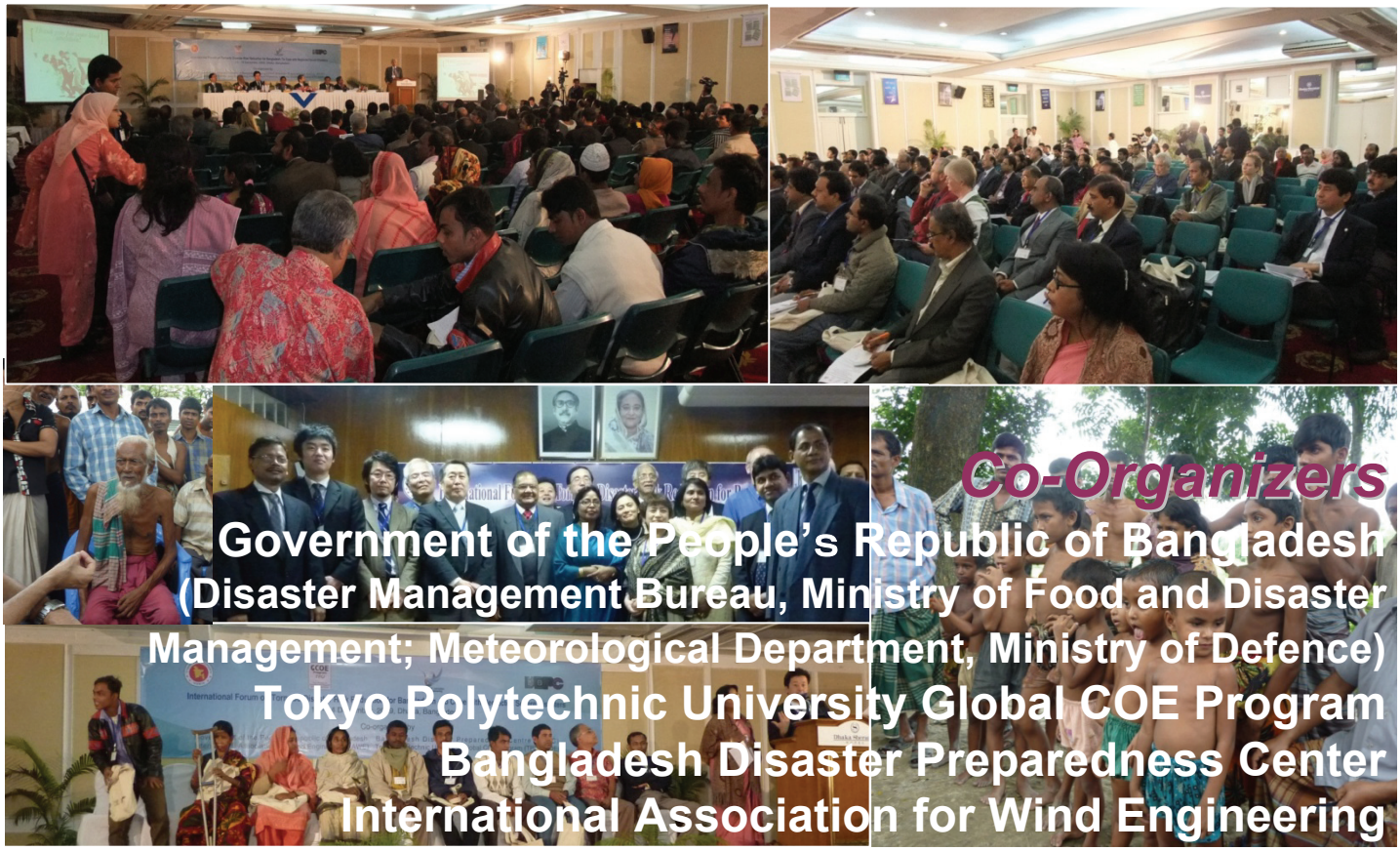
International Forum on Tornado Disaster Risk Reduction for Bangladesh

- To Cope with Neglected Severe Disasters -



Co-Organizers

Government of the People's Republic of Bangladesh
(Disaster Management Bureau, Ministry of Food and Disaster Management; Meteorological Department, Ministry of Defence)
Tokyo Polytechnic University Global COE Program
Bangladesh Disaster Preparedness Center
International Association for Wind Engineering

International Forum on Tornado Disaster Risk Reduction for Bangladesh
– To Cope with Neglected Severe Disasters –
13-14 December 2009, Dhaka, Bangladesh

PROGRAM

December 13 (Sunday) Dhaka Sheraton Hotel

09:00 - 10:00 **Registration**

10:00 - 11:30 **Inauguration Ceremony**

Welcome speech: **Prof. Yukio Tamura (IAWE President/TPU Global COE Director)**
Mr. Muhammad Saidur Rahman (Bangladesh Disaster Preparedness Centre)

Invited Guest : **Mr. Tokiyoshi Toya (Director of WMO)**

Special Guests: **Mr. BMM Mozharul Huq**
(Adviser, Humanitarian Response Team, UNDP, Bangladesh)
Prof. Dr. M.S. Akbar MP (Chairman of Bangladesh Red Crescent Society)
H.E. Mr. Tamotsu Shinotsuka (Ambassador of Japan in Bangladesh)

Chief Guest: **H.E. Dr. Muhammad Abdur Razzaque**
(Honorable Minister of Food and Disaster Management)

Vote of thanks: **Mr. Md. Farhad Uddin (Director General of Disaster Management Bureau)**

11:30 - 12:00 **Tea break**

12:00 - 13:00 *Guest of Honor*: **Mr. Salvano Briceno (Director of UNISDR)**

Introductory session (Ms. Arjumand Habib and Mr. Yuichi Ono)
Voices from tornado affected people and district officials

13:00 - 14:00 **Lunch**

14:00 - 15:30 **Session 1 Governance and Policy Making (Chaired by Mr. Md. Farhad Uddin)**

Speakers: **Mr. AHM Abdullah (DMB)**
Mr. Sifayet Ullah (UNDP)- *Policy and Institutional Aspects of Tornado Risk Management : Case of Bangladesh*
Mr. Atsushi Koresawa (ADRC) – *Governance and Policy Making*
Mr. Hideki Katayama (JICA)

15:30 - 16:00 **Tea break**

16:00 - 18:00 **Session 2 Public Awareness and Education / Finance and Community (Chaired by Mr. Muhammad Saidur Rahman and Ms. Etsuko Tsunozaki)**

Speakers: **Mr. M. Shafiul Alam (BDRCS)**
Mr. Atsushi Koresawa (ADRC) – *Public Awareness and Education for Disaster Risk Reduction)*
Dr. Mahmudul Islam (CDMP) - *Disaster Risk in Public Education System in Bangladesh : Emphasis on Tornado*
Mr. Sohel Khan (UNDP)

Performance by Rupantar, Khulna

International Forum on Tornado Disaster Risk Reduction for Bangladesh
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13-14 December 2009, Dhaka, Bangladesh

PROGRAM

December 14 (Monday) Bangladesh Meteorological Department

08:30 - 09:30 **Registration**

09:30 - 10:00 **Opening session (Chaired by Prof. Yukio Tamura)**
Opening speech: **Ms. Arjumand Habib (BMD)**
Invited speech: **Ms. Mariko Sato (UNHABITAT)**

10:00 - 11:30 **Session 3** **Meteorology and Climatology (Chaired by Prof. Taiichi Hayashi and Dr. Yusuke Yamane)**
Speakers: **Prof. Taiichi Hayashi (Kyoto Univ.) and Dr. Yusuke Yamane (Kyoto Univ.) - *Meteorological Characteristics of Tornadoes in Bangladesh***
Mr. Md. Abdul Mannan (BMD), Dr. Someshwar Das (SMRC) and Dr. Ashraf Dewan (Dhaka Univ.)

11:30 - 12:00 **Tea break**

12:00 - 13:30 **Session 4** **Early warning system in Japan and Bangladesh (Chaired by Mr. Osamu Suzuki and Ms. Arjumand Habib)**
Speakers: **Mr. Osamu Suzuki (MRI)**
Ms. Arjumand Habib (BMD) - *Early Warning System for Severe Storms in Bangladesh*
Mr. Fazlul Wahab (BDRCS)-*Concept paper : Cyclone Preparedness Programme*

Visit of storm warning centre, BMD

13:30 - 14:30 **Lunch**

14:30 - 16:30 **Session 5** **Wind Engineering, Household and Community Storm Shelter, and Risk and vulnerability (Chaired by Prof. Thomas Schmidlin and Prof. Kishor Mehta)**
Speakers: **Mr. Syed Ashraf (DMB)**
Prof. Thomas Schmidlin (Kent State University) - *Risk Factors and Social Vulnerability*
Prof. Kishor Mehta (Texas Tech University) – *Household and Community Shelter*
Prof. Shuyang Cao (TPU/IAWE) – *Recent Tornado Damage in Japan*

16:30 - 17:00 **Tea break**

17:00 **Closing session**
Chair's summary by Prof. Yukio Tamura (IAWE President/TPU Global COE Director)

PRESS RELEASE

International Forum on Tornado Disaster Risk Reduction for Bangladesh

- To Cope With Neglected Severe Disasters -

"The International Forum on Tornado Disaster Risk Reduction for Bangladesh - To Cope With Neglected Severe Disasters" was held in Bangladesh on 13-14 December, 2009 at the Hotel Sheraton. Over one hundred seventy people including large number of international experts from USA, Japan, Switzerland, Thailand and China attended the forum. While Dr. Muhammad Abdur Razzaque, the Honorable Minister of Ministry of Food and Disaster Management was the Chief Guest, Mr. Tamotsu Shinotsuka, Ambassador of Japan in Bangladesh, Prof. Dr. M.S. Akbar MP, Chairman of Bangladesh Red Crescent Society, Mr. BMM Mozharul Huq, Advisor, Humanitarian Response Team, UNDP were present as Special Guests. Chaired by Prof. Yukio Tamura, IAWE President/TPU Global COE Director**,** the forum was addressed by Mr Salvano Briceno, Director of UNISDR and Mr. Tokiyoshi Toya, Director of WMO as guest of honors. Mr. Muhammad Saidur Rahman, Director, BDPC presented the address of welcome and Mr. Farhad Uddin, DG DMB proposed the vote of thanks from the local organizers.

The event was co-organized by Tokyo Polytechnic University Global COE Program TPU/GCOE, Government of Bangladesh (Disaster Management Bureau, Ministry of Food and Disaster Management, Meteorological Department, Ministry Of Defence), Bangladesh Disaster Preparedness Centre (BDPC) and International Association for Wind Engineering (IAWE).

Through a number of sessions addressed by key international and local experts, the forum capture severe local storm disaster risks in Bangladesh, raise awareness of the risks at local, national, and international levels, and develop a strategy to reduce the risks through active interactions among renowned international experts, national and local experts, and local practitioners and decision makers. The strategy includes components of early warning system, risk and vulnerability assessment, research in meteorology, climatology, and engineering, household and community shelter, public awareness and education, finance and community planning, and governance and policy making. The outcomes of this forum will help the Government of Bangladesh to adopt policies and development planning to reduce risks from severe local storms. The outcomes will stimulate donor agencies and NGOs to implement specific projects to reduce the disaster risks. Overall, the forum will contribute to the implementation of the Hyogo Framework for Action.

CHAIR'S SUMMARY

Co-Organized by: Bangladesh Disaster Preparedness Centre (BDPC), Government of the People's Republic of Bangladesh, International Association for Wind Engineering (IAWE), and Tokyo Polytechnic University Global COE Program (TPU/GCOE)

This summary provides the Chair's assessment of the main context of the presentations at the initial session of the International Forum on Tornado Disaster Risk Reduction for Bangladesh held 13-14 December 2009, in Dhaka Bangladesh. The conference was attended by 179 participants, of those, 68 were from the Bangladesh government, 35 from International organizations, 31 from Non Governmental Organizations, 18 local and community people, and 27 media personnel. The proceedings of this meeting are posted at http://www.iawe.org.

The forum began by acknowledging the need for Disaster Risk Reduction specific to tornadoes to be addressed within the context of Disaster Planning and Management. Previous Disaster Planning and Management emphasis has been dominated by cyclone, earthquake, and flood disasters, yet Bangladesh has the highest death rate in the world from tornadoes that devastate the country. In the past, recovery from a tornado event has been reactive and recovery is based solely on the resiliency of the Bangladeshi people.

His Excellency, Honorable Minister Dr. Muhammad Abdur Razzaque, Honorable Minister of Food and Disaster Management has expressed his eagerness to partner with tornado experts and stakeholders to develop and implement an early warning system and preparedness plan. Similarly, His Excellency Mr. Tamotsu Shinotsuka, Ambassador of Japan in Bangladesh, has committed his support, and the support of the Japanese government to provide assistance to the government and people of Bangladesh in this worthy endeavor.

Session 1 - Governance and Policy Making

It is acknowledged that tornadoes are a localized event but of national concern. It is the responsibility of the Government of the People's Republic of Bangladesh to provide for the safety of the Bangladeshi, their property, their livelihood, and the national and economic resources of Bangladesh. The Forum seeks to address ways to reduce the vulnerability of people, especially the poor, to the effects of tornadoes, reducing the hazards to a manageable and acceptable humanitarian level.

It is agreed that currently:

1. The procedures for response preparedness, early detection, and early warning for tornado risk reduction and the capacity of all level stakeholders require strengthening.
2. The importance and effects of tornadoes as localized disasters must be prioritized in the national strategic and action plan.
3. The development process for Disaster Risk Reduction, especially for tornado risk reduction, must integrate all stakeholders. Building resilience to hazard at all levels is critical..

Session 2 - Public Awareness and Education/ Finance and Community Planning

The plan for Tornado Disaster Risk Reduction contains the elements of public awareness and education. Three critical elements include:

1. Raising public awareness about tornadoes in order to strengthen the coping mechanism of communities. This builds community resilience against disaster and creates a culture of prevention and safety.
2. Education and training is essential to building resilience to a tornado disaster. Provide education and training to all groups in society, including but not limited to, students in preschool through higher education, those who are illiterate, those groups that experience political and social discrimination, people with disabilities, women, children, elderly, and volunteers.
3. Commitments of the government at both the local and the national levels will be indispensable to ensure and promote awareness and effective education activities to help reduce the risk to life and property caused by tornadoes.

Finance and Community Planning was not specifically addressed during the session, however, currently the Cyclone Preparedness Programme (CPP) of the Bangladesh Red Crescent Society includes a micro-finance framework to support poor communities. Additionally, SEEDS introduced the micro-credit program to support the livelihoods of the poor affected by a tsunami.

Session 3 - Meteorology and Climatology

A tornado is a meteorological event. Its atmospheric parameters can be measured and monitored. We recognize this and strive to:

1. Evaluate atmospheric conditions and parameters as the primary element in the prediction of a tornado.
2. Understand that Doppler Radar is effective for the detection of meso-scale disturbances.
3. Use numerical models as meaningful tools to forecast tornadoes in Bangladesh.

Session 4 - Early Warning system in Japan and Bangladesh

Tornado Disaster Risk Reduction is integrally linked to an efficient, accurate, and effective early warning system. The early warning system developed for Bangladesh seeks to:

1. Develop a meso-cyclone detection algorithm, possibly modeled after the one being tested in Japan and the United States, to accurately predict tornadic conditions.
2. Enhance the capability of the Bangladesh Meteorological Department (BMD) to objectively observe, assess, and generate thunderstorm and tornado predictions and warnings. Currently, forecasts and warnings are subjective. Continue to develop human capacity related to weather analysis and forecasting. Investigate the use of existing capacity such as the existing 3 Doppler radars to detect, monitor, and forecast tornadic events.
3. Implement a community-based early warning system for tornadoes similar to that described by the CPP. Raise awareness in the community about the need to move to a safe shelter immediately. Develop brochures and provide education to community members related to the identification of tornadoes and the appropriate action in response to the threat of a tornado.

Session 5 - Wind Engineering, Household and Community Storm Shelter, and Risk and Vulnerability

Tornadoes cannot be prevented. Nor can the lightning, hail, and straight line winds associated with a tornado. Currently our response to them is reactive. Instead, we need to develop a proactive plan that reduces the vulnerability of a population in a community struck by a tornado. Attention should be given to:

1. Understanding the vulnerability issues and seeking to reduce vulnerability; increasing resiliency to a tornado disaster

2. Providing education and warning in multiple formats, repeatedly

3. Identification of existing, or creation of new, appropriate shelters. Consider building materials and structural design when constructing homes and shelters or identifying existing locations. Of particular concern was the use of corrugated iron (tin) in structures and its responsibility for causing a large number of injuries and deaths during a tornado. Develop and adhere to governmental mandates. Tested design standards for tornado shelters for a variety of applications are available and are appropriate for use or adaptation in Bangladesh.

Conclusion

Geographical features, population density, poverty, and limited resources pose challenges to Tornado Disaster Risk Reduction. It is hoped that our efforts here these past two days have increased awareness about the devastating effects of tornadoes on the people and economy of Bangladesh. We owe it to those people from the districts of Tangail and Manikganj whose voices we heard on 13 December 2009, as well as to all the people of Bangladesh to move forward, - to guide policies, aid in planning, and implement an effective warning system and a comprehensive tornado preparedness program that will mitigate risks and losses to people and property from tornadoes that strike in Bangladesh.

RECOMMENDATIONS

1. Prioritize tornado disaster risk reduction and integrate it into national policy of the Government of Bangladesh.

2. Obtain commitments of the Government at the local and national levels to implement an integrated action plan for tornado disaster risk reduction in Bangladesh supported by national and international stakeholders.

3. Raise public awareness about tornadoes, their formation, appearance, behavior, and impacts

4. Educate the public about the appropriate actions to take in order to preserve life and property

5. Develop a tornado warning system with improved capacity to identify weather conditions that pose a high risk of tornadoes for early detection

6. Improve capacity to disseminate early warnings to threatened local communities in an innovative way.

7. Identify buildings that would serve as community shelter from a tornado and develop and test an economical household storm shelter for use in Bangladesh.

8. Strengthen the procedures for response preparedness during and after a tornado.

9. Enhance climatological and meteorological research on tornado and develop and maintain a national database of tornado occurrences and their impacts.

10. Conduct a detailed field survey after a major tornado for a better understanding of risk factors.

TORNADO DISASTER RISK REDUCTION FOR BANGLADESH: POLICY ISSUES AND GUIDANCE

EXECUTIVE SUMMARY

Tornadoes are identified as one of the unpredictable localized hazards in Bangladesh. They result in significant deaths and disabilities, loss of income, and destruction of resources. In recent decades, they have drawn little attention, as the emphasis on disaster management has been dominated by floods and cyclones.

More recently, however, tornadoes have drawn more attention. The traditional response has been reactive, the impact of the disaster is responded to after the occurrence of a tornado event. More recent policy recognizes that tornado disasters in Bangladesh, although localized, have a national impact. A local disaster, such as a tornado, seriously damages economic development gains and exacerbates poverty.

While it is highly vulnerable to natural hazards, Bangladesh has a long history of coping with major disasters. Its government and people have a wealth of experience in preparing for, and responding to disaster events. In recent years, Bangladesh has been increasingly recognized as a leader in adopting a more holistic approach to risk reduction (e.g. Comprehensive Disaster Management Programme). Additionally, Bangladesh had actively committed to implement the Hyogo Framework for Action (HFA) which states its vision as, "reduce[ing] the risk of people, especially the poor and the disadvantage, from the effects of natural, environmental, and human induced hazards, to a manageable and acceptable humanitarian level."

With this guiding framework, numerous stakeholders convened in Dhaka, Bangladesh (13-14 December 2009) to discuss methods to mitigate the effect of tornadoes on Bangladesh. Together, they prioritized ten recommendations aimed at strengthening the capacity of disaster management entities at all levels in Bangladesh. The group took into account the existing strengths and weaknesses of the present system. It is their consensus that the following ten recommendations for policy and practice guide the implementation of tornado disaster risk reduction at the local and national levels.

Recommendations:

Governance and Policymaking

1. Prioritize tornado disaster risk reduction and integrate it into national policy of the Government of Bangladesh.

2. Obtain commitments of the Government at the local and national levels to implement an integrated action plan for tornado disaster risk reduction in Bangladesh supported by national and international stakeholders.

Public awareness and education

3. Raise public awareness about tornadoes, their formation, appearance, behavior, and impacts.

4. Educate the public about the appropriate actions to take in order to preserve life and property.

Technological improvements

5. Develop a tornado warning system with improved capacity to identify weather conditions that pose a high risk of tornadoes for early detection.

6. Improve capacity to disseminate early warnings to threatened local communities in an innovative way.

7. Identify buildings in the community that would serve as safe shelter from a tornado and develop and test a household storm shelter for use in Bangladesh.

Recovery and Monitoring

8. Strengthen the procedures for response preparedness during and after a tornado.

9. Enhance climatological and meteorological research on tornadoes and develop and maintain a national database of tornado occurrences and their impacts.

10. Conduct a detailed field survey after a major tornado for a better understanding of risk factors.

This paper was developed as a contribution to the International Forum on Tornado Disaster Risk Reduction for Bangladesh in Dhaka, Bangladesh on 13-14 December 2009, to assist in the deliberations and eventual outcomes of the conferences. It is based on the initiatives and work of many stakeholders including international. national, and regional governments and agencies, local residents, non-governmental agencies, and donors. It remains a work-in-progress, to be developed over time, drawing on the Dhaka forum and other initiatives, and subject to wider input and endorsements, with the goal to encourage stakeholders of all sectors to prioritize tornado disaster risk reduction and to contribute to building global capacities to reduce tornado disaster risks.

1. Tornadoes as a threat to Bangladesh

Bangladesh boasts of the mighty Himalayas to the north and Bay of Bengal to the south. It is a country cross-crossed by an intricate river system, has a complex coastal configuration, and shallow bathymetry, all of which provide an ample supply of warm moist air. Orographic features in the north and east provide cold heavy air, that, mixed with the warm moist air provide the breeding grounds for severe thunderstorms which spawn tornadoes or other strong winds during pre-monsoon (March-May) and post-monsoon (October-November) seasons.

These atmospheric conditions combine to create a rotating column of air that forms a vortex. This vortex, the tornado, descends toward the ground and is characterized by high winds and has a significant lower atmospheric pressure in the center of it. The tornado becomes visible when moisture condenses in the vortex, or dirt and flying debris enter the swirling column. Climate change is expected to increase the frequency and intensity of severe events such as tornadoes.

These severe storms extract their toll on the people, economy and resources of Bangladesh. Tornadoes and thunderstorms rate as one of the major hazards that affect Bangladesh based on the number of casualties and economic losses. They are exceeded only by cyclones and floods. The frequency of tornadoes in Bangladesh is similar to the central United States, and is among the highest in the world. Recent tornadoes killed at least 111 people in Mymensingh and Netrokona districts on 14 April 2004, at least 600 people in the Jamalpur and Tangail districts of Bangladesh on 13 May 1996, and at least 800 in the Manikganj district on 26 May 1989. Local newspapers reported 10,766 tornado deaths during the period from 1961 to 1996.

The stakeholders for this project are numerous and include individuals and agencies at all levels. They include, but are not limited to:

- Local residents
- Local government
  - Union Disasters Management Committee (UDMC)
  - Local police forces
- National government
  - Bangladesh Meteorological Department (BMD)
  - Ministry of Defence
  - Disaster Management Bureau (DMB)
  - Ministry of Food and Disaster Management (MoFDM)

Donors
- Swiss Agency for Development and Cooperation (SDC)
- Japan International Cooperation Agency (JICA)

United Nations
- UN-Habitat
- United Nations Development Programme (UNDP)
- World Meteorological Organization (WMO)
- Economic and Social Commission for Asia and the Pacific (ESCAP)
- International Strategy for Disaster Recovery (ISDR)

Intergovernmental Organizations
- SAARC Meteorological Research Center (SMRC)

Non Governmental Organizations
- Bangladesh Disaster Preparedness Centre (BDPC)
- Bangladesh Red Crescent Society
- SEEDS

Others
- Asian Disaster Reduction Center (ADRC)
- Tokyo Polytechnic University Global COE Program (TPU/GCOE)
- International Association for Wind Engineering
- Researchers
- Teachers and other educators
- Print and electronic media

2. Governance and Policymaking

Given that tornadoes have been recognized as a substantial disaster risk, and that such risks pose an immediate threat to human life, livelihoods and recent gains in the political, social, educational and economic arenas in Bangladesh, it is recommended that:

Recommendation 1. Prioritize tornado disaster risk reduction and integrate it into the national policy of the Government of Bangladesh.

Recommendation 2. Obtain commitments of the Government at the local and national levels to implement an integrated action plan for tornado disaster risk reduction in Bangladesh supported by national and international stakeholders.

Numerous international policy forums have addressed the need to reduce the risk from natural disasters. The programme of the UN International Decade for Natural Disaster Reduction (IDNDR) 1990-2000 and the Yokohama Strategy and Plan of Action in 1994 were the first to provide policy guidance for the mitigation of disasters. They helped shift policy from one of disaster response and rehabilitation to that of prevention and mitigation. The successor arrangement to the IDNDR, The International Strategy for Disaster Reduction (ISDR) was launched by the United Nations in 2000. It aimed to build disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development. The "Stockholm Plan of Action for Integrating Disaster Risk and Climate Change Impacts in Poverty Reduction" in 2007 and the Oslo Policy Forum on "Changing the Way we Develop: Dealing with Disasters and Climate Change" 2008 emphasized the need to systematically integrate disaster risk reduction and adaptation into national development strategies.

The Hyogo Framework for Action 2005-2015, adopted by 168 countries in Japan in 2005, provided a clear mandate for the "substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and states". It identified the main responsibility for the implementation of disaster risk reduction measures to lie with states, but recognized that collaboration and cooperation of other stakeholders, including regional and international organizations, non-governmental organizations, and ISDR systems partners is essential.

3. Public awareness and education

Recommendation 3. Raise public awareness about tornadoes, their formation, appearance, behavior, and impacts.

Tornadoes are atmospheric storms that cannot be prevented. Therefore risk reduction needs to focus on preparedness and reducing the vulnerability of people to the disaster. Education at all levels is the key component to mitigation of risk reduction for tornadoes in Bangladesh.

Already, under the programme memorandum of understanding (MoU) partners are sharing knowledge, resources, and experiences on disaster risk reduction issues. In Bangladesh, textbooks from elementary school to secondary level are beginning to incorporate topics such as disaster risk identification, risk prevention, mitigation, risk treatment and emergency response. The Armed Forces Division is addressing special emphasis on evacuation, search and rescue, emergency relief, and restoration training. Across Bangladesh, universities have identified departments that are key to the development of research, courses, programmes, and degrees in Disaster Management at a University level. Some have programmes already in place.

These efforts will provide an infrastructure to help mitigate the effects of a disaster. However, additional efforts need to be focused specifically on the nature and effects of tornadoes. Stakeholders at all levels, including local residents, social workers, engineers, medical/health experts, emergency personnel, law enforcement, local authorities, relief agencies, non-governmental and non- profit organizations need information regarding tornadoes, how they are formed, what they look like, how tornadoes typically act, and the impacts that result from a tornado.

One practical recommendation is to designate the month of April as "Tornado Awareness Month" because approximately 90% of tornado deaths occur. Various kinds of public awareness campaign could be conducted by a wide range of stakeholders led by the government.

Recommendation 4. Educate the public about the appropriate actions to take in order to preserve life and property.

Because tornadoes cannot be prevented, and warnings of an imminent disaster are precariously short, it is critical that those who are in immediate danger understand the nature and effects of a tornado, as well as the immediate course of action that they need to take to preserve life and property. Information about tornadoes is available through the Red Cross/Red Crescent Societies. It contains specific instructions on actions that can be taken to reduce the impact of tornadoes on the lives of people.

Community level tornado disaster preparedness education has proved effective in both the United States and Japan where tornado pose similar threats to life and property. Studies have shown that informal education in study circles, public talks, leaflets, posters, radio, TV, films, and dramas is a popular and effective means to convey information to people and make them aware and knowledgeable. There is a need to develop severe local storm education materials that

utilize text and visual information about storm appearance and the recommended protective action. Utilize technology as it diffuses among the population to provide varied methods of education.

Education and training is essential in building resilience to a tornado disaster. Education and training need to reach all groups in society, including, but not limited to, students in preschool through higher education, those who are illiterate, those groups that experience political and social discrimination, people with disabilities, women, children, elderly, and volunteers.

4. Technological improvements

Recommendation 5. Develop a tornado warning system with improved capacity to identify weather conditions that pose a high risk of tornadoes for early detection.

A proper and timely early warning system will reduce the loss of lives and properties. This has been demonstrated by the Cyclone Preparedness Programme (CPP). The CPP is a mechanism which relies on technical skills and volunteers to ensure that all potential victims of an approaching cyclone are given sufficient warning to move to shelter. The system starts with the collection of meteorological data by the Bangladesh Meteorological Department (BMD). A warning is issued by the BMD using an extensive telecommunication system operated by the CPP. Additionally, the CPP recruits and trains volunteers, and maintains an active public awareness program. The system has proved effective in mitigating the devastating effects of cyclones. Cyclones, however, have a significantly longer lead time which allows for more time to disseminate a warning. In the case of a tornado, the general population can only be warned minutes in advance, if at all.

In order to provide a more timely dissemination of a warning, they must be able to objectively observe, assess, and generate thunderstorm and tornado predictions, watches, and warnings. Objective, rather than subjective methods are needed to accurately identify weather conditions that are likely to produce tornadoes or other damaging high winds. The BMD must continue to develop their human capacity related to weather analysis and forecasting. Additionally, it would be extremely beneficial to develop a meso-cyclone detection algorithm, possibly modeled after the one being tested in Japan and the United State, to assist in the accurate prediction of conditions that spawn tornadoes. Use of the existing three Doppler radar units would prove beneficial is the detection, monitoring, and forecasting of tornadic events.

Recommendation 6. Improve capacity to disseminate early warnings to threatened local communities in an innovative way.

Early warning is a key consideration to reducing the effects of a tornado disaster. Among patients treated after the 13 May 1996 tornado in Bangladesh, it was reported that 94% of the patients had not known a disaster was imminent. Dissemination of warnings is a challenge in Bangladesh where limited access to electronic media restricts the delivery of severe weather warnings and instructions for safe actions. Rural areas account for 75% of the population and 93% of the area of Bangladesh. In 2005, 44% of residences in Bangladesh had access to electricity, (urban 83%, rural 31%), 11% had access to a mobile phone (urban 27%, rural 6%), 3% had access to a land-line phone, and less than 2% had access to a computer or email. In addition, the rural adult (age 15+) literacy rate of 42% (male 48%, female 36%) limits opportunities for text-based warnings and instructions for safe actions during a warning and after a disaster. Strategies need to be developed, tested, and implemented that overcome these challenges.

Recommendation 7. Identify buildings in the community that would serve as safe shelter from a tornado and develop and test a household storm shelter for use in Bangladesh.

The primary and immediate response to a tornado is to take shelter. Shelters are intended to provide protection during a short-term tornado event lasting not more than a few minutes, though for safety purposes, people may take shelter whenever severe weather threatens and hence may be in the shelter for a couple hours. The shelters are designed to withstand wind, the change in atmospheric pressure that occurs inside a tornado, and wind-borne debris that may exist during a storm. The US Federal Emergency Management Agency (FEMA) has developed guidelines for the design of household and community shelters for tornadoes (published in documents FEMA 320 and FEMA 361). The International Code Council, in collaboration with National Storm Shelter Association, had produced a standard for the design and construction of storm shelters, ICC 500. Many of the criteria for these storm shelters are applicable to Bangladesh.

Storm shelters need to provide safe haven at both a community level, and an individual (family) level. There is very little advance warning of a tornado. While those individuals living in a community setting may have time to reach a community shelter, others, because of lack of time, or because of distance, may not have enough time to reach a community shelter. These individuals would benefit from a smaller, more easily accessible shelter. This shelter would be designed to protect several people, must be affordable, socially acceptable, and easily

constructed out of available materials. A few pilot projects to install such a trial shelter in selected villages would be encouraged as a test case. It would be worthwhile to conduct additional research on the viability of such small local shelters.

The amount of debris in a tornado is a significant concern. Generally the debris consists of failed components of residences and commercial buildings. In Bangladesh, wood and corrugated iron (tin) are a significant cause of death and injury. Storm shelters need to be designed so that the walls and roof can resist this type of debris. Another alternative is to limit the use of corrugated iron (tin) in construction, thereby reducing the threat of it becoming lethal debris.

5. Recovery and Monitoring

Recommendation 8. Strengthen the procedures for response preparedness during and after a tornado.

Response preparedness requires the attention, coordination, and commitment of people throughout Bangladesh. It encompasses all of the aforementioned recommendations. It requires that people, procedures, communication methods, and education and training be in place prior, during, and after a tornado or severe thunderstorm event. A fragmented institutional system without effective coordination and cooperation mechanisms, a lack of political will, and insufficient financial resources present strong obstacles to effectively addressing the effects of a tornado.

This recommendation directly supports the three Strategic Goals set by the Hyogo Framework for Action which are:

a. The more effective integration of disaster risk considerations into sustainable policies, planning and programmes at all levels, with a specific emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction,
b. The development and strengthening of institutions, mechanisms, and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards; and
c. The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected countries.

Recommendation 9. Enhance climatological and meteorological research on tornadoes and develop and maintain a national database of tornado occurrences and their impacts.

The true impact of tornadoes on the people of Bangladesh, their livelihoods, their property, and the resources and economy of Bangladesh is only known in part. There is no formalized procedure to collect, store, and analyze data on the storm event, nor its impact. Data collection, standardization, and dissemination will allow for tracking of trends, measurement of progress on management targets and policies for reducing risk from tornado disasters. Quality information is needed for governments, international organizations, non-governmental organizations, donor agencies, and the private sector to develop plans and strategies and adapt future plans and strategies to tornado events.

The collection of data is also essential to facilitate scientific research that would provide information relevant to the effects of climate change such as the increased frequency, duration, and strength of tornadoes. It would also aid researchers in assessing the effectiveness of strategies in the reduction of social vulnerability.

Recommendation 10. Conduct a detailed field survey after a major tornado for a better understanding of risk factors.

There is much to learn about the people of Bangladesh and their immediate response to an imminent tornado. An individual's response to a tornado is based on a combination of many environmental and demographic factors including place of residence, gender, beliefs and customs, health, education, access to warnings, and access to suitable shelter. Knowing these variable combinations allows those involved in tornado preparedness to understand the appropriateness and effectiveness of policies and resources on the people of Bangladesh and allows for the reduction of risk from tornadoes by changing practices and conditions that aggravate tornado risk.

6. Summary

Bangladesh has among the highest death rates in the world from the hazards of tornadoes, strong wind, lightning, and hail. The magnitude of casualties from all the thunderstorms and tornadoes that occur in a year is nearly equivalent to that of a cyclone in Bangladesh. The crisis that a disaster, such as a tornado, brings to a family or to a community is a leading cause for descent into poverty in Bangladesh. With that in mind, it is easy to understand the need to prioritize risk reduction for tornado disasters.

We are fortunate that a solid foundation of knowledge, an effective organizational network, and international support, particularly from Japan, exist that make possible the development of a successful plan to reduce the risk of disasters resulting from tornadoes. It is through the increased cooperation between technical and political communities that our goal will be achieved.

The people of Bangladesh rely on their resiliency to meet the demands of recovery from a tornado. We need to support them in their efforts by bringing together the relevant policies, stakeholders, technology, early warning systems, education, and procedures to ensure that national disasters as a result of tornadoes are mitigated. The stakeholders attending the International Forum on Tornado Disaster Risk Reduction for Bangladesh are committed to this goal. They seek to progressively refine the perspectives and recommendations set out in this paper and to encourage their endorsement and increasing adoption by relevant authorities at international, national, and local levels. They welcome feedback on this initiative.

INTERNATIONAL GROUP FOR WIND-RELATED DISASTER RISK REDUCTION (IG-WRDRR)

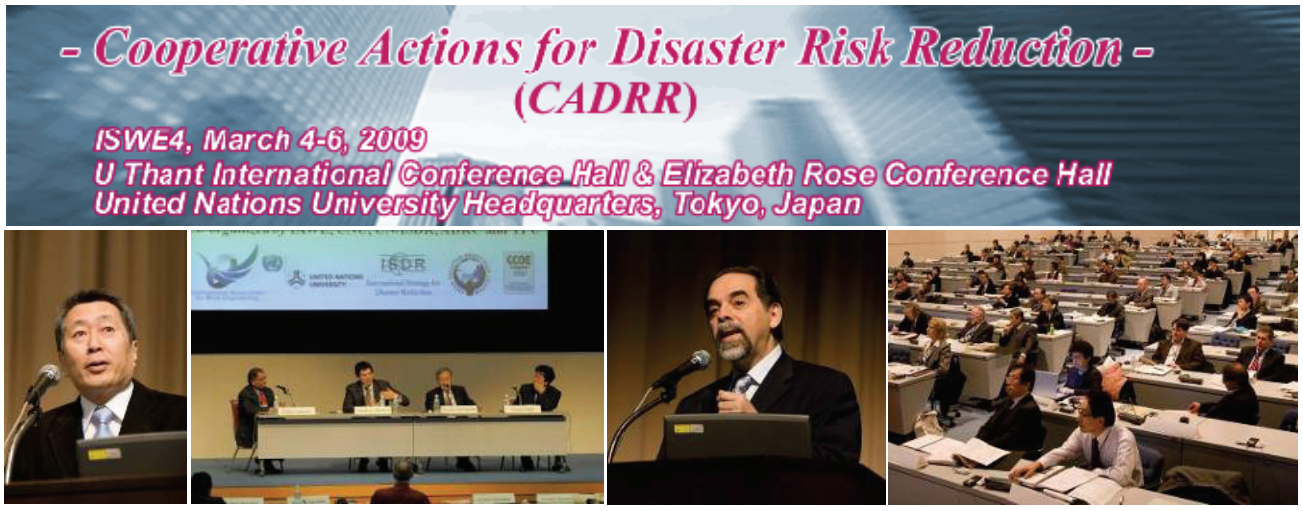
An International Group (IG) for Wind-Related Disaster Risk Reduction (WRDRR) was formally lunched under the framework of UN/ISDR at the Global Platform for Disaster Risk Reduction held in Geneva, Switzerland, during June 16-19, 2009. This Group is responsible for establishing linkages and coordinating various communities to serve as inter-agency coordinators with a charter to work with international organizations involving agencies of the UN and involved NGOs, and to embolden their activities that help to serve as a bridge between policy makers and agencies responsible for actually carrying out the DRR at the local community level. The process that led to the establishment of this Group, the organization, proposed activities and other information of this Group are described below.

1. Launch process

Wind-related disasters such as Cyclone Nargis in Myanmar in 2008 and Cyclone Sidr in Bangladesh in 2007 have had significant impacts on our society, especially in terms of the shocking number of deaths and injuries to people and the attendant property loss. It has been reported that 80-85% of natural disaster economic losses in the world are caused by extreme wind related events, and it is hypothesized that global warming has the potential to further exacerbate this scenario through an increase in the number and intensity of weather-related disasters. However, in the past UN/ISDR (United Nations / International Strategy for Disaster Reduction) framework, there was no professional organization that focused on Wind-Related Disaster. Although some wind-related organizations such as IAWE (International Association for Wind Engineering) have been effectively working to develop technologies, codes and standards for wind hazard mitigation, there has been a lack of coordinated activities among international groups such as the UN and NGOs to bring these technologies to work for less fortunate communities in low lying coastal areas of the world. Unfortunately, these localities are often struck by devastating wind storms such as hurricanes/typhoons that are responsible for escalating loss of life and associated perils they bring to these regions. Former IAWE President Prof. G. Solari and the former IAWE Executive Board realized the necessity of establishing a stable cooperative relationship with the UN, but they were unable to achieve it due to various difficulties. Prof. Y. Tamura, the present IAWE President, considered the establishment of an International Group for Wind-Related Disaster Risk Reduction as an emerging and critical issue to be solved by IAWE and made great and continuous efforts toward achieving that end.

Devastating disasters, e.g., tropical cyclones, are generally accompanied by high waves, storm surge, heavy rains, floods, landslides and lightning. This calls for concerted efforts in pooling of expertise and cooperative actions to reduce losses from various types of natural disasters. Despite recognition of this critical need for cooperative actions in Wind-Related Disaster Risk Reduction (WRDRR) activities among various professional organizations, there has been no notable collaborative effort among the various groups in the past. Thus, IAWE co-hosted a symposium focusing on CADRR (Cooperative Actions for Disaster Risk Reduction) with UNU (United Nation University), UN/ISDR, ADRC (Asian Disaster Reduction Center) and TPU (Tokyo Polytechnic University)-GCOE (Global Center of Excellence) Program. This symposium provided a stimulating

and constructive forum for researchers from various disciplines related to natural disasters, engineers, educators, government officers and citizens specializing in disaster reduction, giving them the opportunity to exchange and share the latest scientific and technical information. It covered all major disasters including strong winds, earthquakes, floods, tsunamis and landslides. The symposium was held at UNU in March 2009 and was a great success.

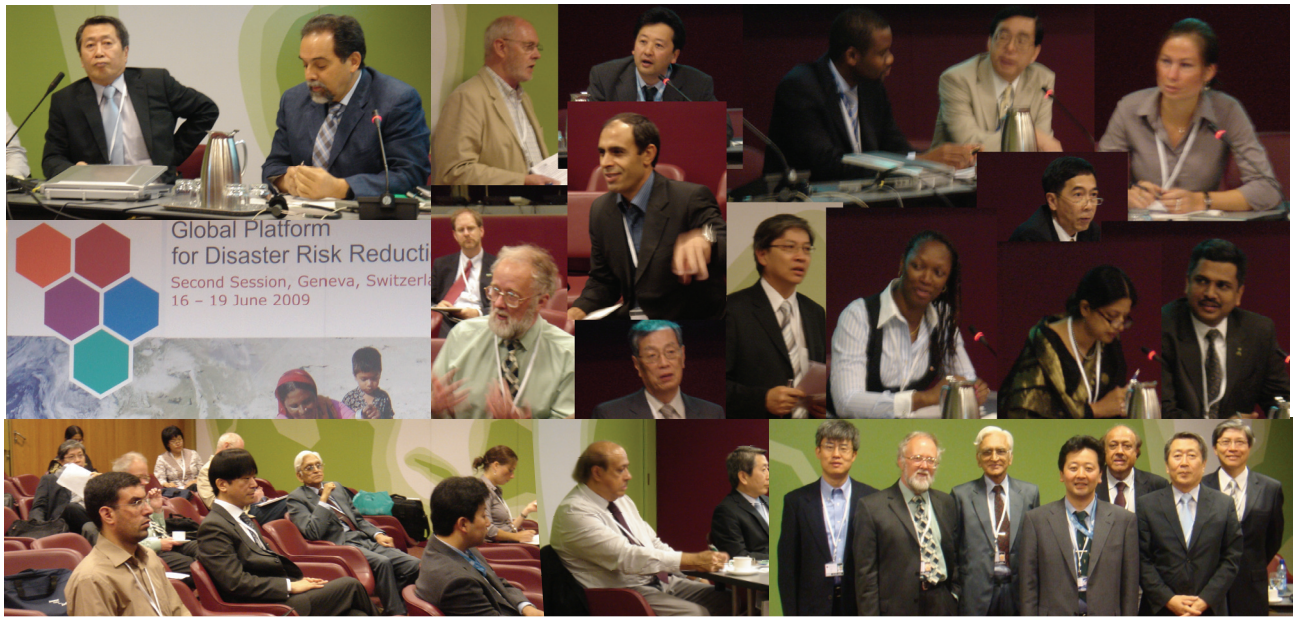


CADRR at UNU in Tokyo, March 2009

During CADRR, the representatives from IAWE, IAEE (International Association for Earthquake Engineering), UN/ISDR, ADRC, WMO (World Meteorological Organization), NOAA (The National Oceanic and Atmospheric Administration) and others reached a consensus that there is a critical need to establish an International Group to work on Wind-Related DRR. Consequently, IAWE, UN/ISDR Secretariat, UNU, TPU-GCOE, ADRC, and SEEDS Asia proposed to hold a Special Event focusing on Wind-Related DRR at the Global Platform for Disaster Risk Reduction, held by UN/ISDR every two years, to formally establish an International Group to discuss and address emerging issues related to wind storms in a global forum with ample opportunities of technology transfer under the auspices of the UN and NGOs.

The session “Launch of International Group for Wind-Related Disaster Risk Reduction” was held from 8:00 to 9:30 on June 17, 2009 in Room 6 of the International Conference Centre Geneva (CICG), as a Special Event of the Second Session of the Global Platform on Disaster Risk Reduction hosted by the UN/ISDR Secretariat. The objective of this Special Event was to launch an International Group (IG) to work on Wind-Related Disaster Risk Reduction. After the opening addresses by the IAWE President (Dr. Y. Tamura) and the Director of the UN/ISDR Secretariat (Mr. S. Briceno), Dr. Tamura introduced in detail the purpose, structure and plan; participating organizations; and possible actions of this International Group. His presentation was followed by a lot of discussions and comments from the IG participants and the audience. The 25 participants in this session were from more than 9 organizations, including IAWE (Dr. Y. Tamura, Dr. A. Kareem, Dr. C. Baker, Dr. K. Kwok, Dr. P. Krishna and Dr. S. Cao), UN/ISDR (Mr. S. Briceno, Dr. Y. Ono, and their colleagues), WMO (Dr. T. Toya and his colleague), ICHARM (Dr. K. Takeuchi and his colleague), IFRC (Ms. J. S. Recass), United Nations University (Ms. K. Teichman), ADRC (Dr. K. Suzuki), SEEDS (Mr. M. Gupta, Ms. E. Tsunozaki) and the Bangladesh Disaster Preparedness Center/ Bangladesh Disaster Management Bureau. Dr. A. Kareem chaired the discussion of this session.

Global Platform for Disaster Risk Reduction, Second Session, Geneva, Switzerland, June 2009



Special Event to launch IG-WRDRR at Global Platform, Geneva, Switzerland, June 2009

The Special Event facilitated launching of IG-WRDRR. The participants representing different groups and organizations overwhelmingly embraced the establishment of IG-WRDRR and promised their cooperation and collaboration in ensuring its success in achieving its goals. The IG-WRDRR promised to establish linkages and to coordinate various communities to serve as inter-agency coordinators with a charter to work with international organizations involving agencies of the UN and involved NGOs, and to empower them with the responsibility to serve as a bridge between policy makers and agencies responsible for actually carrying out the DRR at the local community level. Several key questions were raised during the discussions on how to apply mitigation technologies to housing in coastal regions such as Bangladesh; the need to work collectively in wind and water hazard areas, localized wind storms such as tornados, and the enforcement of building codes, and the need for education on wind related hazards. The main challenges were identified as follows: Bridging the gap between policy makers, technology experts and groups responsible for implementation; knowledge / technology transfer to local communities;

and the impact of climate change on wind related hazards. Accordingly, proposed solutions to these challenges were: to enhance interactions among the three associated groups through IG-WRDRR; to improve knowledge/technology transfer through workshops, training programs and cyber-infrastructure under the auspices of IG-WRDRR; and to improve understanding of the impact of climate change on the frequency and intensity of wind storms (through closer interactions with IPCC and WMO).

2. Organization of IG-WRDRR

The current organization of IG-WRDRR is as follows:

Chairman	Yukio Tamura (President of IAWE)
Vice Chiarman	Yuichi Ono (UNESCAP)
	Filipe D.F. Lucio (WMO)
Secretariat	IAWE Secretariat
Members	IAWE (International Association for Wind Engineering)
	WMO (World Meteorological Organization)
	ICHARM (International Center for Water hazard and Risk management)
	UNESCAP (United Nations Economic and Social Commission for Asia and Pacific)
	UN/ISDR (United Nations Secretariat of International Strategy for Disaster Reduction)
	ADRC (Asian Disaster Reduction Center)
	UN-Habitat (The United Nations Human Settlements Programme)
	IFRC (International Federation of Red Cross and Red Crescent Societies)
	UNU (United nations University)
	SEEDS
	ADRRN (The Asian Disaster Reduction and Response Network)

Secretariat of IG-WRDRR:
IAWE Secretariat, c/o Wind Engineering Research Center, Tokyo Polytechnic University
Iiyama 1583, Atsugi-shi, Kanagawa 243-0297, Japan
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Following the launch of IG-WRDRR, the IAWE established a Working Group inside IAWE to work on WR DRR.

3. Activities of IG-WRDRR

IG-WRDRR is responsible for establishing linkages and coordinating various communities to serve as an inter-agency coordinator with a charter to work with international organizations. It will serve as a bridge between policy makers and agencies responsible for actually carrying out DRR at the local community level. All the efforts of IG-WRDRR are directly related to the implementation of the Hyogo Framework for Action in the area of wind-related disaster risk reduction. The main

expected activities of the International Group for Wind-related Disaster Risk Reduction include:

- to implement the Hyogo Framework for Action in the area of wind-related disaster risk reduction;
- to establish a database/warehouse of the latest information/technologies relevant to wind-related effects and their mitigation;
- to facilitate technology transfer that attends to the needs of local communities exposed to disasters around the world;
- to provide assistance to international organizations in the preparation of guidelines to manage the impact of wind-related disasters including evacuation, recovery and reconstruction;
- to organize, dispatch and facilitate ground logistics for quick-response post-disaster investigation teams;
- to establish an international consensus for extreme winds based on damage relevant to different construction practices;
- to establish international guidelines to prepare for wind-related disaster reduction activities;
- to harmonize wind-loading codes and standards including environmental specifications;
- to facilitate development of a global Engineering Virtual Organization (EVO) for Wind-Related Disaster Risk Reduction; and
- to hold regular international workshops/conferences on WR DRR. For instance, the International Forum on Severe Local Storm Disaster Risk Reduction for Bangladesh was scheduled in 2009.

Discussion on the work of IG can be carried out through the existing platforms established by IAWE, including VORTEX-Winds and APEC-WEN anytime, or at APEC-WW every year, or at GP every two years or at ICWE, Regional CWEs every four (two) years. Organized post-damage activities can be coordinated through these platforms to avoid overlapping disaster investigations and excessive rescue supply, which often become a burden for local communities amidst a disaster. In addition, education and transfer of advanced wind hazard mitigation technologies to developing typhoon/cyclone-prone countries can be carried out through these platforms. The output of this group will be reported at GP every two years.

As shown above, there is a critical need for collaboration between academic organizations and international organizations/local communities/NGOs fighting at the forefront for DRR. IAWE is indeed very pleased to share its knowledge and information base and its resources concerning wind damage mitigation to the society in mitigation efforts. The progress of IG-WRDRR will be uploaded to its official website at http://www.iawe.org/WRDRR/ in time.

Organizing Committee

Yukio Tamura (Chairman, IAWE, TPU)
Taiichi Hayashi (Kyoto U)
Tom Schmidlin (Kent State U)
Kishor Mehta (TTU)
Masashi Kiguchi (U. of Tokyo)
Masahiro Matsui (TPU)
Shuyang Cao (Tongji U)
Yusuke Yamane (Kyoto U)
Etsuko Tsunozaki (SEEDS)
Yuki Matsuoka (UN/ISDR)

Yuichi Ono (Vice-Chairman, UNESCAP)
Md. Farhad Uddin (DMB)
Muhammad Saidur Rahman (BDPC)
Atsushi Koresawa (ADRC)
Noburu Uchiyama (ADRC)
Filipe D.F. Lucio (WMO)
Tokiyoshi Toya (WMO)
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