



# EWC III

## Third International Conference on Early Warning

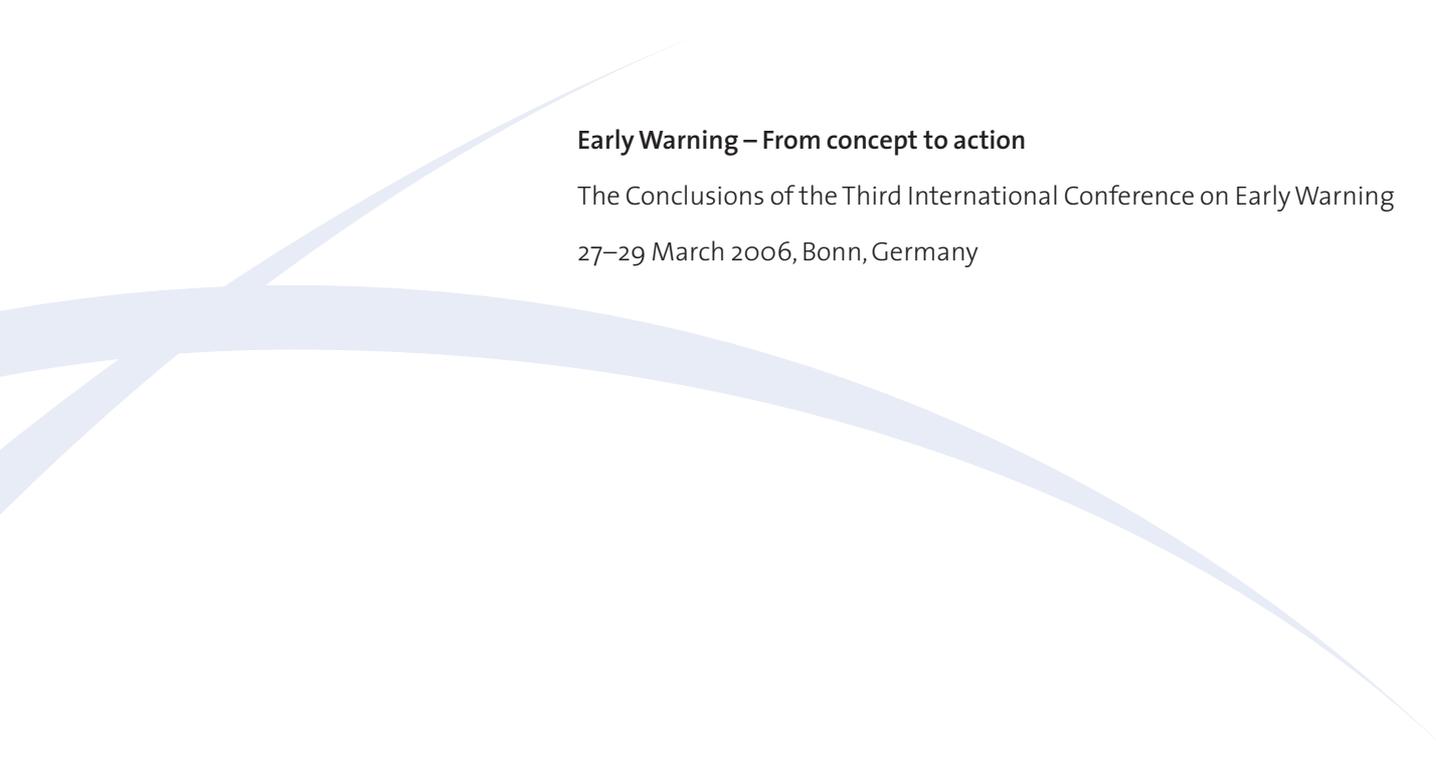
*From concept to action*

27–29 March 2006  
Bonn, Germany



# Early Warning – From concept to action

The Conclusions of the  
Third International Conference on Early Warning



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## Foreword

by Dr. Frank-Walter Steinmeier

We are all familiar with the horrific pictures of the major disasters of recent years. We are all aware that natural disasters can happen everywhere and cause death and destruction. Many people even now still feel powerless and afraid, and ask, “how can we protect ourselves?”

This unsolved problem prompted the Federal Government to host the Third International Conference on Early Warning. Over 1,300 participants from 132 countries and representatives of numerous organizations met under the auspices of the United Nations in Bonn from 27 to 29 March 2006. This response shows how important this issue is. Only together can we successfully meet the huge challenges.

At this conference scientists, experts and practitioners of early warning drew up a checklist to identify weak points in disaster early warning. With the help of this checklist existing early-warning systems can be examined and new ones made sustainable.

With the second result we are complying with the request made by Kofi Annan shortly after the 2004 tsunami disaster. In future we will, thanks to the *Compendium of Early Warning Projects*, be able to close possible gaps in existing early-warning procedures. This compendium was based on the experiences gained from over 100 projects. The Platform for the Promotion of Early Warning (PPEW) in Bonn will constantly update this list.

Whenever we succeed in preventing a natural event from turning into a disaster, we spare countless people unimaginable suffering. This conference represented a major step on the road from the culture of reaction, often practiced up to now, towards a culture of prevention.

I want to thank all those involved, without whose help this major success could not have been possible. Let me single out the Secretariat of the UN’s International Strategy for Disaster Reduction (ISDR) based in Geneva. Finally, I would like to express my gratitude to the organizers and the citizens of Bonn for their generous and cosmopolitan hospitality.



A handwritten signature in black ink that reads "Steinmeier".

Dr. Frank-Walter Steinmeier  
Federal Minister for Foreign Affairs  
Berlin, March 2006

by Jan Egeland



The Third International Conference on Early Warning was announced in the aftermath of the devastating tsunami that struck the Indian Ocean region on 26 December 2004. Building on the commitments made at the second conference in 2003, the German Government proposed a third conference in March 2006 to underscore the urgent need to develop early warning systems worldwide.

The German Government’s initiative was welcomed by the United Nations as an important step in translating early warning concepts into practical actions that ultimately can save lives and reduce the catastrophic effects of natural hazards.

Conference delegates were presented with key recommendations from the *Global Survey of Early Warning Systems*, a report requested by Secretary-General Kofi Annan in the aftermath of the tsunami disaster. This *Global Survey*, undertaken by the ISDR secretariat and its key partners, stressed the importance of filling gaps and improving early warning capabilities worldwide, with a focus on people-centred systems.

Mankind will never be able to master natural hazards – they will continue to strike, as we have seen in recent years, despite the increased sophistication of technological means. But by being better prepared and by devising realistic and practical early warning mechanisms for all communities, we will decrease the risk of hazards turning into disasters. At the end of the day, this is our common goal: making the world a safer place for all people in all regions.

A handwritten signature in black ink that reads "Jan Egeland".

Jan Egeland  
Under-Secretary General for Humanitarian Affairs, United Nations  
New York, March 2006

## Conference Overview

Early warning is a major element of disaster risk reduction. It helps prevent loss of life and reduces the potential economic impact of disasters. To be effective, early warning systems need to actively involve the communities at risk, facilitate public education and awareness; communicate and disseminate warnings and messages, and ensure there is a constant state of preparedness.

The Third International Conference on Early Warning (EWC III) was organized and held in Bonn, Germany, from 27–29 March 2006 under the auspices of the United Nations. The major objectives of the conference were to showcase innovative early warning projects for potential financial support and implementation; to identify unused potential in early warning; and to facilitate

multi-disciplinary scientific debate on latest practices and research.

The conference centred around the theme “from concept to action” and was an initiative of the German Government in response to the devastating Indian Ocean Tsunami in December 2004. It builds on two previous early warning conferences: the first Early Warning Conference (EWC’98) held in Potsdam, Germany in 1998, which focused on state of the art knowledge of early warning systems, and the Second International Conference on Early Warning (EWC II) held in Bonn, Germany in 2003, which concentrated on integrating early warning into relevant public policy.

EWC III adopted a unique format which involved two parallel streams

tackling the same issues from different perspectives. The presentation of early warning projects and debate of key policy themes during the *Priorities and Projects Forum* was complemented by discussion of the scientific elements of early warning during the *Scientific and Technical Symposium*. No other forum has brought together so many stakeholders from such a wide range of early warning backgrounds from around the world.

To facilitate the funding, design and implementation of concrete people-centred early warning systems, as well as to provide good examples of projects for presentation at the conference, a call for proposals was initiated by the conference organizers. The guidelines for the submission of proposals stressed the need for projects to consider all four elements of effective early warning systems – the assessment of risk, the technical warning service, the communication needs, and the preparedness of those at risk.

Project proposals were subjected to a quality control process managed by the UN/ISDR Platform for the Promotion of Early Warning (PPEW), which included an initial screening process to ensure that proposals met the basic requirements of relevance and completeness, followed by a comprehensive review and assessment of the proposal against the submission guidelines, by two or more expert reviewers.

In total, more than 100 proposals were accepted and entered into both the *Compendium of Early Warning Projects* and a web-accessible database containing detailed information on each project. Donors and those involved in the early warning community have been encouraged to make use of this valuable resource.

To further help turn more projects into reality the PPEW will continue to follow-up with project submitters on the progress and funding of their proposals, maintain the projects database and promote the projects with donors during 2006.

The discussion in the *Priorities and Projects Forum* was stimulated by the presentation of proposed early warning projects on the key themes of hazards of the earth, water and air. Professional moderators encouraged open dialogue amongst conference participants on issues ranging from technical monitoring systems through to international and regional cooperation on early warning and the challenges and benefits of multi-hazard early warning systems.

Acknowledging early warning as a complex and multi-faceted concept, the thematic structure of the *Scientific and Technical Symposium* facilitated cross-fertilization between various disciplines and sectors involved in early warning. The participation of a diverse range of stakeholders demonstrated that early



Foyer and exhibition area (Photo: DKKV / M. Malsch)

warning has to be carried out by all parts of society. The key themes discussed during the symposium were multi-hazard early warning; mega-events; and people, politics and economics.

The presentations for each of the thematic sessions were selected through a review process undertaken by an international board of experts. The latitude and diversity of the presented issues underlined that the hazard and risk landscape is dynamic: new risks are emerging and other risks become more or less of a priority. Early warning, as well as disaster risk management, must take those dynamic changes into account. Multi-hazard approaches in early warning were considered very promising with respect to efficiency and synergy. Lively discussions also arose around the issue of public participation, the importance of reaching the recipients of the warning messages, and the underlying legal and policy frameworks for early warning from the regional to the local level.

On the one hand the scientific and technical symposium offered scientists a platform for exchange and discussion on the state of the

art of early warning systems. But on the other, it was highly relevant for policy makers as it provided important information on future trends and new risks so that policies can be future oriented, longer-lasting and more effective. It was also very important that representatives of the civil society could voice their comments and concerns on the presented scientific issues and approaches in early warning.

Five workshops, covering topical early warning issues, were also open to conference participants:

- Wildland Fire
- African Centre for Early Warning and Disaster Reduction in the Indian Ocean (AfrEDI)
- Education and Knowledge: Protecting Schools and Promoting Disaster Risk Awareness to Save Lives
- Tsunami Early Warning Strengthening Project in the Indian Ocean: Partnerships for Building Resilience
- Risk Management of Extreme Floods



President William J. Clinton and Dr. Frank-Walter Steinmeier (Photo: Agentur Reuters/A. Grimm)



Conference Opening in the Plenary Chamber  
(Photo: DKKV/M. Malsch)

Two key outcome documents were presented at the conference:

1. **Developing Early Warning Systems: A Checklist** was developed as part of the conference process and aims to be a simple list of key elements and actions to assist governments and communities implement more effective early warning systems. The checklist was prepared by the secretariat of EWC III, with the assistance of the United Nations international system and other key stakeholders, ahead of time, and was refined to reflect the key issues, concerns and practical tips raised by conference participants.

During 2006 the checklist will be translated into a wide range of languages and distributed throughout the world as a key tool to help facilitate the development of people-centred early warning systems.

2. **Compendium of Early Warning Projects** and its associated on-line

database resulted from a call for project proposals and the project-oriented approach chosen for the conference. The compendium contains over one hundred individual projects focused on early warning and represents a diverse array of initiatives, expertise and capacity to develop early warning systems which can save lives and protect livelihoods around the world.

The compendium was circulated to all conference participants to promote interest in new early warning projects and to encourage donors to fund individual projects.

The conference also welcomed the **Global Survey of Early Warning Systems**, requested by the Secretary-General of the United Nations, and encouraged participants to act upon its recommendations. The survey presents an assessment of capacities, gaps and opportunities towards building a comprehensive global early warning system for all natural hazards.

While it is clear there is still a long way to go and many gaps to fill, the discussions, debate and openness encouraged during the conference allowed all participants to share knowledge, good practices and ideas that will help progress the common goal of implementing effective, people-centred early warning systems into the future.



Dr. Frank-Walter Steinmeier and Jan Egeland  
(Photo: DKKV/M. Malsch)



UN Special Envoy for Tsunami Recovery, President William J. Clinton addresses the Plenary of the Third International Conference on Early Warning  
(Photo: DKKV/M. Malsch)

*“Early warning systems are the key to effective risk reduction.*

*They do save lives and livelihoods (and) in the world we live in, with so much division between rich and poor, they also save an enormous amount of investment for the donor countries who will be called upon to help when people die from such disasters. (...)*

*We know that the most effective early warning takes more than scientifically advanced monitoring systems. All the sophisticated technology won't matter if we don't reach communities and people. Satellites, buoys, data networks will make us safer, but we must invest in the training, the institution building, the awareness raising on the ground. If we want effective global early warning systems, we must work together, government to government, federal and local officials, scientists with policy makers, legislators with teachers and community leaders.”*

Excerpt from the United Nations  
Special Envoy for Tsunami Recovery,  
President William J. Clinton's  
statement at EWC III, on 27 March 2006

# Final Statement

## Third International Conference on Early Warning (EWC III)

Guided by the motto “from concept to action”, the Third International Conference on Early Warning (EWC III) took place in Bonn, Germany, from 27 to 29 March under the auspices of the United Nations. It convened more than 1,250 participants active in the field of early warning from 132 countries, including ministers, senior government officials, as well as representatives of international organizations, experts, and members of civil society.

Building on the two previous international early warning conferences in 1998 and 2003, the conference was an initiative of the German Government to respond to the devastating effects of the Indian Ocean tsunami in December 2004 and in the recognition that had an effective early warning system been in place, many lives would have been saved. Through its outcomes, the conference contributed to the translation into concrete measures of the “Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters” adopted at the World Conference on Disaster Reduction in January 2005 in Kobe, Japan.

The conference was opened by Dr. Frank-Walter Steinmeier, German Federal Minister for Foreign Affairs, and Mr. Jan Egeland, United Nations Under-Secretary-General for Humanitarian Affairs. Ms. Katherine Sierra, Vice President of the World

Bank, delivered a keynote address. The UN Special Envoy for Tsunami Recovery, President William J. Clinton, addressed the conference as a special guest. The Secretary-General of the World Meteorological Organization, Mr. Michel Jarraud, opened the Scientific and Technical Symposium. The Mayors’ Conference convened in Bonn on 26 March delivered a message to EWC III.

The conference’s two parallel streams complemented each other:

- The *Priorities and Projects Forum* was an interactive discussion, stimulated by moderators, on early warning projects in the three clusters of air, earth and water selected to illustrate best practices and experience.
- The *Scientific and Technical Symposium* showcased, through illustrative presentations, state of the art knowledge on multi-hazard approaches, mega-events and the socio-economic components of early warning.

A round table was held in the margins of the conference in the presence of President Clinton for delegates from the region affected by the Indian Ocean tsunami, donors and international organizations. They discussed the current status of the Indian Ocean tsunami early warning system and steps needed to fully establish it over the next year.

The conference and its preparations resulted in the following documents:

- A *Compendium of Early Warning Projects* consisting of project proposals from all parts of the world, reviewed by experts.
- A tool for practitioners entitled *Developing Early Warning Systems: A Checklist*.

Through presentations, discussions and inputs at the forum, in the symposium, and in the workshops, the participants:

- Reiterated that effective early warning systems must be an integral part of disaster risk reduction strategies in national development frameworks and requires cooperation amongst many actors. Emphasis was placed on the important role of local communities, of increased regional cooperation, as well as of training, education and awareness-raising;
- Welcomed the *Global Survey of Early Warning Systems* requested by the UN Secretary-General and encouraged all partners to act upon its recommendations;
- Welcomed the *Compendium of Early Warning Projects* as a catalogue of valuable projects to be promoted by the International Strategy for Disaster Reduction system (ISDR) and invited potential donors to support their implementation;

presented by Hans-Joachim Daerr, Director General of Global Affairs, Federal Foreign Office, Germany



Third International Conference on Early Warning in Bonn, hosted by Germany under the auspices of the United Nations (Photo: DKKV/M. Malsch)

- Acknowledged existing support provided to early warning and called for additional financial resources in this area, recognizing the cost-effectiveness of investing in disaster risk reduction;
- Encouraged national governments, local communities and agencies to utilise the Early Warning Checklist when developing and evaluating their early warning systems;
- Underlined the need for further scientific research to better address early warnings and future

- risks, developing multi-hazard approaches, with a special focus on people at risk, their vulnerability and their socio-cultural context;
- Recognized the need to further mobilize political commitment, to expand the dialogue on early warning and to fill identified gaps in early warning capacities, and therefore encouraged the strengthening of the International Early Warning Programme (IEWP) and its Platform for the Promotion of Early Warning, as part of the reformed ISDR system and to fa-

- cilitate the implementation of the Hyogo Framework for Action; and
- Encouraged the wide dissemination of the outcomes of the conference.

Finally, participants expressed their sincere gratitude to the Government of Germany, to the German National Platform for Disaster Reduction (DKKV) and the ISDR secretariat for organizing the conference, and thanked the City of Bonn for their warm welcome.

Bonn, 29 March 2006

## Summary of the Priorities and Projects Forum

The Priorities and Projects Forum of the conference centred around the presentation of fourteen new and innovative early warning projects covering a wide range of natural hazards and geographical regions. Each project was chosen for its illustrative value in terms of early warning and served as a starting point to stimulate a rich and wide exchange of views on the technical, social and environmental aspects of early warning.

Professional moderators facilitated discussion and debate during the three conference sessions, earth, water and air, on a series of pre-identified themes relevant to early warning. Key issues and comments raised have been summarized below under the most appropriate session and sorted according to the key elements of early warning (risk knowledge, monitoring and warning services, dissemination and communication, and response capability) or identified as an overarching issue.

### Hazards of the Earth Session

Projects presented during the Hazards of Earth session focused on hazards associated with shaking, blasting and sliding. Various geological hazards were discussed, and how communities can be ready and resilient to them.

Five projects, chosen for their illustrative value were presented from Asia, Central Asia and Latin America and highlighted problems encountered and solutions offered in relation to earthquakes, landslides and volcanic activity.

### Issues Identified on Risk Knowledge

During the conference key points raised by participants in relation to risk knowledge, such as the systematic collection of data and the processes of undertaking risk assessments, included:

- The importance of undertaking hazard mapping and risk assessment with the involvement of the community. This is critical to help raise awareness and knowledge, maintain momentum on disaster risk reduction, and to improve relationships between local and national organizations.

- Incorporating local and traditional experience and knowledge into early warning systems, especially in relation to hazard and vulnerability assessment.
- Improving access to reliable data, information and technology. Regional repositories and more co-ordinated arrangements could assist in transferring knowledge between developed and developing countries.
- More effort is required to help close the gap between scientific information and knowledge, and how this can best be used to help people and local communities.

### Hazards of the Water Session

The Hazards of the Water session highlighted early warning projects that addressed natural hazards that involve either too much water, such the result of a flood or tsunami, or too little, due to the impact of climate risks and changes such as drought. Being prepared and developing early warning systems can help to significantly minimize the impact of these hazards on people's lives and livelihoods. Projects from West Africa, Europe, Asia and the Caribbean were presented that highlighted problems in relation to managing natural hazards and disasters and offered innovative solutions in relation to floods, tsunamis and climate risks.

### Issues Raised on Monitoring and Warning Services

Reliable monitoring and warning services lie at the core of effective early warning systems. Conference participants noted that some improvements could be made in this area:

- Technical monitoring and warning systems must account for the needs of recipients, include local knowledge, and be coupled with effective communication systems to ensure warnings are understood and acted upon.



*IKONOS satellite images of Banda Aceh, Indonesia (Scale: 1:10,000)*

*Left: Pre-disaster image, January 10, 2003; Right: Post-disaster image, December 29, 2004*

*(Photo: Satellite images: CRISP, Space Imaging; Mapping: DLR)*





Moderator of the Hazards of Water Session: Mishal Husain (Photo: DKKV/U. Grabowski)



Overarching Issue of the Hazards of the Air Session by Eunice Mucache (Photo: DKKV/U. Grabowski)

## Hazards of the Air Session

The impact of natural Hazards of the Air such as cyclones, sand and dust storms, locust plagues, and severe storms affect the lives of millions of people around the world each year. The session on hazards of the air provided an opportunity to learn how to live with these phenomena and help communities be ready and prepared through the implementation and maintenance of early warning systems.

Four projects were presented from Asia, the Pacific and Western Africa that illustrated problems in relation to natural hazards and disasters and how best to prepare, and hopefully avoid some of the consequences.

### Issues Raised on Response Capability

Communities must understand their risks and warning messages must contain clear useful information to enable proper responses. Key issues include:

- Building local and national capacities through involving and empowering people.

Left: Merapi after the July 1998 eruption (Photo: Institute of Geophysics and Meteorology, University of Cologne)  
Right: Hurricane Katrina regional imagery, 2005 (Photo: NOAA)

- Better education of local people and communities regarding warning and forecasting systems is required.
- There is a need to better interconnect existing monitoring and forecasting systems to develop an efficient global early warning system.
- It is important to identify ways in which technical specialists and scientists can interact more effectively with the local communities in the development of early warning systems.
- Better use should be made of existing monitoring and forecasting technologies, such as satellite and spatial data and equipment for early warning purposes.

### Issues Raised on Dissemination and Communication

Conference participants and presenters highlighted ways in which warnings could better get to those at risk, and contain clear and useful information that enables proper responses:

- A one-size fits all approach will not take the message the critical 'last mile'. The individual needs of each community must be considered.
- Volunteers and their networks are vital to both disseminating warnings and building community capacity.
- Building and maintaining trust in the authorities that issue and disseminate warning is critical.
- Disseminating information and warnings to remote areas remains a challenge and reinforces the need to use both technical and non-technical dissemination methods and technologies.

- The critical role of education and public awareness in building understanding of hazards, vulnerabilities and response mechanisms.
- Focused training to ensure people know how to respond to warnings, understand how to use equipment and interpret data, and feel empowered and motivated to maintain early warning systems.
- Better understanding is required in relation to how people behave and respond to warnings.
- Maintaining trust and credibility in early warning systems remains a challenge, particularly if false alarms are common.
- Learning from previous disasters is critical to enhance education and awareness and to improve existing early warning systems.

### Key Overarching Issues Discussed

A number of important cross-cutting issues were also raised throughout the conference by participants:

- There was clear consensus that a multi-hazard approach to early warning systems is the best way to move forward, while recognizing that different hazards often require individual preparedness and response strategies.
- The need for involvement and empowerment of local communities, or a 'bottom-up approach' consistently emerged. Utilizing existing community structures and systems was stressed, along with the need for active involvement of people most likely to be exposed to hazards in all aspects of the early warning chain.

- Gender and cultural diversity issues require further consideration when implementing effective people-centred early warning systems.
- The importance of effective legal frameworks for disaster risk reduction and early warning was highlighted; the role of local authorities in early warning was stressed; and the importance of mainstreaming disaster risk reduction into development and poverty reduction strategies was reiterated. Coordination of international systems, such as the proposed global early warning system, and national systems was also emphasised.
- Access to adequate funds for disaster risk reduction and early warning remains a concern and challenge for governments, especially in the developing world.



## Summary of the Scientific and Technical Symposium

The Scientific and Technical Symposium of the conference underlined the call for a move from concept to action in early warning. The multi-disciplinary presentations served as a basis to discuss the latest research and approaches in early warning worldwide and raised the awareness of new and growing hazards. Topics ranged from technical novelties to new approaches with a focus on social sciences and local early warning praxis. The symposium was structured into three sessions:

- **Multi-hazard Early Warning** – underlining the importance of multi-hazard early warning systems in the context of their sustainability;
- **Mega-events** – calling for multi-regional, international and even global cooperation and coordination in early warning for particularly rare and large events; and
- **People, Politics and Economics** – emphasizing the role of community involvement, communication, legal and policy issues, cost-benefit, and other issues important for functioning and sustainable early warning.

### Multi-hazard Approaches Session

Many regions in the world are affected by more than one hazard, such as floods, storms, droughts or earthquakes with devastating socio-economic impacts. Early warning systems have been recognized as key elements for preventing and reducing the impact of disasters. As most communities face the threat of numerous hazards, it is important that integrated, multi-hazard warning systems are established. The functionality of a multi-hazard warning system will be improved by using shared structures and communication channels. A multi-hazard system will be triggered more often and hence, processes and links will remain better 'exercised'.

Accuracy of monitoring plays an important role in early warning, not only in a technical sense. It also helps to prevent false alarms and therefore helps to build up trust in the warnings. Monitoring has to adapt continuously to the changing hazard landscape, especially in light of climate and environmental change. Examples such as the evacuation of 40,000 people in the Popocatepetl region, Mexico, in December 2000 just hours before a major eruption are noteworthy examples of successful early warning from which we can learn.

Some regions are today prone to hazards that were practically irrel-



Poster Exhibition  
(Photo: DKKV/M. Malsch)

evant in the past but will be even more threatening in the future, such as droughts and heat waves in Europe or tsunamis in the Mediterranean, or dust and sand storms in North East Asia. Some regions, particularly in the developing world, are still lacking monitoring capacities. International efforts are not only needed to support capacity building in those areas but also to enhance and facilitate the accessibility and exchange of data and information across national and regional borders.

Using synergies in the generation of data and knowledge, serving multiple purposes and target groups, will result in much more favourable cost-benefit ratios. That issue was discussed on the basis of the multi-purpose benefit inherent in earth observation that could simultaneously cater to the early warning, science, and military communities. Cost-benefit ratios play an important role in raising the political will to invest in early warning and prevention.

The observation and analyses of past events, including the emergency response is important to understand, predict and react in a better way to future natural hazards. Databases collecting information and experience are a basis to adapt models and early warning systems in general to be better tailored to the needs of the target groups.

Various multi-hazard warning centres focus in particular on the improvement of the public information system. The communication infrastructure plays a key role in the warning chain, but is often affected by disasters themselves. To implement an effective communication system is a major challenge for the years to come. The possibility of using available broadcast capability for the distribution of warning messages provides one solution for the improvement of the communication system. In multi-hazard warning systems the warnings are often distributed to operating centres of key services and institutions of the integrated crisis management and rescue system. These systems involve close coordination with civil protection authorities as well as collaboration between different institutions at the federal, state and municipality levels. Multi-hazard risk assessment must be incorporated into long-term land use and national development plans and strategies.

Scientific and Technical Symposium at the Waterworks Building  
(Photo: DKKV / U. Grabowski)

### Mega Events Session

Mega events are as much the result of the magnitude of the natural phenomenon as of the size, density and vulnerability of the population subjected to the hazard. Large cities are particularly exposed to mega events. Furthermore, with the increasing trend of urbanization, more and more people will be living in large cities, hence, offering mega events more and more exposure.

In regions where our collective memory does not provide any record of disasters, the hazard events can be inevitable but characterized by very long return periods. Statistical



methods that provide good hazard estimates for small to large events fail when it comes to assessing the frequency of mega events. The risks are known and bound to affect a largely unprepared population. The Indian Ocean Tsunami is one example of such a known but neglected hazard, a tsunami in the Mediterranean should not be the next. To scientists, the Mediterranean is one of the most tsunami prone areas worldwide, but the population is widely unaware and unprepared. Hazard and risk mapping with the involvement of communities can help change that.

Getting to know the risk involves not only the physical characteristics of the hazard, but also the vulnerability of communities at risk and taking into account the trends in landuse and population development. Examples during the symposium demonstrated how flood risk can be evaluated on the basis of precipitation, geomorphology, and settlement patterns.



Debris flow that initiated from a large landslide above the town of La Conchita, 2005 (Photo: USGS)



Earthquake in Pakistan, October 2005: Damage of the devastated city of Balakot (Photo: IRIN, E. Parsons)

Mega events can also happen rather unnoticed and almost in a sustained way, such as malaria and other vector-borne diseases. Their omnipresence in certain areas, but lack of spectacular events and images, tend to make the call for action go unheeded. New methods were discussed to improve the risk mapping of such diseases.

Other hazards are characterized by slow onsets, such as famine. Improved crop monitoring and early warning methods were presented that should lead to enhanced food security.

For some hazards early warning has to rely more on technology. Early warning for earthquakes provides such a short lead time that state of the art technology is crucial. Warning for earthquakes necessarily has a slightly different focus than warning systems for other hazards. In large urban areas, high impact

damage has to be prevented such as nuclear reactor accidents, power and gas pipeline failures or high speed train accidents. Early warning for other hazards, such as floods, storms etc. strive for timely protection and evacuation of the communities at risk.

When mega events affect a large geographic area the concerted efforts of all countries involved are needed. In that case, regional, national and local institutions and policies have to be in place. Building up a tsunami early warning system for the Indian Ocean is one such effort that involves stakeholders from the regional to the local level in multiple countries.

The discussions of the symposium also stressed the effectiveness of taking existing systems and knowledge into account. Attention should particularly be paid to local knowledge and grass root approaches.

## People, Politics and Economics Session

This session addressed an element vital to all early warning systems: the link between scientific/technical knowledge, organizational systems and structures, and the communities at risk. The effectiveness of institutionalized early warning systems can only be achieved by close cooperation between the agencies running the system and the vulnerable people. Early warning systems need to be adapted to different conditions. The complex structure of large cities for example requires different arrangements than a rural environment.

Early warning systems must be 'people-centred': they have to support and empower people in protecting themselves. In order to 'go the last mile', an integrated approach to early warning has to be based on the needs, priorities, capacities, and cultures of those at risk. People at risk must be partners in the system, not controlled by it.

Presentations in this session demonstrated the effectiveness of people-centred early warning systems that utilize and develop community capacities, create genuine local ownership of the system, and are based on a shared understanding of needs and purpose. Such initiatives are sustainable, replicable - they can be scaled up - and, importantly they are adaptable and resilient.

To implement early warning systems on a sustainable basis multi-annual, long term strategies are needed. What makes a system sustainable under different conditions and contexts needs to be better understood. Early warning systems need to continue to innovate and adapt: not only by developing new technologies but also by continuously reviewing their aims and performance and renegotiating the multiple organizational and community relationships of the system.

Early warnings must be credible and reliable. This applies equally to scientific components, to emergency management structures and other agencies in the system. It is not just a question of believing the message, people have to trust the messenger, too. The pluralistic nature of the new information age does not favour a single, authoritative voice issuing warnings. Rapid advances in information and communication technology (ICT) and the growth of global media have widened public access to early warning information. The decision to take protective action will often be the outcome of negotiation between competing messages and priorities. Informed citizens will make their own, informed choices. They are in a sense consumers of early warning information.

Early warning pays off. A prerequisite for an effective early warning system is the recognition of its benefit by the general public, policy

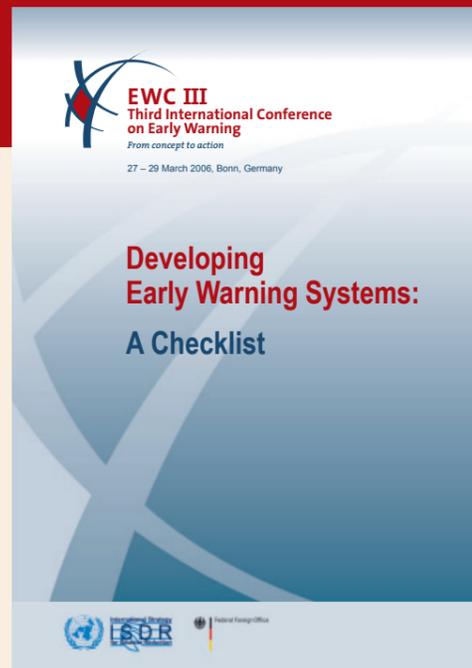


Example of evacuation route in Hawaii (Photo: Y. Ono)

makers and the private sector. Cost-benefit analysis and related tools help to foster the necessary political engagement and the will to develop and promote early warning as an instrument of disaster risk management. Early warning systems are complex, multi-jurisdictional and multi-disciplinary by nature. Collaboration between the multiple stakeholders involved has to be supported by appropriate legal and policy frameworks.

At the same time - especially under the aspect of sustainability of the systems - new findings on the effects of climate change and environmental degradation must be integrated into the design of early warning systems.

# Conference Generated Outcome Documents



## Developing Early Warning Systems: A Checklist

In order to help governments and communities implement effective people-centred early warning systems, a simple checklist of key elements and actions was generated through the conference. The document is structured around the four key elements of early warning and contains non-technical information that national governments or community organizations can refer to when developing new early warning systems, evaluating existing arrangements or simply checking that crucial procedures are in place. The Checklist is not intended to be a comprehensive design manual, but instead a practical, non-technical reference tool to ensure that the

major elements of a good early warning system are in place.

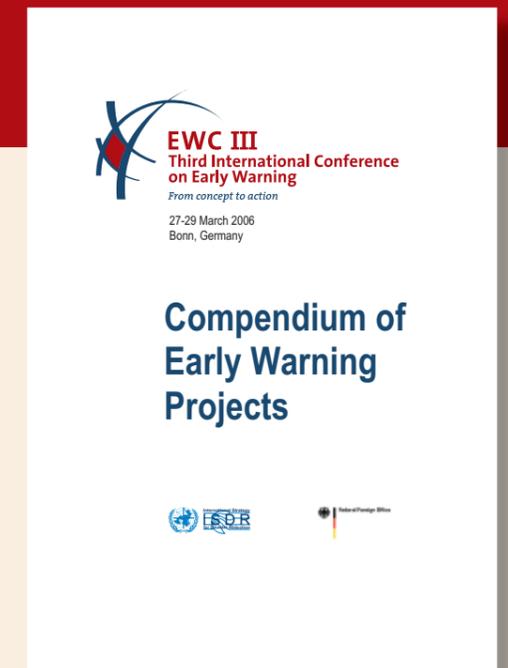
The Checklist was prepared by the secretariat of the Third Early Warning Conference ahead of time and was refined to reflect the key issues, concerns and practical tips raised by conference participants. In addition to inputs gathered during the two and a half days of the conference, significant and substantive input was received from organizations involved in early warning and disaster risk reduction, in the United Nations international system and beyond, including from the secretariat of the International Strategy for Disaster Reduction (ISDR) and

its Platform for the Promotion of Early Warning (PPEW), as well as from the German government and within the German disaster reduction community.

During 2006 the Checklist will be translated into a wide range of languages and distributed throughout the world as a key tool to help facilitate the development of people-centred early warning systems that will save both lives and livelihoods. The document is available electronically at:

[www.unisdr-earlywarning.org](http://www.unisdr-earlywarning.org)  
and  
[www.ewc3.org](http://www.ewc3.org)

The Conference generated two key documents which are intended to serve as functional tools for practitioners and policy makers in the field of early warning.



## Compendium of Early Warning Projects

The Compendium of Early Warning Projects and its associated on-line database is the result of a call for project proposals and the project-oriented approach chosen for the conference. The Compendium contains over one hundred individual projects focused on early warning and represents a rich vein of initiatives, expertise and capacity to develop early warning systems which can save lives and protect livelihoods throughout the world. The proposals cover all major natural hazard types across a diverse array of geographic regions, and span technical systems through to community-based action on early warning.

Many of the initiatives contained in the Compendium are brand new, while others are adaptations of

existing projects. Submitting organizations include government bodies, non-governmental organizations, scientific institutions and private companies. All project proposals were accompanied by a written endorsement from an appropriate government department or international authority.

To help ensure projects were of suitable standard, a quality control process was managed by the UN/ISDR Platform for the Promotion of Early Warning (PPEW). This included a screening process to ensure that proposals met the basic requirements of relevance and completeness, followed by the review and assessment of proposals against submission guidelines by expert reviewers.

The Compendium was circulated to all conference participants to promote interest in new early warning projects and to encourage donor support. In addition, a number of the high quality projects were showcased at the conference, with fourteen projects presented in the plenary session and nine projects displayed in the poster session.

To help turn more projects into reality the UN/ISDR PPEW will continue to maintain the projects database and promote the projects with donors during 2006. The Compendium can be accessed at:

[www.unisdr-earlywarning.org](http://www.unisdr-earlywarning.org)  
and  
[www.ewc3.org](http://www.ewc3.org)

## Workshops

On the second day of the conference, participants had the opportunity to attend one of five workshops covering pertinent issues, which could not be accommodated within the main plenary discussions. The topics ranged from wildfires, extreme floods and tsunami early warning to the African Centre for Early Warning and Disaster Reduction in the Indian Ocean (AfrEDI) initiative in Sub-Saharan Africa and the link between early warning and education. The five events were organized by relevant actors in the field, who were entirely responsible for the content and outcomes of the workshops.



Capacity building for wildfire prevention, early warning and preparedness planning in a village in Gorongosa District, Mozambique (Photo: GFMC)

### Wildland Fire Workshop

Participants agreed that a global early warning system for wildland fire should be part of the global multi-hazard early warning system coordinated by UN, and that the mobilisation of resources for the proposed project would require strong support from the ISDR Secretariat and from key donors. To promote the project in the context of the global multi-hazard early warning system, it was emphasized that:

a) Disasters resulting from wildland fires are not solitary events but are closely linked to other haz-

ards such as flooding, mudslides, landslides or rock falls. They have far-reaching social, economic and environmental consequences;

b) Activities need to be 'people-centred', focusing on local awareness raising;

c) The global early warning system for wildland fire will link regional and national systems; and

d) The proposed project would significantly advance science and help translate existing knowl-

edge into tangible benefits in global early warning.

To maximise the success of such a system, participants agreed that it is important to link the early warning topic to related questions about air quality, insurance and health industry matters. The presentations and outcomes of this side event can also be viewed on the website of the Global Fire Monitoring Center (GFMC) at:

[www.fire.uni-freiburg.de/fwf/EWS.htm](http://www.fire.uni-freiburg.de/fwf/EWS.htm)

### AfrEDI – African Centre for Early Warning and Disaster Reduction in the Indian Ocean

At a UN/ISDR consultative meeting in Nairobi, Kenya during October 2005, delegates from 10 African nations bordering the Western Indian Ocean (WIO) agreed on an association to establish the African Centre for Early Warning and Disaster Reduction in the Indian Ocean (AfrEDI).

The 2004 tsunami seriously affected Somali (150 deaths) and Tanzania (10 deaths) in this region, and even caused a fatality near Port Elizabeth

in South Africa, 8400 km away from its source. The frequent hazards of major tropical cyclones in the South-west Indian Ocean, and the danger of another tsunami within the next 20 years or less from the 1797 and 1833 sources along the Sumatran margin, make the need for AfrEDI more acute in the southern sector of the West Indian Ocean. The countries of Mauritius, Madagascar and South Africa lie directly along the axis of the energy-beaming pattern from the 1797/1833 zones.

The well-attended AfrEDI workshop took notice of these risks, and also the recent major earthquakes in the southern part of the East African Rift System, such as that in Mozambique in February 2006. An inaugural meeting to establish the constitutional basis of AfrEDI was discussed, but no definite time line was set for it.

### Education and Knowledge:

#### Protecting Schools and Promoting Disaster Risk Awareness to Save Lives

The event benefited from the presence of government representatives, NGOs, researchers, experts, UN agencies, associations and other actors interested in the subject. Two presentations and a brief summary of the elements of the UN/ISDR campaign on knowledge, education and disaster risk reduction set the stage for an intense exchange among participants, who shared initiatives, examples and opportunities. They discussed and confirmed the following:

- A keen and active interest in the subject of education (formal and informal), knowledge related to disaster risk reduction and school safety;

- The value of presentations of experiences from a national point of view in terms of good practices and lessons learned;

- The extensive use and appreciation of the key findings of the world review presented at the workshop;

- A commitment to the Education Campaign's focus and outcomes;

- A willingness to have further exchanges on the subject and to capitalize on similar opportunities to raise awareness of the subject of disaster risk reduction and education; and

- A call for the inclusion of disaster risk reduction in school curricula.

The event agenda, a one-page invitation, list of participants, background documents, PowerPoint presentations and information on the UN/ISDR thematic cluster on knowledge and education are available at:

[www.unisdr.org/knowledge-education](http://www.unisdr.org/knowledge-education)

## Tsunami Early Warning Strengthening Project in the Indian Ocean

Recognizing the urgency to establish an early warning system for the Indian Ocean region, a multi-partner, multi-donor initiative "Evaluation and Strengthening of Early Warning Systems in countries affected by the 26 December 2004 Tsunami" was launched in early 2005 with funding through the UN Flash Appeal for the Indian Ocean. The initiative has provided an overall integrated framework and has been focusing on key components that include core system implementation, integrated

risk management, public awareness and education, community-based approaches, and coordination and partnership building.

This workshop was organized to brief participants on progress towards strengthening tsunami early warning systems in the Indian Ocean, and to offer an opportunity to exchange information and experiences with regard to the implementation of activities and delivery of results at the regional, national,

and local levels. Participants also discussed the prospects for cooperation and partnership towards building resilience to tsunamis in the Indian Ocean region. The workshop included presentations on tsunami hotspots and risk assessment, the 'past, present and future' of the Tsunami Early Warning Project, as well as regional, intergovernmental, national and local tsunami early warning systems.

## Risk Management of Extreme Floods

It is not possible to completely eliminate floods. Even after implementing comprehensive flood defence measures, we may be confronted with situations for which these measures have not been designed. Therefore, the international discussion on flood risks and flood loss reduction recognizes the need to improve the potential of people at risk and of disaster managers to

respond to extreme events. In many cases, forecasting, early warning and operational flood risk management can significantly improve coping capacity, leading to dramatic reductions of fatalities, property losses and environmental effects.

This workshop, organized by scientists of the GeoForschungsZentrum Potsdam and the University

of Karlsruhe discussed the need and possibilities for improved capacities in crisis management. It presented the perspectives of the International Flood Initiative, a UN inter-agency activity, and presented new tools for local authorities and flood managers.



Katherine Sierra, World Bank,  
Vice-President Infrastructure  
(Photo: World Bank)

*"Losses from natural disasters are a severe threat to all of our efforts at poverty reduction in developing countries. At the World Bank, part of our work is to assess the economic impact of disasters. What we know is this: it is now clear that natural disasters can have long-term impacts on economic growth and development, especially in developing countries. For countries at high risk of natural disaster, not integrating these risks in development planning makes economic projections unrealistic, and it makes meeting any poverty reduction goals much more difficult. This connection between disaster risk and economic growth, poverty, and planning makes disaster reduction a core development issue for all of us, including my own institution."*

Katherine Sierra, World Bank, Vice-President Infrastructure

# Conference Agenda



Moderator of the Hazards of the Air Session: Sir Trevor McDonald (Photo: DKKV/M. Malsch)

Entrance area of the Internationales Kongresszentrum Bundeshaus Bonn (IKBB) (Photo: DKKV/M. Malsch)



Monday 27 March 2006		
Welcome Address by Federal Minister for Foreign Affairs, Dr. Frank-Walter Steinmeier		Opening (Plenary Chamber)
Opening Address by United Nations Under-Secretary-General for Humanitarian Affairs, Jan Egeland		
Message from the Mayors' Conference on Early Warning delivered by Juan del Granado Cosio, Lord Mayor of the City of La Paz		
Key Note Address by Katherine Sierra, World Bank, Vice-President Infrastructure		
Organizational Matters		Address
Address by Special Guest President William J. Clinton, UN Special Envoy for Tsunami Recovery		
Poster Session		
Priorities and Projects Forum (Plenary Chamber)		Scientific and Technical Symposium (Waterworks)
Opening Priorities and Projects Forum		Opening Scientific and Technical Symposium Framework for Multi-hazard, Multi-purpose Early Warning Systems <i>M. Jarraud</i>
Overarching Issue 1: A Global Early Warning System; Who is Responsible and How can it be Achieved?		<b>Key Note:</b> Promoting Risk-Wise Behavior: An Integrated Strategy for Reducing Vulnerability and Improving Resiliency <i>H. M. Wood</i>
International Action and Governance to Build Reliable Systems Worldwide, to Energise Partnerships, and to Capitalize on Opportunities and Plug the Gaps <b>Keynote:</b> Sir D. King		Effective All-hazard Warning System Development and Community Resilience: Results from Ongoing Multi-hazard Research in New Zealand, USA and Australia <i>G.S. Leonard</i>
Introduction to Session 1: <b>EARTH</b> Shaking, Blasting and Sliding – Ready and Resilient for the Hazards of the Earth		Multi-hazard Risk Analysis for the Eastern Coastal Areas of India Affected by the Tsunami TS-2004-000147-IND <i>S. del Carmen Mosquera-Machado</i>
During this session, the following projects will be presented that illustrate problems encountered and solutions offered in relation to earthquakes, landslides and volcanic activity		Monitoring and Warning Systems for Natural Phenomena. The Mexican Experience <i>E. Guevara</i>
<b>Discussion Themes</b>	<b>Projects</b>	Exploitation of Remote Sensing Techniques by the DWD for Early Warning of Natural Hazards <i>W. Benesch</i>
Public Awareness and Education; Community Response Capability	From Local Action to National Cooperation: A National and People Centered Early Warning System in Tajikistan <i>M. Ziyyev, N. Alieva</i>	Acquiring Comprehensive Observations Using an Integral Sensorweb for Early Warning <i>S. Habib, S. Ambrose</i>
Hazard Assessment	An Early Warning System for Hazards of the Tungurahua and Cotopaxi Volcanoes, Province of Tungurahua, Ecuador <i>M. Rodriguez Benitez, H. Yepes</i>	Meteorological Vigilance an Operational Tool for Early Warning <i>J.-M. Carrière</i>
Risk Assessment and Perception		Multi-hazard Early Warning Service for Emergency System in the Czech Republic <i>I. Obrusnik</i>
Forecasting and Technical Monitoring Systems	A Warning Analysis Network and Site for Iran <i>M. R. H. Marvasti</i>	Development of Decision Support System for Early Warning Against Natural Hazards <i>P.-H. Hsu</i>
Decision-making Processes for Communication and Dissemination of Warnings	Flooding and Landslides Early Warning Systems in the City of La Paz, Bolivia <i>J. del Granado Cosio</i>	Multi-Hazard Risk Assessment at Different Levels with Extremum System Application <i>N. Frolova</i>
	Short Presentation of Geographical Analysis of the Watershed of the Mocoties and Lineamientos Valley and Urban Local Plan for Sustainable Development for the Community of Santa Cruz de Mérida, Venezuela <i>A. Linayo</i>	A Satellite-Based Communication Channel for the Reliable Distribution of Early Warning Messages: The Alert Interface via EGNOS (ALIVE) for Disaster Prevention and Mitigation <i>H.-P. Plag</i>
		Intergrated Climate Early Warning Activities Being Undertaken in the Greater Horn of Africa Within the Framework of the IGAD Centre for Climate Prediction and Applications (ICPAC) <i>L. Ogallo</i>
Reception hosted by the Federal Foreign Office		

Multi-hazard Approaches (Chairs: Maryam Golnaraghi, Laban Ogallo)

Tuesday 28 March 2006			
Priorities and Projects Forum (Plenary Chamber)		Scientific and Technical Symposium (Waterworks)	
Session 2: Water (Moderator: Mishal Husain)	Feedback from Symposium Session 1: <b>Multi-hazard Approaches</b>		Early Warning Systems for Natural Disasters in Korea <i>S.-K. Roh, et al.</i>
	Overarching Issue 2: National Warning Systems for all Hazards and all People		Session Discussion
	Welding the Best Players into the Best Team for the Best Results: Politicians, Hazard Experts, Disaster Authorities, Media, Community Leaders <b>Keynote: B. Carby</b>		<b>Key Note: Istanbul Earthquake Early Warning and Rapid Response System</b> <i>M. Erdik</i>
	Introduction to Session 2: <b>WATER</b> Too Much or Little – Coping with the Hazards of Water		The Global Framework: Intergovernmental Coordination of Regional Tsunami Warning Systems <i>P. Bernal</i>
	Participants will be presented with the following projects to illustrate problems and solutions related to climate risks, floods and tsunamis:		The Indonesian-German Contribution to the Indian Ocean Tsunami Early Warning System <i>J. Sopahleuwakan, J. Lauterjung</i>
	Discussion Themes	Projects	A Coupled Teleseismic Ocean-General-Circulation-Model System for Global Tsunami Warning <i>Y.T. Song</i>
	Vulnerability Assessment	Enhancing Hydroclimate Monitoring, Early Warning and Applications for the Reduction of Climate Related Risks in the Greater Horn of Africa <i>L. Ogallo</i>	Remote Sensing and GIS Contribution to Tsunami Risk Sites Detection of Coastal Areas in the Mediterranean <i>T. Taymaz, B. Theilen-Willige</i>
	Gender and Cultural Diversity	Implementing a Real-time Flood Forecasting System for East Black Sea Region <i>F. Keskin</i>	
	Understanding and Respecting Warnings	Towards a Multi-Hazard Early Warning and Response System in West Africa: A Multi-Hazard Approach to Forecasting Adverse Health Impacts in Africa <i>D. Rogers</i>	Early Warning of Earthquakes Using Earth, Ocean and Atmospheric Parameters Observed from Satellite Data <i>R.P. Singh, et al.</i>
	Reliability of Warnings	Early Warning Systems for Natural Hazards in the Bi-national River Basin Catamayo-Chira <i>R. Vivar Bermeo, L. Salazar Chavesta</i>	From Sudden Local Wildland Fire Disasters to Transboundary Impacts of Creeping Wildland Fire Mega Events: Needs for Global Early Warning of Wildland Fire Within a UN Multi-Hazard Global Early Warning System <i>J.G. Goldammer, et al.</i>
Benefits and Challenges of a Multi-hazard Approach	Establishment of an Information Chain to Influence the Behaviour of Populations Exposed to Atmospheric and Geological Risks (Cyclones and Tsunamis) in the Caribbean Basin and the Atlantic Ocean, with a View to Reducing their Vulnerability <i>V. Lurel, P.-M. Sarant</i>	Automated Mosquito Identification and Monitoring: A new tool for Early Warning of Vector-borne Disease Outbreaks <i>E. Anderson</i>	
Workshops	The African Centre for Early Warning and Disaster Reduction in the Indian Ocean AfrEDI; and Risk Management of Extreme Floods, GeoforschungsZentrum Potsdam and Universität Karlsruhe		Workshops
	Wildland Fire, Global Fire Monitoring Centre. This will include presentation of two projects: Global Early Warning System for Wildland Fire, <i>T. Keenan, W. De Groot, G. Morgan, J.G. Goldammer</i> Early Alert, Monitoring and Impact Assessment System for Forest Fires in Mexico and Central America, <i>R. Ressl</i> The National Commission for the Knowledge and Use of Biodiversity		
	Tsunami Early Warning Strengthening Project in the Indian Ocean: Partnership for Building Resilience to Tsunamis, UN/ISDR Platform for the Promotion of Early Warning and Partners; and Education and Knowledge: Protecting Schools and Promoting Disaster Risk Awareness to Save Lives (Knowledge and Education UN/ISDR System Cluster)		

Priorities and Projects Forum (Plenary Chamber)		Scientific and Technical Symposium (Waterworks)	
Session 3: Air (Moderator: Sir Trevor McDonald)	Introduction to Session 3: <b>AIR</b> Weather Eyes Open Predicting and Responding to Hazards of the Air		Crop Monitoring and Early Warning for Food Security, the MARS-FOOD Approach <i>F. Rembold</i>
	During this session, the following projects will be presented, to illustrate problems and solutions related to drought and desertification, storms and climate risks:		Session Discussion
	Discussion Themes	Projects	<b>Key Note: Cost-effective Strengthening of Warnings Through Informal Networks and Channels</b> <i>J. Handmer</i>
	Knowledge Transfer	Development of a Regional Sand and Dust Storm Early Warning System (SDS-EWS) in North East Asia <i>Z. Xiao-Ye</i>	Political, Psychological and Legal Aspects of Early Warning Systems in Alpine Regions <i>R. Schmidt</i>
	Access to Data and Information	Early Warning Communications System for Kingdom of Tonga <i>M. Takai</i>	Central America Small Valleys Flood Alert and Vulnerability Reduction Programme (SVP) Regional Platform Development <i>P. Bastidas</i>
	People Centred Dissemination Systems		Willingness to pay for Early Warning Systems using Contingent Valuation Method <i>A. Asgary, N. Mehregan</i>
	Technical Dissemination Systems and Equipment	Relevance and Feasibility of International Alert Systems: A Case Study of Central Asian Earthquakes <i>D. Eriksson</i>	
	Feedback from Symposium Session 2: <b>Mega Events</b>		Supporting End to End Flood Early Warning Systems in South East Asia <i>E. Turvill</i>
Reception hosted by the City of Bonn			

Wednesday 29 March 2006			
Priorities and Projects Forum (Plenary Chamber)		Scientific and Technical Symposium (Waterworks)	
Session 3: Air (Moderator: Sir Trevor McDonald)	Discussion Themes	Projects	Benefits of an Integrated Early Warning System: The Jamaican Experience <i>B. Carby</i>
	Strengthening Institutional Capacities and Mechanisms	Development of an Advanced Tropical Cyclone Early Warning System for the Philippines <i>P. Nilo</i>	Multi-purpose Information System for Early Warning <i>O. Ravsal</i>
	Early Warning Pays Off	Early Warning Systems for Desert Locusts – A West Africa Pilot Project <i>M. Ndiaye, M.V.K. Sivakumar</i>	PREDICT An Initiative to Help Communities to Anticipate and Manage the Crisis Situations due to Floods <i>A. Roumagnac, K. Moreau</i>
	Legal and Policy Frameworks; Making Early Warning a Long Term Priority	The Helmholtz Association's Integrated Earth Observation System (EOS): A German Contribution to Disaster Management <i>H. Mehl, et al.</i>	
	<b>Overarching Issue 3: The Ultimate Question Who Gets the Message and What Should They do? Engaging Communities, Building Awareness and Preparedness, and Making Early Warning Systems People-centred</b> <b>Keynote: E. Mucache</b>		
	<b>Overarching Issue 4: Early Warning for Early Action – Mobilizing the International Community</b> <b>Keynote: H. Josserand</b>		Session Discussion
	Feedback from Symposium Session 3: <b>People, Politics, Economics</b>		
	Closing Session (Plenary Chamber)	Conclusions from Symposium, Dr. Irmgard Schwaetzer	
Closing Remarks, Co-Chair Salvano Briceno			
Closing Remarks and Conference Statement, Co-chair Hans-Joachim Daerr			

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- United Nations Development Programme (UNDP)*
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- United Nations University (UNU)*
- United Nations World Food Programme (WFP)*
- The World Bank*
- World Health Organization (WHO)*
- World Meteorological Organization (WMO)*

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*Michael Jarraud, Secretary-General of  
the World Meteorological Organization  
(Photo: WMO)*

*“Disaster prevention and mitigation are essential to sustainable development, especially for the developing countries and the Least-developed Countries (LDCs). Today, the advances made in meteorology, hydrology and climate research, coupled with progress in telecommunications and computers, can allow the National Meteorological and Hydrological Services of WMO’s Members to issue warnings of hazards from a few hours to several months in advance, thus performing a quantum leap forward in terms of reducing loss of life and property. The challenge for countries is, therefore, to empower each community to apply these tools optimally, through networking and partnerships.”*

Michael Jarraud, Secretary-General of WMO

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