storm surges from thousands each year to a few hundred annually.

For the future, a major challenge for the early warning community is to reduce the number of "false alarms" which cause unnecessary evacuations in the most vulnerable regions. Furthermore, the predicted location and magnitude of surges must be pinpointed with much greater accuracy. Achievement of these improvements will require substantial investment in research directed towards improving the prediction methods. In addition, public awareness and education efforts must continue to be supported as essential components of preparedness and mitigation.

## VOLCANOES

**Speaker:** Mr. S. Malling, UNESCO, On behalf of Dr. R. Punongbayan, Philippines

As dramatically demonstrated by the violent eruptions of Mount St. Helens in 1980, Pinatubo in 1991 and more recent catastrophic events in the Caribbean and elsewhere, volcanoes can wreak great havoc and devastation in the short term. They can also produce serious impacts over the medium and longer term, forcing evacuations, interfering with transport, increasing the acidity of precipitation and cooling global temperatures. Submarine volcanoes are also common features on certain zones of the ocean floor and some are active, occasionally blasting steam and rock-debris above the surface of the sea or generating dangerous tsunami waves.

In the face of these hazards, the challenge to policy makers and scientists is, therefore, to mitigate the adverse impacts of volcanic eruptions so that society may continue to benefit from products of volcanism such as fertile soils, access to geothermal energy and industrial raw materials. Mitigation of the adverse impacts of volcanic eruptions requires that we improve the capability for predicting these events and providing early warnings of potentially disastrous events. It also requires that decision makers and the general public are provided with the best possible information on high-risk volcanoes, to underpin sound decisions on land-use planning and public safety.

Considerable advances have been made in recent decades and scientists have the ability to predict their future behaviour. During the Decade, predictive ability has improved and hardware such as single component disposable seismometers has become more accessible. Capacity has been enhanced in developing countries but further work is needed. In the aviation context, mention must also be made of the ICAO/WMO Volcanic Ash Advisory Centres which now issue forecasts of the trajectories of volcanic plumes as a contribution to flight safety.

For the future, emphasis needs to continue on preventive and preparedness measures which have been initiated but are still embryonic in most developing countries. Similarly, efforts to raise awareness have begun in selected countries and locations but much more work is needed in the years to come.

## TROPICAL CYCLONES

**Speaker:** Dr. G. Holland, Bureau of Meteorology Research Centre, Melbourne, Australia

Tropical cyclones are rightly feared as being amongst the most dangerous of the natural hazards. They are potentially the most destructive of all systems that affect coastal communities in tropical and subtropical countries. Increasing population and development density in such communities will continue to result in increased economic and social disruption from tropical cyclones

Scientific research and technical development have generated remarkable improvements in tropical cyclone forecasting and community response during the IDNDR. Contributing factors include continuing research emphasis on tropical cyclones, increases in computing power and the skill of numerical models, improving observational and communications capability and a growing recognition of the vital importance of public education and community preparedness in the face of these devastating storms.

At the end of the Decade, we have a strong community across all related disciplines, research meteorologists, forecasters and social scientists, applied to the reduction of tropical cyclone impacts. It is imperative that this be expanded and applied to further improving the safety and reducing the economic losses of affected communities.

In this context, the recent establishment of the WWRP is welcomed and their emphasis on high impact weather is strongly endorsed. Their establishment of a tropical cyclone landfall program is seen as a logical vehicle for carrying the research and development initiatives into the 21st century. The WWRP approach of taking research and development programs through to the forecast demonstration stage ensures a strong operational perspective. It is pleasing that the WMO/ICSU development, under the IDNDR, of a pilotless aircraft to improve the observations of tropical cyclones has reached the stage of the aircraft moving to operational use

Provided that the impetus generated during the IDNDR can be maintained, the outlook is optimistic for substantial improvements in tropical cyclone forecast accuracy leading to more accurate and timely early warnings and enhanced preparedness for cyclone landfalls. Serious concern remains that the budgetary pressures being felt by governments may further undercut weather observing networks and forecasting and communications systems which are essential to the realization of these improvements.

## FLOODS

**Speaker:** Dr. T.A. Khan, Bangladesh

Huge economic and social losses result from flooding in river floodplains and coastal regions subject to storm-surges and vulnerability is increasing in parallel with economic development. Floods continue to kill vast numbers of people, particularly in developing countries though the toll has declined significantly due to advances in early warning combined with planned evacuation to safe areas. In the future, climate change may compound the problem through sea-level rise, resulting in regrading of river-beds and more frequent overtopping of banks and levees. It may also enable an increasing percentage of tropical cyclones to reach coastlines, one study suggests an increase of about 30% is likely in the number of tropical cyclones which make landfall.

Substantial progress has been made in preparedness for flooding, issuance of timely early warnings and organized evacuations. Around the world, basin-wide land and water management is increasingly being used to mitigate floods and reduce vulnerability to them. Flood-protection structures provide real benefits but can also increase vulnerability by encouraging unwise developments. During floods, the greatest contribution that governments can make is often, however, to enable people to save their lives by warning them and facilitating their evacuation to safe areas. Consequently, provision of timely early warnings of flood events is a fundamental contribution to preparedness and mitigation and has resulted in saving many lives during the Decade.

For the future, risk assessment remains critically important in mitigating the effects of flooding. There is a need for continuing research and capacity building efforts to improve preparedness and strengthen early warning and other mitigation aspects. Structural measures, land use and planning approaches, forecasting and warning systems, identification or construction of safe havens and public education and awareness initiatives all play vital roles in achieving these objectives. In developing countries, investment is required in capacity building to keep floods away from people and keep people away from floods as well as in the more readily-funded "clean up afterwards" option.



# LIST OF SPEECHES AND PRESENTATIONS AVAILABLE FOR DISTRIBUTION

Speech/Presentation Title	Organization/Institution	Speaker
<b>OPENING CEREMONY</b>		
"Despite dedicated efforts, number and cost of natural disasters continue to rise"	the United Nations	Secretary-General Mr. Kofi Annan
Address	WMO	Secretary-General Prof. G.O.P Obasi
"A Message from the Yokohama Conference to the Programme Forum in Geneva and Beyond to the 21st Century"	Japan	H.E. Ambassador N. Akao Permanent Representative of Japan , President of the Programme Forum
Speech	P.R. China	H.E. Fan Baojun, Vice Chairman and Secretary-General of CNCIDNDR, Vice Minister of Civil Affairs
Message from the President of the Economic and Social Council (ECOSOC)	ECOSOC	H.E. Ambassador Fulci, President of ECOSOC
Speech	French National Committee for IDNDR	Mr Ch. Kert, President and member of the French Parliament
Speech	Costa Rica	H.E. A. Fischel, Vice President of Costa Rica and Chair of the IDNDR Meeting for the Americas
Speech	United Nations Scientific and Technical Committee (STC) on Natural Disaster Reduction	Mr. R. Hamilton, USA, Rapporteur General of the Programme Forum and Chairman of the United Nations STC on Natural Disaster Reduction
<b>COPING STUDIES</b>		
"Public Perception, Economic Aspects and Education Needs, An African Perspective"	Dept. of Civil Engineering, University of Pretoria, South Africa.	Prof. Alexander

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
"Disaster Resilient Infrastructure"	Laboratory of Hydrology and Glaciology of the Swiss Federal Institute of Technology, Zurich, Switzerland	Prof. Dr. H.E.M. Minor
"Technology for Disaster Reduction"	United Nations University (UNU) in cooperation with the International Center for Disaster Mitigation Engineering (INCEDE), University of Tokyo	Prof. S. Herath

## **EDUCATION AND SOCIO-ECONOMIC CONCERNS**

### **EDUCATING FUTURE GENERATIONS**

Educating for the future: The Risk & Society initiative Mode	Canadian National Committee IDNDR	Ms. Kate White
The Power of film-based learning in risk reduction	University of the Western Cape Cape Town	Ms. A. Holloway
Networking for Education for Disaster Reduction - An Indian view	Global Forum of NGO's for Disaster Reduction	Mr. N.K. Jain Director, Joint Assistance Centre, India
L'éducation des générations futures	Ministère de l'environnement, Paris, France	Mr. Jacques Faye

### **CIVIL SOCIETY AND PARTNERSHIPS**

U.S National Report to the IDNDR Programme Forum	California Institute of Technology, California	Prof. W. Iwan
Incentives for Mitigation Investment and More Effective Risk Management. The Need for Public-Private Partnership.	Center for Risk Management and Decision Processes. The Wharton School. University of Pennsylvania, Philadelphia	Prof. Howard Kunreuther
Mitigation as a Public Value (From Relief to Prevention)	USA. Property and Casualty Group	Ms. G. Craven

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
The Critical Role of Private/ Public Alliances to Ensure Community Disaster Preparedness: An International Disaster Recovery Business Alliance	MLC & Associates Incorporated, USA	Ms. M.L. Carrido

#### **ASSESSMENT AND PROJECTION OF SOCIAL AND ECONOMIC IMPACT**

America Latina El Caribe: El Impacto de los Desastres Naturales en el Desarrollo, 1972-1999	Sede Subregional de la CEPAL	Mr. Ricardo Zapata Mar
The Asian Experience: Impacts of Recent Disasters Responses and Bangkok Declaration	Environment and Natural Resources Development Division ESCAP	Mr. C. Ertuna
Socio-Economic Conditions in Africa and Risk Management	Economic Commission for Africa	Mr. Ousmane Laye

#### **EMPOWERMENT OF LOCAL COMMUNITIES**

Transforming Risk into Opportunity: Empowering Vulnerable Communities	La Red, Lima, Peru	Mr. F. Ramirez
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#### **DISASTERS, ECONOMY AND TRADE**

UNCTAD's Mandate on the Impact of Natural Disasters in Tourism	UNCTAD Division on International Trade in Goods and Services and Commodities	Mr. D. Diaz
Disasters, trade and the Economy of Least Developed Countries and Small Island Developing Countries	UNCTAD Office of the Special Coordinator for Least Developed Countries and Land-locked and Island Developing Countries	Mr. P. Encontre



<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
The Effects of Natural Disasters on the Development of Tourism	UNCTAD	Mr. R. Withers
The Impact of Hurricane Mitch in the Central American Tourism Sector	Secretaría de Integración Turística Centroamericana, Nicaragua	Mrs. L. Valenty
The Role of the Media in Directing the Impact on Foreign Markets (A case study of Antigua & Barbuda with specific reference to the UK Source Market)	Antigua and Barbuda Tourist Office	Ms. S. Scotland

#### **HEALTH DIMENSION IN DISASTER REDUCTION**

Health impacts of Bangladesh Floods in 1998	WHO/SEARO	Dr. J. Larusdottir
Health impacts of Kobe earthquake	WHO/WPRO	Dr. S. Asahi
Health impacts of Hurricane Mitch	WHO/AMRO	Dr. R. Saenz

#### **SCIENTIFIC AND TECHNOLOGICAL CONCERNS**

##### **TOWARDS INTEGRATED RISK REDUCTION**

Chile and the International decade for Natural Disasters Reduction (A successful experience)	ONEMI Ministry of Interior, Government of Chile	Dr. A. Maturana
China Disaster Reduction Plan and Integrated Disaster Reduction	Center for Disaster Reduction China Academy of Sciences	Prof. Wang Ang-sheng
Stratégie de réduction des risques d'inondation en Loire moyenne (A Flood Control Strategy in the Loire River Middle Reaches)	Equipe Pluridisciplinaire du Plan de Loire Etat (EPALA), Orléans France	Mr. N-G Camp'huis

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
Vulnerability Reduction through Urban Development Planning	Secretariat of Housing and Urban Development In conjunction with the Directorate of Civil Protection, Government of Mexico City of Mexico City	Mr. L. Preciado Barragan

### **INFORMATION TECHNOLOGY FOR ASSESSMENT AND SIMULATION CAPACITIES**

Science Technology and Disaster Reduction	Japan National Committee for IDNDR	Mr. J. Kondo
Early Estimation System for Earthquake Disasters (EES)	Disaster Prevention Bureau, National Land Agency, Japan	Mr. K. Mochizuki
“If the banks of Yodogawa River Broke Today” Flood Inundation Simulation (Predicted Underground Facility Damages)	Disaster Management Division, River Bureau, Ministry of Construction, Japan	Mr. R. Kojiroi
“Forest and Steppe Fire Monitoring in Mongolia Using Satellite Remote Sensing”	Ministry of Nature and the Environment Mongolia, International Cooperation Department	Mr. N. Erdenesaikhan
Development of Pictogram System for Natural Disaster Reduction through Internet	Kyoto University, Japan	Dr. H. Hayashi
Information Technology and Disaster Management: Issues for the Next Decade	Emergency Management Australia	Mr. A. Hodges

### **SAFE HUMAN SETTLEMENTS IN DISASTER-PRONE AREAS**

Safe Human Settlements in Disaster Prone Countries	UNCHS (Habitat) Geneva Office	Mr. L. Ludvigsen
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<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
The Resettlement and Rehabilitation after Flood 1998 in China	Institute of Geography, Chinese Academy of Sciences, Beijing, China	Dr. Yang Qinye
- International Decade for Natural Disasters Reduction: The Yokohama Message - Vulnerability of Housing in India. - Natural Disasters. Prevention in India	University of Roorkee, India	Prof. A. Arya

#### **EARLY WARNING SYSTEMS: AN INTEGRATED PROCESS**

The Role of Meteorological and Hydrological Warning Systems in an Integrated Approach to Disaster Management	WMO/National Meteorological Service, Melbourne, Australia	Dr. J. W. Zillman
Forecasts and Warnings	Department of Civil Engineering, University of Portsmouth, United Kingdom	Prof. B. Lee
"Field Level and Local Realities and the Effective Applications of Early Warning Guiding Principles of Effective Early Warning"	Effective Applications of Early Warning Asian Disaster Preparedness Center (ADPC)	Mr. K. Kishore
Early Warning Programme. Action Plan for the Future	Center for Public Service Communications Washington D.C. USA	Mr. J.C. Scott

#### **URBAN MEGA DISASTERS**

Reconstruction from the Great Hanshin-Awaji Earthquake	Secretariat of the Headquarters for Reconstruction of Hanshin-Awaji Area, Japan	Mr. K. Nakashima
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<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
Managing Earthquake Damage Scenarios and Volcanic Alerts in Quito, Ecuador	Geophysics Institute, Quito, Ecuador	Dr. H. Yepes
Disaster Reduction in Asian Cities - The Experience of the Asian Disaster Preparedness Center (ADPC)	Asian Disaster Preparedness Center (ADPC), Bangkok, Thailand	Mr. D. Hollister
Preparedness and Mitigation of Urban Earthquake Disaster in China	China Seismological Bureau	Dr. Y. He
Bandung Initiatives in Risk Mitigation	Institute Technology Bandung (ITB), Indonesia	Dr. K. Pribadi

#### **APPLYING TECHNOLOGY FOR SHARING INFORMATION**

China Disaster Reduction Plan and Integrated Disaster Reduction	Ministry of Civil Affairs	Prof. Wang Ang-Sheng
CRID Experience in Latin America	IDNDR Office in Costa Rica	Ms. H. Molin-Valdes
Advances in Disaster Information Delivery and Hazard Awareness	United States Geological Survey (USGS) USA	Mr. J. Devine and Mrs. E. Padovani

#### **TOWARDS EARTHQUAKE SAFE CITIES: HOW TO REDUCE EARTHQUAKE DAMAGES**

International Cooperation in Disaster Mitigation: an Earthquake Engineer's Review on IDNDR	National Research Institute for Earthquake Prediction Science and Technology Agency, Japan	Dr. T. Katayama
Nepal's Experience with Earthquake Risk Management	Ministry of Science and Technology, Nepal	Mr. M. B. Karki
The Radius Initiative: A Practical Approach to Reduce Urban Seismic Risk	IDNDR Secretariat	Mr. K. Okazaki

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
The Radius case study in Tijuana, Mexico	Tijuana Municipality, Mexico	Lic. J. M. Gastelum
Seismic Risk Assessment and Management in Urban Areas: The Addis Ababa (RADIUS Case Study) Example	Centre National de Recherche Appliquée	Dr. M. Belazougui
Panel Discussion on Radius		Dr. R. Shaw

#### **GEOLOGICAL HAZARD ASSESSMENT- HOW SCIENCE TRIES TO STOP HAZARDS FROM BECOMING DISASTERS**

From Seismic Hazard to Seismic Risk CSHAP	Geophysical Institute ETH Zurich	Prof. D. Giardini
Mountain Hazards: Tools for Risk Management	Geography Institute, University Bern, Switzerland	Prof. H. Kienholz
Countermeasures Against Volcanic Disaster on Mt. Uzen-Fugendake	Sabo Technical Center, Japan	Mr. K. Hoshina

#### **DEVELOPMENT AND ENVIRONMENTAL CONCERNS**

##### **DISASTER REDUCTION WITHIN DEVELOPMENT - DISASTER REDUCTION AND RECOVERY FOR SUSTAINABLE HUMAN DEVELOPMENT**

Disaster Reduction and Recovery for Sustainable Human Development	Emergency Response Division, UNDP	Mr. O. Baknet
The Impact of Disasters on Development Gains	Latin American Social Science Faculty (FLACSO) and The Network for the Social Study of Disaster Prevention in Latin America - LA RED	Mr. A. Lavell
Vulnerability Matters	Disaster Mitigation Institute (DMI), Ahmedabad, India	Mr. Mihir R. Bhatt
Sustainability of Disaster Management in South Asia: The Approach of the	Urban Redevelopment, World Bank	Dr. J. Pantelic

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
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World Bank

#### **LAND-USE PLANNING**

Land-Use Planning in Mountain Areas (Risques naturels en montagne et aménagement du territoire)

Pôle Grenoblois d'Etudes et de Recherches pour la Prévention des Risques Naturels, Conférence sur les risques naturels en Montagne, France

Mr. F. Gillet

Impact of Urban Risks in Environmental Safety

Centro Europeu de Riscos Urbanos (CERU), Portugal

Mr. Luis A. Mendes Victor

El ordenamiento del uso del suelo en la mitigación: la experiencia Argentina

Ministry of Interior Argentina

Mr. Eduardo J. Fernandez

Conclusions from the Paris Conference

Ministry of Environment, France

Mr. P. Douard

#### **CAPACITING DEVELOPING COUNTRIES - LIVELIHOOD SUSTAINABILITY AND RISK: CHALLENGES FOR DEVELOPING COUNTRIES**

Capacity Building in Government: Overview and Evolution of Disaster Management Policies in South Africa

South Africa Government

Ms. Janet Love

Capacity Building by Way of Outreach Programs Through Household Food Security, Nutrition and Health Monitoring. The Case of Zambia

Ms. Joyce Kanyangwa-Luma

La Lección de El Niño 97-98

INAMHI

Mr. Nelson Salazar

#### **PROTECTION OF NATURAL RESOURCES**

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
Protection of Natural Resources	Conservation Union	
Burning Issues: Managing Forest Fires in Indonesia	IUCN World Commission on Protected Areas. Southeast Asia	Mr. A. Sumardja

#### **VULNERABILITY OF ECOSYSTEMS AND NATURAL DISASTERS**

Natural Disaster Prevention: Mountain Ecosystems in the Republic of Kazakhstan - a Decade of Achievements	Emergency Agency of the Republic of Kazakhstan	Mr. S. Kulmakhanov
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#### **CLIMATE CHANGE AND NATURAL HAZARDS - EXPERIENCE IN AND FROM SWITZERLAND**

"Efforts made in Switzerland during the IDNDR": Guidelines and Strategies for Natural Hazards Assessment	PLANAT	Mr. A. Götz
Natural Disasters and Response	Geo7, Bern Switzerland	Dr. M. Zimmermann
International Cooperation and Transfer of Knowledge	Observatorio Vulcanologico, Passo, Colombia	Dr. Bruno Martinelli

#### **SUCCESS STORIES**

Japan: The Establishment of the Asian Disaster Reduction Center (ADRC) - Disaster Reduction Cooperation through	ADRC	Mr. Y. Ogawa
Information Sharing	ADRC	Mr. M. Murata
Bangladesh: Cyclone Preparedness Programme (CPP)	Government of Bangladesh Disaster Management Bureau	Lt. Col. Mohammad Haris
Zimbabwe: Public Awareness Campaigns on Seasonal Hazards	Department of Civil Protection, Zimbabwe	Ms. S. Ndlovu

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
Cuba: Achievements of IDNDR National Committee of Cuba (Logros del Comité Nacional de Cuba para la Reducción de los Desastres Naturales)	Civil Protection, Development Division, Cuba	Mr. A. Castelanos Perez
Morocco: Moroccan National Seismic Network	National Research Centre, Morocco	Prof. A. El Mouraouah
Communication sur la gestion d'un cas de catastrophe par la collectivité locale	Direction Nationale de la Conservation de la Nature, Bamako, Mali	Mr. G. Konate
Armenia: Armenian National Survey for Seismic Protection	National Survey for Seismic Protection under the Government of the Republic of Armenia	Prof., Dr. S. Balassanian

#### **OPEN PUBLIC FORUM**

#### **COMMUNITY BASED DISASTER REDUCTION**

Strengthening local disaster preparedness structures. Report about two cooperation projects between local units of civil protection from Morocco and Germany Uzbekistan/Kyrgyzstan and Germany/Netherlands	German IDNDR Committee	Christian Eikenberg
Role of NGO's in Disaster Reduction GFNDR India	GFNDR	N. K. Jain
Community based Disaster Preparedness Programmes in the International Federation of Red Cross and Red Crescent Societies	IFRC Disaster Preparedness Department	Ms. A. Galperin



<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
<b>NETWORKS AND PARTNERSHIPS</b>		
IDNDR Audit of UK Assets (pending finalization)	UK IDNDR Working Group	Mr. Ian Davis
Breve Descripci3n de mi Ponencia	LaRed	Mr. Enrique Picado
Earthquake Public Education in Iran	Public Education Department, International Institute of Earthquake Engineering and Seismology (IIEES), Iran	Mr. F. Parsizadeh
<b>EARLY WARNING</b>		
Integration of Warning and Forecasting Services	Czech Hydro meteorological Institute, Prague, Czech Republic	Dr. I. Obrusnik
Early Warning for flash floods in France: recent advances	Météo France	Mr. F. Helloco
1998 Floods Disaster and Actions in China	Institute of resources Science, Beijing Normal University	Prof. Shi Peijun
<b>INTEGRATED RISK MANAGEMENT</b>		
La Protection des ressources naturelles en Côte d'Ivoire	Gouvernement de Côte d'Ivoire	Mr. B. Koffi
Teaching Seismic Protection Skills at School of Armenia	Northern Department of the National Survey for Seismic Protection. Gyumri, Armenia	Dr. A. Mikayelyan
Extreme Weather Events due to Climatic Changes in Sri Lanka	Team for Disaster Prevention and Sustainable Development, Sri Lanka	Mr. P. Patabendi

<b>Speech/Presentation Title</b>	<b>Organization/Institution</b>	<b>Speaker</b>
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**ACTION TOWARDS THE 21ST CENTURY**

**REGIONAL APPROACHES TO DISASTER REDUCTION - NETWORKING, SYNERGIES AND COORDINATION**

The Economic and Social Aspects of Disaster Reduction in Asia: the Bangkok Declaration	Thailand	H.E. Krit Garnjana-Goonchorn
Seismic Risk Reduction Strategy in the XXI Century	National Survey for Seismic Protection, RA	Prof., Dr. S. Balassanian
La integración de los análisis de riesgos en las políticas de ordenación del territorio y de los usos del suelo	Ministerio del Interior. Espana	Prof. D. Juan San Nicolàs
Handling Natural Disaster Center of Technology: The WBGU Approach to Risk	Evaluation and Management Assessment in Baden-Wuerttemberg, Stuttgart, Germany	Ortwin Renn & Andrea Klinke

**CLIMATIC VARIABILITIES AND EXTREMES: EL NINO, LA NINA**

Seven El Nino Traps People Ought to know about	Environmental and Social Impacts Group	Mr. M. Glantz
The UN Inter-Agency Task Force achievements on El Nino (Cooperacion internacional para reducir el impacto del fenomeno el Nino)	Division of External Affairs, Foreign Ministry, Quito, Ecuador	Mr. F. Paliz

**DISASTERS OF THE FUTURE**

Disaster Loss Reduction through United Nations Conventions and Agreements	STC	Mr. J. Bruce
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**Speech/Presentation Title      Organization/Institution      Speaker**

**PROGRAMME FOR THE FUTURE**

General Conclusions of the IDNDR International Programme Forum 1999 Strategy for a Safer World in the 21st Century Disaster and Risk Reduction	Rapporteur General for the IDNDR Programme Forum	Mr. R. Hamilton
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**PRESENTATION OF THE CONFERENCE STATEMENT**

The Geneva Mandate on Disaster Reduction	IDNDR Programme Forum	
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**WMO/UNESCO SUB-FORUM ON SCIENCE AND TECHNOLOGY**

WMO Statement and Annexes

# LIST OF PROJECTS PRESENTED AT THE POSTER SESSIONS

1. **Project title:** Vulnerability Atlas of India  
**Organization(s)/Institution(s):** University of Roorkee; Building Materials and Technology Promotion Council  
**Country:** India
2. **Project title:** Climate Change and Natural Hazards - Message from Switzerland  
**Organization(s)/Institution(s):** PLANAT, DEZA,SKH, CENAT, CERG, NFP31, PROCLIM, OCCO, PLANAT  
**Country:** Switzerland
3. **Project title:** Natural Disaster Management - Book Commemorating the Achievements of IDNDR  
**Organization(s)/Institution(s):** Natural Disaster Management (NDM)
4. **Project title:** IAVCEI IDNDR - Réduction des risques volcaniques - Programme de la Décennie  
**Organization(s)/Institution(s):** European Volcanological Society
5. **Project title:** Disaster Reduction  
**Organization(s)/Institution(s):** German IDNDR Committee  
**Country:** Germany
6. **Project title:** Earthquake disaster risk reduction management  
**Organization(s)/Institution(s):** Ministry of Science and Technology  
**Country:** Nepal
7. **Project title:** The Programme of A Global Eco Reform  
**Organization(s)/Institution(s):** Russian National Committee for IDNDR  
**Country:** Russian Federation
8. **Project title:** Disaster Mitigation - Duryog Nivaran - South Asia  
**Organization(s)/Institution(s):** Intermediate Technology Development Groups (ITDG)  
**Country:** Sri Lanka
9. **Project title:** Australia's IDNDR Programme 1990-2000  
**Organization(s)/Institution(s):** Australian IDNDR Coordination Committee  
**Country:** Australia
10. **Project title:** Sistema Nacional de Protección Civil - Mexico  
**Organization(s)/Institution(s):** Centro Nacional de Prevención de Desastres (CENAPRED)  
**Country:** Mexico
11. **Project title:** Réduction du Risque Sismique au Maroc  
**Organization(s)/Institution(s):** Centre National de Coordination et de Planification de la Recherche Scientifique et Technique  
**Country:** Morocco

12. **Project title:** Disaster Mitigation for Sustainable Livelihoods Project  
**Organization(s)/Institution(s):** Disaster Mitigation for Sustainable Livelihoods - University of Cape Town  
**Country:** Cape Town, South Africa
13. **Project title:** Global Fires and other wildfires reports. Identification of the global environmental Early Warning Systems  
**Organization(s)/Institution(s):** GRID, UNEP
14. **Project title:** Natural Hazards and Disasters of North America  
**Organization(s)/Institution(s):** United States Geological Survey (USGS), Emergency Preparedness Canada (EPC), Centro Nacional de Prevencion de Desastres (CENAPRED)  
**Countries:** United States/Canada/Mexico
15. **Project title:** Japanese contributions to IDNDR  
**Organization(s)/Institution(s):** National Committee for IDNDR  
**Country:** Japan
16. **Project title:** RADIUS (Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters)  
**Organization(s)/Institution(s):** IDNDR RADIUS Project
17. **Project title:** Global Earthquake Monitoring  
**Organization(s)/Institution(s):** International Seismological Centre (ISC)  
**Country:** United Kingdom
18. **Project title:** Disaster Management Activities in Ethiopia  
**Organization(s)/Institution(s):** Policy Plan, Programme Department (DPPC), Disaster Prevention Commission, Addis Ababa  
**Country:** Ethiopia
19. **Project title:** Disaster management excellence in the Asia and Pacific regions since 1986  
**Organization(s)/Institution(s):** Asian Disaster Preparedness Center (ADPC)
20. **Project title:** Chinese National Committee for IDNDR (CNCIDNDR)  
**Organization(s)/Institution(s):** Chinese National Committee for IDNDR (CNCIDNDR)  
**Country:** China





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