Proceedings of the Conference

Climate Change and Extreme Cyclones

Regional Conference on Disaster Risk Reduction and Emergency Response in a Rapidly Changing World

17-18 February, 2010
Lake Shore Hotel, Dhaka, Bangladesh

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Table of Contents

Climate Change and Extreme Cyclones:
Regional Conference on Disaster Risk Reduction and Emergency Response in Rapidly Changing World

1. Introduction

Asian Disaster Preparedness Center (ADPC) and Bangladesh Disaster Preparedness Center (BDPC) in collaboration with the Ministry of Food and Disaster Management of Bangladesh has organized a regional conference on 'Climate Change and Extreme Cyclones' highlighting disaster risk reduction in the paradigm of climate extremes inflicted scenarios of the Asia and the Pacific regions. This regional conference was held in Lakeshore Hotel and Apartments, Dhaka, Bangladesh on 17 – 18 February, 2010.

The conference was a review of cyclones and related impacts embedded with the climate change, which demands a much needed actions before further aggravation. The symposium was a forum to share practical, analytical and research based studies executed in the region by disaster professionals, academia, community based organizations, international organizations and various other groups working in the field of disaster risk reduction.

The conference was supported through the Program for Hydro-meteorological Disaster Mitigation in Secondary Cities in Asia (PROMISE) and Risk Assessment Project with the Norwegian Geotechnical Institute (NGI). The PROMISE program is being implemented by the Urban Disaster Risk Management (UDRM) team of ADPC with the financial assistance of the Office of Foreign Disaster Assistance of the US Agency for International Development (OFDA/USAID) since early 2006. The PROMISE program, initiated in six countries in South and South East Asia have been successfully achieving its strategic visions with the goal of reducing vulnerability of urban communities by adopting specific Hydro-Meteorological preparedness and mitigation measures. PROMISE program cities of the program are Chittagong and Jamalpur in Bangladesh, Jakarta in Indonesia, Hyderabad in Pakistan, Dagupan and Pasig in the Philippines, Danang in Vietnam and Kalutara and Matara in Sri Lanka.

The Risk Assessment project will be executed in close collaboration with Norwegian Geotechnical Institute (NGI) and Center for International Studies and Cooperation (CECI) with World Bank funding. The study will be carried out in close association with relevant government institutions such as Department of Hydrology and Meteorology, Ministry of Environment, Science and Technology, Nepal etc. and other stakeholder institutions. The project for Nepal is to develop a synthesis report on Nepal's major hazards, carrying out desk review of already available reports, carry out an assessments of vulnerability to natural hazards, potential losses at the national and sub-national levels, to develop a detailed economic analysis using loss probability modeling of the country's risk with projected economic losses form forecasted hazards, and map high risk geographic regions.

Aim and objectives

The aim of the conference was to present the potential relationship of devastating cyclone events with the global phenomena of climate change and its impacts on the society and development initiatives. While examining the probable consequences of extreme cyclones, the conference led to emphasize the need for effective risk reduction interventions which include early warning,

community preparedness, emergency response, and recovery interventions, etc. in the changing socio- economic culture.

The specific objectives of the conference were:

(1) To capture lessons from recent tropical cyclones.

(2) To understand the implications for disaster risk reduction of the climate change scenarios.

Participation

More than hundred of disaster management practitioners, professionals, policy makers, researchers, academicians, scholars, students, etc. from Europe, Australia, Asia and the Pacific regions were participated in this regional conference. The majority represented institutions were from Bangladesh. They represent eminent agencies such as UNDP, SAARC Disaster Management center, Bangladesh Red Crescent Society, Bangladesh University of Engineering and Technology, (BUET), Dhaka University, Health Dept., Bangladesh, University of Khulna, Muslim AID, Islamic Relief, CARE Bangladesh and many others. The detail list is in annexure **1**

2. Proceedings

The conference comprised of inauguration, two plenary sessions, six thematic sessions and the closing sessions: The detail programme is in the annexure **2**

Day 1 :

Inaugural Ceremony & Opening Plenary Speeches

Testimony

Plenary 01- Climate Change Scenarios and their Implications for Disaster Management and Emergency Preparedness

Thematic Session A - Climate change induced extreme cyclones and community preparedness – How ready are we?

- Cyclone Nargis, Myanmar: Lessons learned
- Analysis of climate change phenomena in Bangladesh
- Changing the agricultural habitation and adapting innovative farming practice in the coastal zone in Bangladesh
- Local strategies to live with cyclones in coastal areas of Bangladesh
- Impacts of climate change: An overview on cyclones on some selected coastal areas of Bangladesh
- Preparedness mechanism to minimize the disaster effects in the coastal area: A study on Latachapali

Thematic Session B - Climate change scenarios and the potential social impacts

- Projected risks to health associated with climate change
- Climate change and impact of cyclones on public health: Bangladesh
- Evaluation of water supply facility in the cyclone shelters and examine the feasibility of rainwater as an alternative source

- Climate change scenarios and its impacts on the livelihoods of affected people in coastal Bangladesh
- Climate change in Bangladesh, rural livelihood and impact on cities
- Coastal ethnic minorities' capacity to address the post disaster effects of cyclone and storm surge on livelihood: A study on Rakhain community of Lotachapli Union
- Vulnerability of Chittagong to climate change and future challenges for planning and development
- Climate Change in Bangladesh: Implications for Public Health

Thematic Session C - Information technology for reducing disaster risks from climate change

- Cyclone wind hazard assessment in coastal Bangladesh
- Monitoring cyclone Aila and its impact in Bangladesh
- Inundation risk map developed by past storm surge modeling of the coastal region of Bangladesh
- Improving Early Warning Dissemination System at Receiver's End: Experience on Community Based EWDS

Day 2:

Plenary 02 - Approaches for Improving Disaster Risk Reduction and Community Adaptation

Thematic Session D -Policy Advocacy for Climate Change Adaptation

- Linking disaster risk reduction to climate change adaptation
- Mainstreaming disaster risk reduction in Bangladesh
- Critically appraising the issues pertinent to implementing carbon-neutral urban development

Thematic Session E - Climate Change Adaptation and Institutional Development

- Sustainable Approaches to Disaster Risk Reduction & Community Adaption to Climate Change
- Disaster risk reduction and climate change education and research in Bangladesh - A progress report
- Local governance for disaster risk reduction
- Climate change adaptation for cities
- Problems and issues of climate change in Bangladesh – Does this matter to urban local governments?

Thematic Session F - End-to-End Early Warning

- End-to-end early warning system: Location specific user- relevant tools for reducing disaster risk
- Improving early warning dissemination system at receiver's end: Experience of a community based EWDS in Bangladesh
- Integrating local knowledge and informal practices with early warning system for disaster risk reduction
- Hydro-meteorological study of Sunamganj and surroundings for forecasting flash flood early warning

- Climate change and the behavior of cyclonic storm formed in the Bay of Bengal and crossed Bangladesh coast

Closing Session

- Report to the Plenary on the outcome of the sessions
- Panel Discussion: "A focus on building climate resilient communities. What should be the future strategy?"

2.1. Inauguration

The Honorable Minister for the Ministry of Food and Disaster Management (MoFDM) of Bangladesh, Dr. Muhammad Abdur Razzaque graced the auspicious inaugural ceremony as the chief guest to initiate the conference. H.E. Dr. Stefan Frowein, Ambassador and Head of the Delegation of European Commission to Bangladesh paid his kind presence as the guest of honor in the conference. Dr. Bhichit Rattakul, Executive Director of ADPC addressed the welcoming speech highlighting the significance of the conference. The session was chaired by Md. Mokhlesur Rahman, Secretary of the Disaster Management and Relief Division under MoFDM

In his speech, the Honorable Minister mentioned that Bangladesh is one of the worst victims of climate change phenomena and one of the highly cyclone susceptible countries in the Asian region. He presented some sad memories of devastating cyclone in Bangladesh since 1970. The Honorable Minister also highlighted the experience of Bangladesh in managing hydro-meteorological disasters as a growing example to countries in the region. He wished that by sharing experience from different countries through this conference, each country of the region would be benefited in terms of improving their own disaster management system to tackle the climate change induced disasters in the future. He also believed that the conference would come up with suggestions which could be useful to fight against climate change realities especially to fight against 'super cyclone'.

2.2. Testimony

The testimony was to have a good understanding on risk dynamics and disaster risk with poverty interactions. For the testimony, six (6) selected community representatives from categories of different livelihoods were invited. They have a background of being victimized by the cyclones and climate change impacts. They were: a tailor, a fisherman, a house wife, boutique keeper, a community leader and a vendor. They came from a coastal area in Bangladesh. Experiencing a number of cyclones, floods and storm surge, they, their fathers and grand fathers had to take decisions to mange their risk on housing and livelihood, understanding the short term and long-term implications they were facing or presently facing. Some have taken the challenge and accepted high level risks and losses by changing the livelihood for high income generation activities either living in the same area or migrating to cities. Some are continuing the same way of living with less income and increased poverty. Predominant farmer families from this community are now occupying with other trades or moved to higher and interior of the country to continue their agricultural living. Salinity intrusion into the land made life difficult due to the scarcity of drinking water. After floods and cyclones and salinity intrusion, farmer families had to abandon agricultural lands and were compelled to seek for alternative ways of livelihood.

2.3. Plenary 01- Climate Change Scenarios and their Implications for Disaster Management and Emergency Preparedness

The session was co-chaired by Ahsan Zakir, Director General for Disaster Management Bureau of Bangladesh and Dr. Bhichit Rattakul, Executive Director, ADPC

Dr. Tore Furevik, Bjerknes Centre for Climate Research (BCCR): *Climate change over Central and South Asia and implications for Bangladesh:* The rate of CO_2 emission has risen from .9% per year during 1990 – 99, to 3.4% per year during 2000 – 08. The T^0 changes over the century shows a rapid increase in the end than during early years. Bangladesh is having $2 – 3^0$ degrees higher than the normal. It is also observed a monsoon– seasonal migration of the rain belt: i.e. drier winters, wet summers and large uncertainties. As a result of warmer and dryer climate, permanent droughts may occur. In addition, due to glacier melting and discharge, the sea level rise will be accelerated and the glaciers in Himalayans are in the rapid decay. His presentation was about how the IPCC report has been refuted by a later study showing that the Himalayas are NOT rapidly melting. The melt will results in more floods of rivers originating from the Himalayan thereby more floods in Bangladesh. During the next few years, more collaboration is expected from Bangladesh – Norway relationship in the field of disaster management.

Dr. Senaka Basnayake, SAARC Meteorological Research Center (SMRC): *Tropical cyclone prediction and activities of SAARC Met center*: Many studies and scientific research are carried out by the SMRC based on the past events including the cyclones affected SAARC countries. Simulations of extremes cyclones are also in the research modelling with approaches of different models. Bangladesh is the worst hit countries in the region and will be benefitted from the ongoing modelling.

Dr. Ren Fu Min, National Climate Center (NCC) Beijing: U*ncertainties in Climate change of tropical cyclone activities and response strategy:* With the extensive research on tropical cyclones using the data ranges from early in twenties, the NCC studies differences among different Datasets such as JTWC, JMA, CMA. The objective is to establish documents and observations for the datasets and to compare differences in tropical cyclone intensities and locations. With the developed scenarios and models, it is predicted that the frequency of North western pacific typhoons decreases while the number of strong typhoons, typhoon precipitation and winds are in the increase. The Center expects to strengthen climate monitoring, prediction, data service and training in Asia.

2.4. Thematic Session *A*- *Climate change induced extreme cyclones and community preparedness – How ready are* we?

The session was chaired by Mr. M.A. Wazed, Joint Secretary, Ministry of Food and Disaster Management and co-chaired by Mr. Mehedi Ahmed Ansary, Professor, Bangladesh University of Engineering and Technology (BUET). Six papers were presented during the session from researchers, professionals, academicians and graduate students

Mr. Sudhir Kumar (ADPC): *Lessons learnt from Cyclone Nargis*: A category 111 cyclone cost 150,000 lives, 2.4 million affected and USD 4.1 billion losses. With the reliable early warning and prediction, transformation of the powerful cyclone was observed on 29th April 2008 and warned the authorities. The message timely disseminated through newspapers, TV and radio, but the interpretation by larger groups, action by target groups and activation of support systems were in barely existence. Studies reveal that the loss of mangrove and forests was one of the reasons to

spread the cyclones in interior. Institutional framework with the support from ASEAN and UN was established and the physical social and livelihood recovery programmers are being executed.

Md. Saidur Rahman : *Analysis of climate change phenomena in Bangladesh*: Facts are there in Bangladesh that there were 6 severe cyclones during the last 25 years, saline water intrusion scaled up to 150 km in coastal areas, about 7 to 16% of the land will submerge due to sea level rise etc. Damages to coastal polders, embankment failures lead the devastation severe during the Aila and Sidr cyclones. Presently, Bangladesh Climate Change Strategy and Action Plan (BCCSAP) is taking steps to repair and maintain flood embankments, cyclone shelters and coastal polders for adaptation for floods, cyclones and storm surges. These tasks should be carried out with proper laboratory tests for soils and compaction of embankment with a comprehensive survey on conditions of polders.

Md. Imran Reza (SAFE) *Changing the agricultural habitation and adapting innovative farming practice in the coastal zone in Bangladesh:* Agriculture is the worst suffering sector due to climate change. With research experience, certain recommendations were made for adaptation in flood prone areas: double transplanting system, floating seedlings, selecting crops which ripe before flood season, rainwater harvesting and drought friendly fruits were some of them. For adaptation in salinity intruded areas, use of high yielding salinity tolerant rice, potato cultivation over double layers of water hyacinth and straw, use drip irrigation, relay cultivation are possible adaptations.

Bishawjit Mallick (KIT): *Local strategies to live with cyclones in coastal areas of Bangladesh:* The study was conducted to understand the coping strategy through a field survey and a desk study. Though people know how to protect materials, 50% do not take any step. For sheltering, 20% did repairs and adopt safety measures, 20% tied their houses to the ground and 45% did not plan to protect their houses and but waiting for AID and relief distribution which was bias. However, young/ educated people will invest on housing while 31% of illiterate do not wish to spend money on safe housing. Need arises to provide equal access to all services and to have more awareness on safe housing and encouragements.

Md. Bayzidul Islam (GSRC): *Impacts of climate change: An overview on cyclones on some selected coastal areas of Bangladesh*: A study in three unions in Kalapara Upazila of Patuakhali district was carried out and the losses were compared on the basis of social and economical factors. Stressing the need for coping mechanism for coastal people,

Mahfuja Sultana (Khulna University) *Preparedness mechanism to minimize the disaster effects in the coastal area: A study on Latachapli Union:* The study was on structural intervention as preparedness and mitigation measures during the last few years. Though actions were taken, only 87% of displaced can be accommodated in cyclone shelters and shelters are often over crowded. 50% of victims were without proper sanitation facilities. On infrastructure, 67 % Katcha roads were damaged. 45 km long embankment was badly damaged and no action has been taken to repair. In the study area, one Killa covers five acre of land and to maintain killa, govt has not taken actions as it does not belong Govt. 72% of people who need killas to be used , had to walk about 2 km distance from killa which made difficult to evacuate cattle in time. However, it is needed to accelerate the measures.

Summary of discussions

Being inherited the most vulnerable geographically lactation in the Indian Ocean, Bangladesh experiences gradually increasing intensities and frequencies of heavy rain falls and severe cyclones

during the last four decades. In terms of social needs, livelihood, health, sanitation, food, education etc. are apparently affected basic needs of the community. SIDR and Aila are the examples of such scenarios. A large number of people are forced to migrate from the affected areas to urban/city areas, had to start living in miserable conditions than before and ultimately creating the unhealthy environment for the cities as well. These affected people are also forced to change their occupation in order to earn their provisions. Among the affected people, women and children are most vulnerable to the effect of cyclone. A number of cases show that the effect on women during and after cyclones, are far deeper than men are facing.

Way forward

It is important to find out the local strategies and adopt it to cope with the climate change induced extreme cyclones. Innovative coordination mechanism is also requires for response and recovery. In addition to the professional and technical inputs on structural and nonstructural interventions in preparedness, it is significant to understand the socio- cultural dilemma among Bengali community. Suitable strategies should be adopted to instill the ideas on long-term preparedness measures rather than short term based relief and aid.

2.5. Thematic Session B: *Climate change scenarios and the potential social impacts.*

The session was chaired by Mr. Aminul Islam, Assistant Country Director, UNDP Bangladesh and co-chaired by Md. Kamaruzzaman, Senior Mission Engineer, USAID, Bangladesh. Eight papers were presented during the session from researchers, professionals, academicians and graduates.

Esther Lake (ADPC): *Projected risks to health associated with climate change:* The climate change impacts are transmitted through direct and indirect exposures such as water, food, ecological changes etc. and social and economic disruption causing health impacts. Consequences maybe seen as short and long-term with primary and secondary effects such as Cholera, leptospirosis, malnutrition, mental disorders. Surveillance and monitoring capacity and building a strong and resilient public health system are the keys to reducing risks.

Dr. Zahidur Rahman (NIPSOM): *Climate change and impact of cyclones on public health: Bangladesh:* From the health administration aspects, a structure has been established for immediate health needs and to prevent spreading communicable diseases. However, for post disaster psychological trauma, there is no solid programme is being established.

Abu Hena Mustafa Kamal Sikder *Evaluation of water supply facility in the cyclone shelters and examine the feasibility of rainwater as an alternative source*: Based on a study conducted in 7 sub districts of Cox's Bazar, it was revealed that facilities of 60 cyclone shelters constructed by International Fund for Agriculture Development in 1992 – 93 and by Red Crescent in 1988 – 93 are badly dilapidated. Many of the shelters are beyond use with depreciated welfare facilities

Dr. Khondoker Mokaddem Hossain and Dr. Mahbuba Nasreen (University of Dhaka) *Climate change scenarios and its impacts on the livelihoods of affected people in coastal Bangladesh*: Risks for fishing families living in river islands is getting increased. Information on climate change are not shared or no access among the grassroots level. Due to disasters, health risks on malnutrition and diarrheal diseases increase. The risks on rising salinity, led reduced crop yields and scarcity of drinking water making hardship for women who collect water. This social disruption need to be addressed with cross boundary water issues with Ganges and broaden policy framework.

Dr. Akhter Husain Chaudhury: *Climate change in Bangladesh, rural livelihood and impact on cities:* Due to the 70% of landless and scarcity of employment in rural areas, after every cyclone like Aila and Sidr, rural population migrate to cities despite the strong resilience in rural areas. Inadequate investments on infrastructure and services and management failures in rural areas are the reasons for the migration and Govts fail to resolve the problems.

Abir Ahammad, Talukdar: C*oastal ethnic minorities' capacity to address the post disaster effects of cyclone and storm surge on livelihood: A study on Rakhain community of Lotachapli Union*: Minor groups of ethnic communities do not get enough focus by authorities making them more vulnerable. Due to their socio- cultural traits, linguistic and religious sensitiveness, the study on 8 such villages reveals that some use local technology for windbreak construction. However, they are treated with stepmother treatment by local administration as well as the landlords by forcible acquiring the land etc.

Dilara Mehrab Arif et al, (Khulna University): *Vulnerability of Chittagong to climate change and future challenges for planning and development:* Chittagong with its industries of pulp and paper, textile, fertilizers, chemicals, oil refinery etc. and increase of poorly maintained automobiles make the city more polluted. Further, the studies show a gradual increase of temperature with warmer summer days and winters. It is necessary for a planned intervention at national and local level with coordinated responses which can reduce the vulnerability and the impacts by establishing a structure of technical and administrative bodies.

Prof Dr. Anwar Islam (BRAC University): *Climate Change in Bangladesh- Implications for Public Health:* Due to sea level rise, salinity intrusion, floods, cyclones drought etc., mostly the poor living in the coastal areas have potential health threats. These are on safe drinking water, sanitation, psychological stress, malnutrition and resurgence of communicable diseases, food insecurity and climate refuges. Suggested measures to be adopted are reduced wastage on water and energy, structural measures for flood protection, drought resistance crops, change of life style and new technology for irrigation. However, major drawbacks are due to neglecting environmental health, lack of skills, centralized decision making and low priority for research.

Summary of discussions

The papers presented in this session were analyses of different aspects of extreme cyclones and community preparedness on social and health related issues. They are to reduce the risk, impacts on social fabric and environment, to adapt local strategies to live with cyclones, to use locally adopted shelters such as by Rakhayeen community in the coastal belt, to design and learn on materials used by different NGOs to adopt suitable model for shelter, to change livelihood pattern, etc. The findings also showed obstructions to improve locally adopted shelter structures due to cultural ego of Bengali Community and the shelter model of NGO was not affordable for marginal farmers and poor. The other important issue was on the community dependency on Relief and Aid. There is a strong economic dependency rather than mental or attitudinal dependency. People who are most vulnerable require support from the government and development organizations to BUILD BACK BETTER.

Way Forward

It requires proactive initiatives to reduce the present vulnerability due to the effect of cyclone. Women and children needed to be addressed with special attention and on priority basis.

2.6. Thematic Session C: *Information technology for reducing disaster risks from climate change*

The session chaired by Dr. A.S.M. Maksud Kamal, National Expert, CDMP and co-chaired by Dr. Fumin Ren, Professor, NCC, Beijing. Four papers were presented during the session from researchers, professionals, academicians and graduate students

Kazi Nusrat Jahan, et al: *Cyclone wind hazard assessment in coastal Bangladesh*: A study aimed at probability of cyclone occurrences with the maximum wind speed in different regions. A simulation has been developed using a scientific method on cyclone and wind analysis and assessing the hazard with data from 1960 to 2007 and in some occasion from 1877. Used variables were wind speed, track speed, radius of max speed, cyclone track etc. Probabilistic analysis shows that cyclones of wind speed 40 m/s will occur in every five years and wind speed of 66 m /s has a return period of 40 years. The study developed probable return periods for six coastal sub-divisions. Study recommends to use Monte Carlo simulation for storm surge and urges the need of disaster planning, early warning and mitigation, improvements to Building code and resource allocation by the authorities.

Mehrunnessa et al (Space Research and Remote Sensing Organization): *Monitoring cyclone Aila and its impact in Bangladesh:* The research organization monitored Aila, tried to delineate the affected areas caused by the storm surge and delineated the most affected districts with MODIS time series data. Analyzing the air pressure, wind speed and direction, results were obtained. However, the team recommends further expansion and advance forecasting using developed software, need of microwave data to delineate inundated areas, high resolution satellite data like QUICK BIRD and the availability of funds to procure high accurate data.

Prof. A. S. M. Maksud Kamal (UNDP)*: Inundation risk map developed by past storm surge modeling of the coastal region of Bangladesh:* With an analysis of socio economic importance and vulnerabilities of coastal area of Bangladesh and using scientific models, a study was done exhibiting cyclone modelling, tidal movement model, and inundation forecasting with details of area. The highest inundation depth of 5 – 7.5 m lies within Maghna Estuary area and eastern coast and western coast with depths of 4 – 6m and 3 – 5 m respectively. Adaptation measures for reducing damages are building resilient communities, environment friendly coastal polders, EWS for cyclone and storm surge inundation and cyclone shelters

Md. Rejaur Rahman et el (Khulna University) : *Improving Early Warning Dissemination System at receiver's End: experience of a community based EWDS:* The research was carried out to develop an effective all hazards EWS for easy and effective interpretation in Assasuni, Shatkhira. Considering the hazard profile of the area, common cyclone path, existed EWS and dissemination tools, a social survey has been conducted and a EWDS developed. The EWDS is a combination of SMS and public address system strengthened with community and school level training, a mock exercise, and awareness campaigns.

Summary of discussion

The papers presented in this session were analyses of different aspects of disaster risks related to climate, such as trends of cyclone frequencies, cyclone impacts, hazard assessment, and the development of disaster risk indices for Reducing Disaster Risks from Climate Change. The studies were based on scientific models and developed technology on information and communication

Way forward

Better datasets, better data collection instruments and systems are required for enhanced disaster risks reduction from risk reduction on climate change.

2.7. Plenary 02 : *Approaches for Improving Disaster Risk Reduction and Community Adaptation*

The session was chaired by Dr. Mihir Kanti Mazumder, Secretary, Ministry of Food and Disaster Management and co-chaired by Dr. Tore Furevik, Scientist, BCCR

Dr. Bhichit Rattakul, (ADPC): When facing disasters, the developed countries have high economic losses with low deaths and developing countries face high rate of deaths with less economic losses. Main problems to be addressed due to climate change are the improvements for infrastructure and livelihood development. To deal with them, many developing countries do not have sufficient resources. Sharing experience of the Bangkok Metropolitan Authority, BMA too face the climate change impacts due to sea level rise. The average rainfall in Bangkok of 1500mm/ year is now increasing. During floods, earlier BMA used to lay sand bags along both sides of the 80 Km long Bangkok River and it was a temporary measure. When the decision was taken to permanently erect 2.5 m high dykes people were opposing and BMA had to convince people prior to taking tough decision for long term measures.

Film on Dagupan – It shows the converting the city to a safer place to live by adapting appropriate measures for disaster risk reduction with a community based approach. .

Dr. Jayaraman Potty, (ADPC): The science of Genesing movement of cyclones, detection of cyclones, cyclone simulation, cyclone and Cyclogenesis are key instruments for EWS. When pressure and wind distribution is getting increase, cyclones occur with characteristics of sudden pressure drops, maximum sustained wind, high radius of max wind and cyclone tracks with rain fall. For simulation, WDF model is used with data on rain fall and wind forecast. Nargis, Aila, Parma and GONU were perfectly forecasted cyclones during the recent past. Generating cyclones largely depends on the sea surface temperature (SST). Past records for 1901 – 2009 show that the number of minor cyclones is in decrease where as the number of severe cyclones are in the increasing trend. With more reliable data and information, simulations can forecast cyclones with more accuracy, on the timely manner and the exact geographical locations. In addition, prediction of generating location and exist location also can be predicted. Nargis was a good example of well advance warning of 5 days ahead with accuracy on the severity, but without adequate preparedness and dissemination mechanism, the disaster impacts was colossal.

Dr. Atiq Rahman, (BCAS) ; The world is facing the increase of CO_2 percentage in the atmosphere and 1 m rise of sea level for the next 50 years. People get prepared for cyclones as within short period losses will occur with huge impacts. As the climate factors take longer periods, people are getting accustomed to and disregard the preparedness needs. The danger lies here as the atmosphere and environment are changing over the period. The main courses for Bangladesh being flooded are the complex river system in Himalayas, melting glaciers, changing eco- systems and social behaviors.

2.8. Thematic Session D: *Policy Advocacy for Climate Change Adaptation*

The session chaired by Dr. Khondoker Mokaddem Hossain, Director, Center for Disaster and Vulnerability Studies, University of Dhaka. Five papers were presented during the session from researchers, professionals, academicians and graduate students

Atiq Kainan Ahmed, (ADPC): *Linking disaster risk reduction to climate change adaptation:* In the region of Asia, hazards events are on the increase where as adaptive capacity is not increasing to the trend required. The warning duration for different stages of developing a cyclone highly matters to the vulnerable teams to decide on the activity to be chosen. The flow of end to end climate information generation and application need to be established. For emerging approaches, solid relationship between climate change adaptation and DRR should be built, a systematic process for creation of an enabling environment for integration should be established and these should be achieved on a gradual basis from the grass root level

Md. Abu Sadeque, (MoFDM): *Mainstreaming disaster risk reduction in Bangladesh:* The discussion was on the cyclones, floods, drought and river erosion as disasters and on the impact of them on agriculture, health, housing, and education sectors. The need to mainstreaming DRR and implementation of HFA priorities, activating national platform and revision of SOD and strengthening EWS were issues concerned.

Md. Abdul Awal Sarker (Lund University, Sweden): *Critically appraising the issues pertinent to implementing carbon-neutral urban development*: CO_2 emission through energy use, electricity generating, construction related wastage and transportation is the main factor for global warming. Use of renewable fuel, combined heat and power, water saving, zero net carbon emission methods, biodiversity methods etc are ways of Carbon Neutral Urban Developments. Achievements over climate change depend on how quickly and profoundly lives can be changed through reforming social and economic policy incorporating different groups of stakeholders. Carbon neutral urban development process will help on reducing climate change impacts.

Summary of discussion

The papers presented in this session were analyzed the different aspects of climate change adaptation, like the range of available tools for both Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) and its practice or application at the local level, lack of appropriate mechanisms to transfer DRR tools, adaptation for CCA, lack of interaction between two different ministries/departments concern for DRR and CCA in most of the Asian countries, etc. The papers also discussed about the issues of gender inequalities in all aspects that made women more vulnerable to climate change-induced disasters and climate change is creating a new social community as ‘Climate Migrants’ or ‘Climate Refugees’. How Bangladesh approaches to leading countries of cyclone disaster risk reduction also discussed in the session. It was also outlined the secret behind the reduction of deaths is adopting the risk reduction concept and cyclone risk reduction mainstreaming in the policy folder and effective implementation of DRR agendas following the instructions of HFA.

Way forward

The institutional capacity should be strengthened for mainstreaming the Disaster Risk Reduction and Climate Change Adaptation in global and national policies and operations

2.9. Thematic Session E: *Climate Change Adaptation and Institutional Development.*

The session was chaired by Mr. Ahsan Zakir, Director General, Disaster Management Bureau (DMB). Five papers were presented during the session from researchers, professionals, academicians and graduate students

M Aminul Islam (UNDP): *Sustainable approaches to Disaster risk reduction and community adaptation to climate change:* With a majority of below the poverty line living in disaster prone areas, factors of economic poverty, powerlessness, exclusion, illiteracy and discrimination seriously matters on the climate induced disaster risks. Efforts are taken to link local experience, priorities, policy and planning process, analyze poverty – climate links, provide community risk assessment and adaptation planning and training.

Dr. Mahmudul Islam *Disaster risk reduction and climate change education and research in Bangladesh - A progress report:* With the growing need of disaster management professionals and current trend of increase in disasters, DRR and climate change education and research demands more competencies. Developing multi-hazard and risk assessment with strengthened technical and scientific capacity, through campus-curriculum –culture -community model can lead knowledge enhancement and qualifications. It ranges from short term certificate courses to Masters and above post graduate qualifications. At present, consultative meetings are being held and university level courses have been commenced.

Gabrielle Iglesias (ADPC): *Local governance for disaster risk reduction:* Local authorities are close to the people and have mandate for basic services such as solid waste management, health and sanitation, land use planning, emergency service etc. which can be used as vehicles for disaster risk reduction. Under the PROMISE program, selected cities have adapted community based approaches for preparedness, response and mitigation measure for floods and cyclones which are proven with practical situations.

Prof. M. Alimullah Miyan (SADMC): *Climate change adaptation for cities:* City population in Bangladesh has increased from 13% in 1900 to 49% in 2005. SADMC is active from 1991 in the field of disaster management. A number of regional programmes were conducted including training of trainers, campaigns for solar energy for high rised buildings and preservation of rivers embankments, canals and lakes. The need is emphasized to make the cities with proper land use planning, transport, building control and greenery maintenance.

Dr. Md. Ghulam Murtaza et el (Khulna University): *Problems and issues of climate change in Bangladesh – Does this matter to urban local governments?* : An assessment of cities' administrative capability for climate change against the mandated functions shows the poor status of responsiveness for climate change risks. Except for water supply and drainage, trees, parks, gardens and forests, there are no legal provisions in existence and cities neither practice risk reduction measures nor do they have the capacity of practicing. So, climate change policy and action plan are required to strengthen the urban local authorities with the support on fund allocation for improvements of transport, energy supply, waste management etc, and for research studies.

Summary of discussions

Disaster risk reduction and preparedness can be ensured through knowledge, practice and by implementation before an event takes place. And this is only possible through active participation by the local inhabitants through proper guidance by local level agencies or local government. There

are several cases where disaster preparedness has been successful through pro-active initiations by local government. It is important to integrate disaster risk reduction / climate change adaptation issues into curriculum and need to develop professionals in this regard. Bangladesh government has taken several initiatives in order to integrate disaster management issues into university curriculum through both existing subjects as well as new programs. Beside these, local government institutes are being oriented to focus on disaster risk reduction and climate change adaptation so that proper initiatives can be taken.

Way forward

The initiatives of Climate Change Adaptation should be carried out through mainstreaming both in academic curriculum and at institutional level for sustainable development and both at local and national levels.

2.10. Thematic Session F : *End-to-End Early Warning*

The session was chaired by Dr. Senaka Basnayake, Scientist, SAARC Meteorological Research Center. Five papers were presented during the session from researchers, professionals, academicians and graduate students.

S.H.M. Fakhruddin (**ADPC):** *End-to-end early warning system: Location specific user- relevant tools for reducing disaster risk:* EWS system comprised of detective, management and response subsystems and advances with searching opportunities through new emerging forecasting technologies. Hazard risk information area flows, providing outlook and guidance during 14 days to 3 months and then to advising and detail warning at the end of 2 day to 0 -2 hour frequencies. Design Support System (DSS) has been used as a tool for decision making in selected coastal areas in Bangladesh, China and Vietnam. DSS tool with inputs of meteorology, hydrology and social condition data is extensively used for inundation maps and agricultural damage monitoring.

Dr. Shamim Haque & Md. Rejaur Rahman (**ADPC):** *Improving early warning dissemination system at receiver's end: Experience of a community based EWDS in Bangladesh* Study was conducted in Assashuni area, out side of CPP area. Limitations for traditional and existing warning systems were highlighted and a pilot project is being implemented to improving early warning system for EWDS development with predetermined template

Bijayananda Dash (SSK India): *Integrating local knowledge and informal practices with early warning system for disaster risk reduction*: The study area of Behraich of India, bordering Nepal experiences frequent flooding almost every year. With 32% literate people, they use indigenous practices such as bamboo sticks for flood prediction. A structured and systematic mechanism is planned to integrate local knowledge and informal practice, by SSK (regional NGO).

Md. Zillur Rahman, et el (Dhaka University) : *Hydro-meteorological study of Sunamganj and surroundings for forecasting flash flood early warning:* Based on the Hydro Meteorological Study of Sunamganj regarding flash floods, using satellite and radar data, other information from weather related organizations and monitoring river gauges installed in number of stations in Sunamganj, a hydro metrological study has been carried out. Results show that 100- 200 mm rainfall for 3 days in Bhonganj will cause flash floods in Sunamganaj in 2 days. Need more stations for better prediction and to develop a community based automatic siren system for flood warning.

Md. Abdul Mannan (Met Dept): *Climate change and the behavior of cyclonic storm formed in the Bay of Bengal and crossed Bangladesh coast:* The presentation was on a model study and a mathematical analysis using software on the past climate change and the behavior of cyclonic storm formed in the Bay of Bengal and crossed Bangladesh coast. Temporal variations of maximum wind of cyclones were depicted. Conclusions were: the decrease of number of cyclonic system formed in the Bay of Bengal at a rate of 0.1, increase of yearly max wind of cyclones at a rate of 0.9 kts/yr, increase of annual average wind speed and the decrease of decay rate of cyclones.

2.11. Closing Session

The session was chaired by **Ahmed Hossain Khan,** Additional Secretary, Disaster Management and Relief Division, MoFDM and **Dr. Tore Furevik**, Scientist, BCCR

NMSI Arambepola (ADPC): *Report to the Plenary on the outcome of the sessions:* During the preparation of the conference, nearly sixty (60) abstracts were received out of which 49 papers were expected to be present. During the conference, thirty four (34) papers were tabled. The presenters come from international research organizations, UN affiliated agencies, scientific and research institutions and universities. Among the speakers were national experts, researchers, eminent scientists, academicians, and also students from universities who were encouraged on their researches. Climate change and disaster risk reduction are interlinked and areas of scientific modelling, data analysis, prediction and forecasting and adaptation measures are directly connected with people's social, cultural and economic environment. Through out all the sessions, highly fruitful discussions were observed for better and safe living of the vulnerable communities.

Panel Discussion: "*A focus on building climate resilient communities. What should be the future strategy?"*

Dr. Senaka Basnayake : Space Research organization in India was providing information for India and now their services are expanded to neibouring countries. During a near future, they will further extended to the Asian region. Expansion of EWS is already in place in the Region.

Dr. Jayaraman Potty: Updated information from all the countries is extremely essential as cyclones have no borders and need corporation of all the countries in the region to simulation, modeling and to forecast. There are limitations for Bangladesh to obtain data and regional intervention is required to overcome those constraints. The Mekong River Committee (MRC) has a very good corporation from the bordering countries of the river. SAARC countries also need similar support.

Dr. Tore Furevik: Already with the Norwegian project, the collaboration of Norway Climate Change Research has commenced with ADPC and BCAS of Bangladesh. So, avenues are opened for exchange of workshops information and data sharing. Norway can help in capacity building in scientific research so that disaster management can be applied at local level.

Dr. Ren Fu Min: WMO provides support to build international and Regional Corporation. They also have formulated the Global Forum of Climate Services (GFCS) to discuss disaster risk reduction and climate change related issues concerned. Under the WMO assistance, National Climate Change in Beijing has set up a program for regional calamity projection and monitoring system which can easily accessible for corporation.

Dr. Atiq Rahman: Climate Change adaptation strategies and action plans at the community level are equally important as for urban and rural communities. Such actions should be a result of participation by the community at large. There are many good practices and success stories of livelihood with CC adaptation across the countries of the region and the making available for sharing them is one of the responsibilities of the mass communication. For that, local government sector should be strengthened.

Dr. Shamim Mahabubul Haque: It is a timely need for activation by the urban sector with the support from the local authorities by strengthening the policy framework and administrative set up with institutionalization of disaster risk reduction and climate change adaptation strategies.

Ms. Dilruba Heider: Before deciding and introducing livelihood adaptation strategies, authorities should listen to the beneficiary and understand the local knowledge with traditional approach. The role of the decision makers should be the extraction of the "technology" behind the community information and to blend with the technology, research and data.

Comments from the audience

1. Majority of local presenters are from Khulna University and it shows the interest of the young generation on the current issues of the environment.

2. The conference opened doors for young students to do more research on climate change for Bangladesh and they learn a lot from the international speakers on the avenues for further studies.

3. Pakistan has a 50 Km length of the coast; very less research has been conducted on the impacts. Expansion for a cross boarder adaptation methodologies and sharing the information and data in the region is very much essential

4. The regional level workshops help the researchers as well as decision makers to impart knowledge on other countries which is very much helpful to benchmark some strategies.

Chair: **Ahmed Hossain Khan:** The conference is a timely need for the Bangladesh and the other regional countries. He expressed his gratitude to the learned panel to advise the Govt. of Bangladesh with the knowledge and research. The Govt. of Bangladesh has taken action to climate change adaptation and wishes that the polluting countries should support the developing countries more to come up with solid solutions.

3. Conference Outcomes

Expected outcome of the conference was to:

1) Capture lessons from recent tropical cyclones
2) Understand the cyclone surge patterns and its potential impacts,
3) Understand implications for disaster risk reduction of the climate change scenarios on elements at risk

The conference was an open forum for a common understanding and evaluation of existing situation of developing countries of the Asian region. Based on the scientific studies, which were built up on data and information, examining different cyclones and their impacts, a better assessment on risk reduction options/models, keenness to increase readiness, awareness of countries, local authorities and communities was achieved. Vulnerable people, livelihoods, and infrastructure should benefit from actions that will protect life and ensure sustainability. The gaps between extreme cyclone events and the rapidity to cope with such disasters and reduce durably its harmful impacts have been explained. Emerging out constraints to achieve climate change resilient communities in Bangladesh were social background of most vulnerable groups, non availability of structured solid mechanism to convince people to change the way of living/ livelihood, financial constraints on mitigation actions and scientific research, issues in converting research outcomes to grassroots level actions. The situation in other Asian countries may be similar but it is not possible to comment as only a very few papers were presented. However, international organizations such as Centre for Climate Research (BCCR) of Norway, SAARC Meteorological Research Center (SMRC), National Climate Center (NCC) Beijing and many others are working in Asia providing technical assistance in developing resilient communities for climate change.

Disaster risks are not distributed evenly in the countries. According to the social, scientific and mathematical studies, analysis and implemented pilot projects, presented at the conference, hazard found to be changing due to external factors such as climate change, environmental degradation and urbanization. Sea Surface Temperature (SST) is rising resulting increase of frequency for severe cyclones. During hot years, the tendency for severe cyclone found to be high. Occurrences of minor cyclones are declining while incidences for high and very high cyclones are escalating, which is evident now. Hazard severity, exposure, the extent of preparedness, legal and institutional frame work, governance factors such as accountability, transparency and participation at the decision making process can be the main cyclone risk drivers behind.

The poorest, mainly depending on informal earning, are the most vulnerable and mostly affected by any disaster. No serious consideration has been drawn for strengthening their livelihood. If due deliberations are provided to sustain their livelihood or to support for alternative living, through natural resource management that can reduce the migration to urban centers. In this process, factors to be considered may be land tenure and ownership, information on agricultural research, social security, strengthened risk reduction strategy, local level implementation mechanism, awareness and training etc. Concurrently, national level efforts with the local level inputs for housing and infrastructure development also need attention. Appropriate siting of cyclone shelters, access roads, killas (shelter for livestock) and due maintenance of them are vitally important. In strengthening individual housing or new construction, training and technical inputs required to be disseminated to the builders or owners. In this context, capturing local experience, indigenous structural adaptation methods should be encouraged in place of country based stereotype techniques. Similarly, strengthened EWS coordinated with new technologies should be in place.

However, existing situation and futuristic threats on coastal environment and ecosystems, which may be due to extensive fishing and deteriorating coral reef and mangrove have not been discussed in the conference.

4. Conclusion

As per the 2009 Global Assessment Report on Disaster Risk Reduction of UN, countries of Bangladesh, The Philippines, India, Madagascar, Vanuatu and Fiji are among the top ten countries of the world with the highest mortality risk index for cyclones. Low-income generating countries are far more likely to suffer and Asian countries have the largest expansion for cyclones. More exposed, less income generated and the greater the risk for cyclones victimization. With the high density of population in developing countries in the Asian region, the top ten most human exposed countries for cyclones are also in the East and South East Asia. Economic dependency, inadequate mechanism and strategies, poor administrative and legal enforcement, lack of devolved powers to local authorities, gap between decision makers and beneficiaries, poorly planned and untimely relief and assistance and lack of access to social protection are underlying drivers of the transformation of disaster impacts into poverty outcome. Most of economic losses are associated with meteorological, climatological and hydrological disasters. When frequencies of severe cyclones increase, people have to face more difficulties, before recovering from the previous disaster.

For determining the climate change adaptation measures, several factors such as technical effectiveness, costs, expected benefits and the social environment have to be taken into consideration. The measures should be in par with the national and local level development planning. The course of actions depends on sustainable maintenance, healthy environment, reduced exposure and vulnerability, strengthened governance framework, reduced risk on human health and safety and maintaining livelihood opportunities. Innovative approaches for land supplies, basic infrastructure, secure land tenure, housing financing for poor households may be explored.

The urban local Govt. shoulders the responsibility for safe housing for urban poor. It can be achieved by planning and regulating urban development, providing hazard mitigation infrastructure and proper land use planning. For this exercise, Building codes are of utmost importance. Developers should be enforced so that facilities are built according to disaster resilient designs incorporating mitigation measures into design and construction. Further, good urban and local governance with well structured and built up partnership with active civil society and private sector also plays a major role in building resilient communities.

The role of researchers is also equally significant. With updated technology and equipment, advanced studies can be executed. With assessment of the consequences of present trend in long term human development impacts in health, society, living standards, education, food and nutrition, scientists can recommend remedial measures which are directly and indirectly connected with climate change.

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Annexure

Annex 1 - List of Participating Organisations

Annex 2 - Program Schedule

Annex 3 - Caption of the Conference

List of Participating Organizations

Regional Conference on Disaster Risk Reduction and Emergency Response in Rapidly Changing World

17 to 18 February 2010
Dhaka, Bangladesh,

	Name of the Organization
1	Action Against Hunger (ACF)- Worldwide Mission, Bangladesh
2	Bangladesh Betar
3	Bangladesh Center for Advanced Studies
4	Bangladesh Disaster Preparedness Center, (BDPC)
5	Bangladesh Metrological Department
6	Bangladesh Network for Urban Safety under Bangladesh University of Engineering and Technology, (BNUS- BUET), Bangladesh
7	Bangladesh News Association, (BSS)
8	Bangladesh Red Crescent Society (BRCS)
9	Bangladesh Television, BTV
10	Bangladesh University of Engineering and Technology, (BUET)
11	Bjerknes Centre for Climate Research (BCCR), Norway
12	BOISHAKHI, Bangladesh
13	BRAC University, Bangladesh
14	Caritas, Bangladesh
15	Center for Disability in Development (CDD), Bangladesh
16	Center for Environment and Geographic Information System (CEGIS), Bangladesh
17	Coastal Research Foundation, (CRF), Bangladesh
18	Community Participants from Coastal districts
19	Comprehensive Disaster Management Program- CDMP, Bangladesh
20	Concern Universal, Bangladesh
21	Concern World Wide, Bangladesh
22	Daily Samakal, Bangladesh
23	Dhaka University, Bangladesh

24 Disaster Management Bureau, Bangladesh

25 Fire service and Civil Defense, Bangladesh

26 GSRC, Bangladesh

27 Indus Resources Center, (IRC), Pakistan

28 Institute of Integrated Rural Development (IIRD), Bangladesh

29 Khulna University, Bangladesh

30 Laar Humanitarian and Development Programme (LHDP), Pakistan

31 Mega Urban Food System, Dhaka ,Bangladesh

32 Ministry of Food and Disaster Management, Bangladesh

33 Muslim Aid - Bangladesh

34 Muslim Aid -UK

35 National Climate Center (NCC) Beijing, China

36 National Institute of Preventive and Social Medicine, Govt. of Bangladesh

37 Pakistan Fisher Folks Forum, Pakistan

38 Radio Today, Bangladesh

39 Regional Integrated Multi-hazard Early Warning System in AIT, ADPC/RIMES, Thailand

40 RTV (Private TV Channel), Bangladesh

41 SAARC Meteorological Research Center (SMRC), Bangladesh

42 Sahabagi Shikshana Kendra, (SSK) India

43 Shcemshanews.com, Bangladesh

44 SHUCHILAN, Bangladesh

45 Social Activities For Environment (SAFE), Bangladesh

46 South Asia Disaster Management Center, Bangladesh

47 South Orissa Voluntary Action, India

48 Space Research and Remote Sensing Organization - SPARRSO, Govt. of Bangladesh

49 TRO CAIRZ, Bangladesh

50 UDDYOG Foundation, Bangladesh

51 UNDP - Bangladesh

52 UTTARAN, (Bangladesh)

53 Water Aid, Bangladesh

54 Young Power Social Action, (YPSA), Bangladesh

PROGRAMME SCHEDULE

DAY 1, 17 February 2010	
8:00 – 9:00	Registration
9:00- 10:15	**Inaugural Ceremony & Opening Plenary Speeches** • *Welcoming Remarks:* Dr. Bhichit Rattakul, Executive Director, Asian Disaster Preparedness Center • *Address by* Dr. A. Atiq Rahman, Executive Director, Bangladesh Center for Advance Studies • *Address by* Dr. Tore Furevik, Scientist, Bjerknes Centre for Climate Research, Norway • *Address by the Guest of Honor:* H.E. Dr. Stefan Frowein, Ambassador and Head of the Delegation, Delegation of EU to Bangladesh • *Address by the Chief Guest:* Dr. Muhammad Abdur Razzaque, Hon. Minister, Ministry of Food and Disaster Management • *Remarks by the Chair:* Md. Mokhlesur Rahman, Secretary, Disaster Management and Relief Division, MoFDM • Presentation of Memento to the Guests by Dr. Bhichit Rattakul, Executive Director, Asian Disaster Preparedness Center • *Vote of Thanks* Muhammad Saidur Rahman, Director, Bangladesh Disaster Preparedness Center **Chair**: Md. Mokhlesur Rahman, Secretary, Disaster Management and Relief Division, MoFDM
10:15- 10:45	Tea/Coffee Break
10.45-11.15	**Testimony**

11:15- 13:15	*Plenary 01* **Climate Change Scenarios and their Implications for Disaster Management and Emergency Preparedness** 1. Dr. Tore Furevik, Scientist, Bjerknes Centre for Climate Research (BCCR) 2. Dr. Senaka Basnayake, Scientist, SAARC Meteorological Research Center (SMRC) 3. Dr. Ren Fu Min, Professor, National Climate Center (NCC) Beijing, PROC **Co Chairs** Ahsan Zakir, Director General, Disaster Management Bureau Dr. Bhichit Rattakul, Executive Director, ADPC **Rapporteur**: Dr. Shamim Mahabubul Haque, ADPC
13:15 - 14:30	Lunch Break

	Technical Sessions		
Co-Chairs:	M.A. Wazed, *Joint Secretary, Disaster Management and Relief Division, MoFDM* Prof. Mehedi Ahmed Ansary, *BUET*	Aminul Islam, *Assistant Country Director, UNDP Bangladesh*	Prof. A. S. M. Maksud Kamal, *National Expert, CDMP* Dr. Ren Fu Min, *Professor, NCC Beijing*
Rapporteur	Esther Lake	Anisur Rahman	Gabrielle Iglesias
14:30 – 15:15	***Thematic Session A*** Climate change induced extreme cyclones and community preparedness – How ready are we? 1. Cyclone Nargis, Myanmar: Lessons learned *by Sudhir Kumar* *2.* Analysis of climate change phenomena in Bangladesh *by Md. Saidur Rahman and Prof. Mehedi Ahmed Ansary* 3. Changing the agricultural habitation and adapting innovative farming practice in the coastal zone in Bangladesh *by Md. Imran Reza and Md. Afjal Hossain*	***Thematic Session B*** Climate Change Scenarios and the Potential Social Impacts 1. Projected risks to health associated with climate change *by Esther Lake* 2. Climate change and impact of cyclones on public health: Bangladesh *by Dr. Zahidur Rahman* *3.* Evaluation of water supply facility in the cyclone shelters and examine the feasibility of rainwater as an alternative source *by Md. Imtiaz Shahed and Abu Hena Mustafa Kamal Sikder* 4. Assessment of variations in disaster vulnerability in coastal communities from socio-economic perspective: A study on Assasuni Upazila of Satkhira District, Bangladesh *by Madhuri Rani Roy and Dr. Shamim Mahabubul Haque*	***Thematic Session C*** Information Technology for Reducing Disaster Risks from Climate Change 1. Cyclone wind hazard assessment in coastal Bangladesh *by Kazi Nusrat Jahan, Dr. Mohammad Shakil Akther, Shakil bin Kashem, Shakila Kayum and Sayed Rokkanuzzaman* 2. Monitoring cyclone Aila and its impact in Bangladesh *by Mehrun Nessa, Engr. Mozammel Haque Sarker and Suraiya Begum* 3. Inundation risk map developed by past storm surge modeling of the coastal region of Bangladesh by Prof. *A. S. M. Maksud Kamal*
15:15 – 15:30	Question and Answer Period and Summary		
15:30 – 16.00	Tea Break		

Co-Chairs:	M.A. Wazed, *Joint Secretary, Disaster Management and Relief Division, MoFDM* Prof. Mehedi Ahmed Ansary, BUET	Aminul Islam, *Assistant Country Director, UNDP Bangladesh*	Prof. A. S. M. Maksud Kamal, *National Expert, CDMP* Dr. Ren Fu Min, Professor, *NCC Beijing*
Rapporteur	Esther Lake	Anisur Rahman	Gabrielle Iglesias
16.00 – 16:45	***Thematic Session A*** Climate change induced extreme cyclones and community preparedness – How ready are we? 4. Local strategies to live with cyclones in coastal areas of Bangladesh *by Bishawjit Mallick et al.* 5. Impacts of climate change: An overview on cyclones on some selected coastal areas of Bangladesh *by Md. Bayzidul Islam and Tauhidul Islam* 6. Preparedness mechanism to minimize the disaster effects in the coastal area: A study on Latachapli Union *by Mahfuja Sultana, Fawzia Farzana and Abir Ahammad Talukdar*	***Thematic Session B*** Climate Change Scenarios and the Potential Social Impacts 5. Climate change scenarios and its impacts on the livelihoods of affected people in coastal Bangladesh *by Dr. Khondoker Mokaddem Hossain and Dr. Mahbuba Nasreen* 6. Climate change in Bangladesh, rural livelihood and impact on cities *by Dr. Akhter Husain Chaudhury* 7. Coastal ethnic minorities' capacity to address the post disaster effects of cyclone and storm surge on livelihood: A study on Rakhain community of Lotachapli Union *by Abir Ahammad Talukdar, Fawzia Farzana and Mafuja Sultana* 8. Vulnerability of Chittagong to climate change and future challenges for planning and development *by Abir Ahammad Talukdar, Dilara Mehrab Arif, Mahfuja Sultana , Mitun Talapatra and Md. Sharoar Hossain Apo*	***Thematic Session C*** Information technology for Reducing Disaster Risks from Climate Change 4. Construction of Disaster Risk Index using GIS for better management of disaster information: A study on coastal communities of Bangladesh *by Mohammad Shahidul Hasan Swapan and Dr. Shamim Mahabubul Haque*
16:45 – 17:00	Question and Answer Period and Summary		

9:00- 11:00	*Plenary 02* **Approaches for Improving Disaster Risk Reduction and Community Adaptation** 1. Dr. Bhichit Rattakul, Executive Director, ADPC 2. Hon. Alipio S. Fernandez, Jr., Mayor, Dagupan City, Philippines 3. Dr. Jayaraman Potty, RIMES/ADPC 4. Dr. A. Atiq Rahman, Executive Director, BCAS **Co-chairs:** Dr. Mihir Kanti Mazumder, Secretary, MoEF Dr. Tore Furevik, Scientist, BCCR **Rapporteur**: Dr. Shamim Mahabubul Haque, ADPC
11:00 - 11:30	Tea Break

	Technical Sessions		
Co-Chairs:	Dr. Zafar Ahmed Khan, *Director General, Department of Environment*	Ahsan Zakir, Director General, *Disaster Management Bureau*	Arjumand Habib, Director, *Bangladesh Meteorological Departme*nt Dr. Senaka Basnayake, *Scientist, SMRC*
Rapporteur	Khondoker Golam Tawhid	Anisur Rahman	Nurul Alam
11:30 – 12:15	**Thematic Session D** Policy Advocacy for Climate Change Adaptation *1.* Linking disaster risk reduction to climate change adaptation by *Atiq Kainan Ahmed* 2. Mainstreaming disaster risk reduction in Bangladesh by *Md. Abu Sadeque* 3. Critically appraising the issues pertinent to implementing carbon-neutral urban development by *Md. Abdul Awal Sarker*	**Thematic Session E** Climate Change Adaptation and Institutional Development 1. Sustainable Approaches to Disaster Risk Reduction & Community Adaption to Climate Change *by M. Aminul Islam* 2. Local governance for disaster risk reduction *by Gabrielle Iglesias* 3. Disaster risk reduction and climate change education and research in Bangladesh - A progress report by *Dr. Mahmudul Islam*	**Thematic Session F** End-to-End Early Warning *1.* End-to-end early warning system: Developing user-relevant tools and early warning information products for reducing disaster risks *by S.H.M. Fakhruddin* 2. Improving early warning dissemination system at receiver's end: Experience of a community based EWDS in Bangladesh by *Dr. Shamim Mahabubul Haque and Md. Rejaur Rahman* 3. Integrating local knowledge and informal practices with early warning system for disaster risk reduction by *Bijayananda Dash*
12:15 – 12:30	Question and Answer Period and Summary		
12:30 – 14.00	Lunch Break		

	Technical Sessions (continued)		
Co-Chairs:	Dr. Zafar Ahmed Khan, *Director General, Department of Environment*	Ahsan Zakir, *Director General, Disaster Management Bureau*	Arjumand Habib, *Director, Bangladesh Meteorological Department* Dr. Senaka Basnayake, *Scientist, SMRC*
Rapporteur	Khondoker Golam Tawhid	Mustaq Khalid	Nurul Alam
14.00 – 14:45	**Thematic Session D** Policy Advocacy for Climate Change Adaptation 4. Gender issue in climate discourse: theory versus realty *by Mohammed Abdul Baten and Dr. Niaz Ahmed Khan* 5. Climate migrants and their changing livelihood pattern in the southwest coastal region of Bangladesh *by Md. Sultan Mahmud*	**Thematic Session E** Climate Change Adaptation and Institutional Development *4.* Climate change adaptation for cities by *Prof. M. Alimullah Miyan* 5. Problems and issues of climate change in Bangladesh – Does this matter to urban local governments? by *Dr. Md. Ghulam Murtaza, Fawzia Farzana and Mohammed Shariful Islam*	**Thematic Session F** End-to-End Early Warning *5.* Hydro-meteorological study of Sunamganj and surroundings for forecasting flash flood early warning by *Md. Zillur Rahman, Mohammad Saiful Islam, Subrota Kumar Saha, ASM Maksud Kamal, M. Qumrul Hassan, ASM Woobaid Ullah* 6. Climate change and the behavior of cyclonic storm formed in the Bay of Bengal and crossed Bangladesh coast by *Md. Abdul Mannan*
14:45 – 15.00	Question and Answer Period and Summary		
15.00 – 15:30	Tea Break		

15:30 – 17:30	**Closing Session** **Report to the Plenary on the outcome of the sessions** *by N.M.S.I. Arambepola, Director, ADPC* **Panel Discussion: "***A focus on building climate resilient communities. What should be the future strategy?" (05 min. presentation by each Panel member)* • Dr. Shamim Mahabubul Haque, ADPC *on urban community resilience* • Ahsan Zakir, Director General, Disaster Management Bureau - *Role of DM organizations* • Dr. Atiq Rahman, Executive Director, BCAS: *on targeting the most vulnerable coastal communities* • Dilruba Haider, Additional Director, BDPC: *on livelihood adaptation* • Dr. Tore Furevik, Scientist, BCCR: *on capacity building and knowledge management* • Dr. Senaka Basnayake, Scientist, SMRC: *on sub-regional cooperation for effective early warning* • Dr. Ren Fu Min, Professor, NCC Beijing, PROC: *on the role of the World Meteorological Organization* • Dr. Jayaraman Potty, RIMES/ADPC: *on the role of regional EW centers in forecasting and early warning* **Chair**: Ahmed Hossain Khan, Additional Secretary, Disaster Management and Relief Division, MoFDM **Rapporteur:** Padma Karunaratne , ADPC

Captions of the Conference

Inauguration

Audience

Testimony

Question ?

Plenary

Thematic session

Closing session