

Technical and Financial Report

Regional Training Workshop

On

**Climate Change and Water Resources: IWRM as a tool to cope with changing
condition of the climate system**

January 10-14, 2010
BRAC-CDM, Gazipur, Dhaka



**Submitted and Prepared
By**

**Bangladesh Centre for Advanced Studies (BCAS)
Secretariat, CapNet South Asia**



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1. Introduction

This report is based on a five day regional training workshop held on "Climate Change and Water Resources: IWRM as a tool to cope with changing condition of the climate system". The workshop was organized by CapNet South Asia Regional Secretariat from 10th to 14th January, 2010. This timely workshop reflected the growing concern amongst regional community on the impacts of climate change and water resources using IWRM as a tool to cope with changing climatic conditions.

The five day workshop provided basic and advance knowledge about IWRM and climate change at the beginning followed by sharing of case studies from across the region on impacts of climate change on water use sectors like agriculture, water supply, sanitation, health, industry, energy, etc. This workshop was based on sessions through presentations, case studies on different sectors relating climate change impact and group exercise. The participants were given four group exercises to facilitate the participants to come up with developing adaptation plans within IWRM framework. The participants discussed on the issues and jointly prepared draft action plans to develop and implement them at regional levels.

2. Objective of the workshop

The aim of this five day Regional workshop was to develop capacity building material on climate change impacts on water resources and IWRM as a tool to cope with changing conditions of the climate and prepare a manual for imparting training to the trainers. The workshop also aimed to strengthen CapNet South Asia Network.

Focus of the Workshop

- Understanding the causes and effects of climate change, with special emphasis on consequences for uses and management of water resources
- Identification of opportunities for vulnerable communities to adapt to climate change
- Build resilience to extreme climate variability
- Development of strategies to cope
- Adaptation of water resources management systems to changing conditions and dealing with uncertainty

3. Methodology of the workshop

3.1 Identification of the participants

Thirty five participants representing from Bangladesh, India, Sri Lanka, Pakistan & Nepal, played active role in the workshop. There were 14 external participants; three from Nepal, four from Pakistan, four from Sri Lanka, and three from India; 21 participants including resource persons were from Bangladesh . So in total 35 water and climate professionals attended in this regional workshop where 6 were women.

3.2 Themes of the workshop

The workshop was organized in such a manner that ample time for questions and discussions were given to participants after each sessions and case study presentation. The workshop has been designed on four themes which aimed to fulfill the workshop goals. This workshop was divided into four themes, eight sessions and six group exercises, which are as under:

Theme-1	IWRM and Climate Change : Concepts, Science uncertainties, Impacts and Vulnerabilities
Session-I	Climate Change Science, Climate Change Impacts and vulnerabilities (Global, South Asia and Bangladesh perspective)
Session-II	Introduction to Integrated Water Resource Management (IWRM) concept and Implications of Climate Change on Water Management in Bangladesh
Session-III	Techniques/Tools for assessing Climate Change Impacts
Session-IV	Climate Change and Climate Variability : Dealing with Uncertainties
Theme-2	Case Studies : Impacts of Climate Change on Water Use Sector
Session-V	Climate Change and Gender Vulnerability
Theme-3	Instruments and Measures for Adaptation
Session-VI	Concepts, Types of Adaptation and possible Adaptation Measures for various Sectors to Climate Change Impacts : few cases in Bangladesh
Session-VII	Adaptation to Climate Change in Water Management
Theme-4	Strategy Development and Action Plan for Adaptation to Climate Change
Session-VIII	Economics of Adaptation, Challenges and Opportunities in Integration of Adaptation into National Planning

4. Workshop overview: Technical Sessions

The workshop has been designed in three basic components; technical sessions, case studies and group exercises. In the workshop technical sessions delivered various points of topics on IWRM and climate change issues. These sessions were divided into presentations, group exercises and case studies. Five consecutive days filled with presentations and group exercises. The whole workshop designed for in depth discussion on various issues covering climate change science, integrated water resources management (IWRM), impacts of climate change on water supply, sanitation, health, agriculture, industry, energy, and infrastructure. Techniques and tools assessing impacts, and implication of climate change on water management in Bangladesh, notably gender issues involve with water resources management in the changing climate vulnerabilities and adaptation strategies in the water sector. The participants talked about their own country perspective, state of climate change impact with south Asian context.

Technical Sessions

In the workshop, each session delivered one presentation focusing specific topics confirming the objectives.. The key messages of the sessions discussed in later part of the report.

Case studies

Case studies of the workshop meet the demand about field based status in the context of climate change and south Asia. Theme-2 was itself committed to case studies about impact of climate change on water use sectors. Case studies represent the impacts of

climate change on agriculture, water supply, sanitation and health in the countries. Bangladesh, India, Sri Lanka, Pakistan. The hydrological changes in Bangladesh due to climate change and climate variability widely discussed in the case studies session. The brief of the case studies presented later in the report.

Group exercises

Group exercises were the understanding and comprehension of using IWRM as a management tools to cope with climate change. Four group exercises conducted, first two group exercises were in the day one and based on first two sessions. Third and fourth group exercises were looked for concrete understanding about climate change impacts on water use sectors, adaptation measures and strategies into sustainable water resources planning and management. The exercises made for the participants greater understanding in adaptation measures with sustainable strategies implementation in South Asia.

5. Opening /inaugural session

The workshop commenced with the Welcome Address by Dr. A. Atiq Rahman, Executive Director, BCAS, Secretariat CapNet South Asia who informed the gathering that through this effective forum, South Asian Programme on "Water & Climate Change" will take a concrete shape in fighting the adverse effects of climate change. He further told that BCAS is already working vigorously on this issue and has played an important role in Copenhagen Climate Change Summit.

Mr. Golam Rabbani, Senior Research Officer, BCAS and Focal Point, CaptNet South Asia highlighted about the role of CaptNet South Asia network and its strength which is existing in about 30 countries through 5 Regional networks. Mr. Rabbani also briefed the participants about the genesis of this workshop. The first workshop was held in Panama in 2008, followed by the second one in Malaysia in 2009 and now this is the 3rd workshop in succession being held at Dhaka, Bangladesh.

6. Summary of the sessions: Key messages

6.1 Session 1: Climate Change Science, climate change impacts and vulnerabilities

It is now admitted that South Asia including Bangladesh is vulnerable to climate change impacts through sea level rise, cyclone (intensity and frequency), deeper penetration of saline water, erratic rainfall, drought, riverbank erosion, GLOF, landslide etc. which greatly influence life and livelihoods. There might be a vicious relation among Climate Change-Water/sanitation-Health-Livelihood and poverty. The linkages of climatic influence changes the life toward more poverty, more health hazards through excessive flooding, long drought, increased salinization in coastal region and violent storm surges, spreading of vector borne diseases; all these worsen human life and livelihood.

6.2 Session 2: Integrated Water Resources Management (IWRM) concept and implications of climate change on water management in Bangladesh

The IWRM concept and principles by means of Integration of the natural system and human system might be one of the best tools coping with climate change impacts on water resources in South Asia. The predicted changes of climate may have great impacts on Water Regime (Changes in precipitation and evaporation; Change in river flow; Change in groundwater flow; Increase in saline water intrusion in estuaries; Increase in the intensity of storm surge flood. Some of the major risk areas of Water Management in particularly in Bangladesh may -Risk of water shortage for domestic and industrial water supplies; risk of water stress in irrigation projects due to increase in evaporative demand; risk of fresh water scarcity in irrigation projects due to saline water intrusion; risk of

disruption of water transport; risk of wetland ecosystems degradation. These impacts can have enormous consequences on socio-economy, environment and ecosystems. To reduce these risks for sustainable water management some of the essential step should be initiated.

6.3 Session 3: Frameworks, Methodologies and Tools for climate change impact assessment

The climate change impacts assessment frameworks, methodologies and tools with sectoral basis including integrated assessment of water resources comprises assessment of a. Impact b. Adaptation c. Vulnerability d. Risk management. Frameworks may have four elements- climate events, exposure units, impacts and consequences, and adjustment responses.

6.4 Session 4: Dealing with uncertainties

Uncertainties on climate change are not a lack of knowledge but part of it. IPCC assess uncertainty in two ways; Quantitative measures and Qualitative statements. The qualitative approach of climate change uncertainties depends on amount of evidence and degree of consensus among experts on its interpretation.

Another two keys to interpret uncertainties are likelihood and level of confidence. Likelihood refers to a probabilistic assessment of a well defined outcome having occurred/occurring in future. Level of confidence used to characterize uncertainty that is based on expert judgment on correctness of an analysis/statement.

6.5 Session 5: Climate change and gender vulnerabilities

Women work two-thirds of the world's working hours but receive 10 % of the world's income. Factors influencing women's vulnerability may includes less access to valuable resources, lack of participation in decision making, natural calamities like cyclones, floods, earth quake kill more women then men. Gender issues becoming more concerned topic in international arena which include gender component in the international declaration. Some of the findings of a case study in Bangladesh indicate that women's greater vulnerability to mortality rates higher then men's especially in flood prone area, women's face food deficit and lack of safe drinking water during hazard period higher in percentage then men. And more gravely women's have little involvement in disaster management decision making process.

6.6 Session 6: Adaptation measures: Cases of Bangladesh

Adaptation is necessary for climate change threat to unique eco-system and biodiversity, vulnerability to extreme weather events, inertia in climate & ecosystem, and inertia in socio-economic system. Adaptation strategies classify as Generic, Sector Specific, Ecological Zone Specific and Livelihood Specific which are working in Local, Sub-national, National, Regional and global level. Common adaptation practices which might be effective are listed in the following page.

Adaptation-Practices

Agriculture:

- Changes of cropping pattern
- Flood, drought and saline tolerant varieties new crop varieties
- Crop Intensification
- Crab Farming in Saline Water
- Saline Tolerant Rice cultivation
- Chickpeas in Drought Area

Water Resources Management:

- Re-excavation of traditional ponds/canals
- Rain water harvesting
- Improve water use efficiency (drought tolerant varieties)
- Community based rain water harvesting
- Household based rain water harvesting

Alternate enterprises:

- Floating gardens
- Cage culture
- Homestead gardening
- Household level nurseries

Structural measures:

- Multipurpose cyclone centres
- Raised Plinth Height
- Raised Plinth of Toilet
- Preservation of Household Assets Over False Ceiling
- Storage of Food for Flood
- Raised Tube Well in flood prone area
- Pond Sand Filter
- Household Based Rain Water Harvesting in Drought Prone Area
- Floating Garden During Flood

The way forward for adaptation strategies through the institutional arrangement with strong set up for mainstreaming climate change and adaptation, engagement of stakeholders throughout policy/planning and implementation process will be imperative. Identification and documentation of good practices, dissemination of relevant knowledge and technologies, building capacity among variety of stakeholders with massive awareness on climate change and adaptation should be speed up.

6.7 Session 7: Adaptation to Climate Change and IWRM

The major challenges in water resources management may include securing water for people, for food production, protecting vital ecosystems, coping with climate change, forging the political will to act.. IWRM itself a powerful tool and integrate development and management of economic, social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

6.8 Session 8: Strategy Development and Planning For Adaptation

In the last session a paper presented under the theme Strategy Development and Action Plan for Adaptation to climate change. This was aimed to strategy development and action plan for climate change adaptation according to UNFCC, UNDP and NAPA guidelines. Adaptation priority activities criteria focused on level of degree of adverse effects of climate change, poverty reduction to enhance adaptive capacity with considering cost-effectiveness. Cost benefits of adaptation graph indicate that the cost of climate change increase with the increase of global mean temperature; while it decrease with decrease

with adaptation measures. The challenges of adaptations are multifaceted with insufficient monitoring and observation systems and data sharing, lack of basic information, appropriate political, technological and institutional framework ensuring social equity in decision making. On the other hand adaptation measures open new avenue for planning new investments, modifications in processes and demands by introducing new efficient technologies. The climate change strategies of Bangladesh include food security, social protection and health, comprehensive disaster management, infrastructure development, research and knowledge management, mitigation and low carbon development and most importantly capacity building of all relevant stakeholders.

7. Case studies

In this session Dr. Veena Khanduri, of India Water Partnership chaired and conveyed that in South Asia, water has large impacts on the cultural, social, economic and political fabric in the lives of around 1.5 billion people. While at one hand water resources is key to agriculture, hydropower, and to sustain the aquatic environment, on contrary the region remains highly vulnerable to droughts and floods that not only devastate lives and livelihoods, but also undermine progress on economic growth and poverty alleviation. Therefore, it is imperative to prepare for Adaptation to Climate Variability (the already occurring extreme events) and keep in mind the trend indicated in Climate Change forecasts. Time is now to act on adaptation strategy especially in water sector keeping in view the IWRM approach and sharing of experiences would be of immense use in the region.

Theme-2 : Case Studies : Impact of Climate Change on Water Use Sector

In this session, five case studies were presented on (i) Climate Change on Water Resources in Sri Lanka; (ii) Climate Change & Climate Variability : Hydrological Changes in Bangladesh ; (iii) Climate Change Impacts on Agriculture : Pakistan; iv) Climate change impacts on water supply, sanitation and health: Bangladesh; v) Climate change impacts on water supply, sanitation and health: India The details are as follows :

7.1 Case Study-1: Climate Change on Water Resources in Sri Lanka

Prof. Sohan Wijesekera, University of Moratuwa, Sri Lanka presented the case of Sri Lanka in detail. The presentation highlighted that climate change has a significant impact on the water requirement for irrigation purposes. The case study also showed that neglecting the irrigation systems, thereby decreasing the efficiencies, which would significantly increase the water requirements. This would also lead to more expenditure on infrastructure, rehabilitation and new system expansions. Hence, while identification of a reliable climate prediction which is of paramount importance for mitigation or adaptation activities, it is important for Sri Lanka to use past data for comparison in order to establish relationships.

7.2 Case Study-2: Climate Change & Climate Variability : Hydrological Changes in Bangladesh

A H M Kausher, Chief Engineer (Hydrology), BWDB Presented relevant data on rainfall, population, temperature, land, drought & flood and how it is impacting Bangladesh. Stressing on population growth statistics, he explained that due to rapid urbanization, it is expected to increase in population with 40 % of people by 2025. About 45.5 million people are exposed to severe and moderate floods. The adaptation strategy, reassessment & redesign of flood embankments including submergible embankments in North East region of Bangladesh is the way forward approach. In context of adaptation

strategy, updated National Adaptation Programme of Action (NAPA), Bangladesh moved from the immediate and urgent needs to wider adaptation requirement to address medium and long term climate issues.

7.3 Case Study-3 :Climate Change Impacts on Agriculture : Pakistan

Shakeel Ahmed Ramay of SDPI, Pakistan delivered case study of climate change impact on agriculture in the context of Pakistan. Highlighting agriculture, he presented that agricultural land has come under severe stress which in turn leading to land degradation due to greater use of agro-chemicals. As a result, average yield of wheat, rice, cotton, and sugarcane decreased. Due to these factors, agriculture labour force is losing job opportunities. So while planning for adaptation strategy for water use sectors, it is important to understand that what types of technologies are most suitable and whether finance is available for the same.

7.4 Case study-4: Climate change impacts on water supply, sanitation and health: Bangladesh

S.M.A Rashid, Executive Director, NGO Forum for Drinking Water; Supply & Sanitation presented impacts of climate change on water supply, sanitation and health in Bangladesh. Due to climate change the sanitation will be affected through shortage of safe drinking water in drought prone area, salinity intrusion in coastal zone, declining ground water level and massive damages of water supply and sanitation facilities due to frequent natural disaster. It is now known that increased temperature facilitate rapid growth of water and vector borne disease causing microorganisms. So, in time water borne and vector borne diseases such as malaria, dysentery, diarrhea, and dengue will be prevalent. It is very urgent to ascertain comprehensive risk assessment in various sectors for development of matching action plans which will reduce the climate change impact on water, sanitation and health. Preparation of mitigation and adaptation plans based on a vulnerability assessment of the national health systems and increase knowledge and awareness of the health consequences from climate change should be encouraged.

7.5 Case study-5: Climate change impacts on water supply, sanitation and health: India

M. Manoj Kumar Development Alternatives, India presented detail aspects of climate change scenario of India with relevant data on rainfall, population, temperature, droughts, precipitation etc. and impacts of all these factors on sanitation and health system. In India about 300 million people do not have access to clean drinking water. For this water borne diseases spread out and several million babies dies every year. He stressed that the potential impacts of climate change on health burdens will raise diseases like- diarrhea, malnutrition, respiratory disease and stress related problems also will rise. Climate change induced decline in cultivable land and water shortage leading to decreased agricultural production will further cause food shortage and malnutrition especially in vulnerable population. All these impacts lead to displacement of people and increase eco refugees.

Development Alternatives has programs as awareness and communication packages which based on a principle of B-B-B (Behavior-Belief-Bonding) cycle through community mobilization, institution development, participatory planning and women empowerment through literacy campaign. Some other services-Technological and Social Measures – Water Conservation & Climate Resilience, Irrigation and Livelihood Water Services, Skill building of people to adopt measures that lead to enhanced adaptation capacities mentionable.

6. Group exercises

8.1 Group Exercises 1: Climate change impacts and vulnerabilities

In the first exercise each country group has made some conclusions regarding climate change impacts of their country. The brief of each country given below:

Nepal: Climate induced hazards in Nepal observe at faster snow and glacial retreat and changes in weather and climate pattern (more droughts, erratic rain fall, flash floods, landslides, drying up of springs), increased frequency of vector borne diseases like malaria. Most strikingly pronounced temperature rise in higher Himalayan region and decrease in snow cover in Himalayan Mountains will faster in future.

India: The obvious climate induced hazards in India observed as occurrence of drought episodes, ground water depletion, salinity ingression, productivity of cropping decreasing, erratic rainfall pattern and increased frequency of water/vector borne diseases.

Sri Lanka: The noticeable changes with climate change in Sri Lanka are rise of temperature (0.01-0.03 °C), reduction of annual rainfall, and sea water intrusion along rivers during dry periods.

Pakistan: Climate change induced hazards make Pakistan 6th climate vulnerable country in Asia. Impact of climate change on water resources includes –glacial retreat, glacier lakes, erosion of river basins, depletion of aquifers and changes in water table, lake atrophy, reduced water in wetlands, changes in fresh and sea water interface which will intensify in near future.

Bangladesh: Noticed changes in climate of Bangladesh are increased frequency of cyclone with greater intensity, prolonged flood, river bank erosion, erratic rainfall, outbreak of vector borne diseases, and increase in temperature and inconsistency in seasons. Some of the possible future changes and effects on water resources will in case of sea level rises include salinity intrusion, coastal inundation, coastal erosion, water logging; in case of erratic rainfall may increase flooding, drought, river erosion, poor water quality and rises of temperature increase frequent cyclone, longer drought and depletion of ground water level.

8.2 Group Exercises 2: IWRM concept and implications of climate change

The second group exercise of the day ensue the purpose to develop the understanding IWRM based on session 2. In the group study 4 groups have made discussion on four issues a. Socio-economic and environmental roles of water; b. Implications of water related natural hazards; c. Causes of changes in water regime; and d. Protection to water, environment and livelihood. Each group presents their exercise output which reflected the IWRM principles and practices.

This group exercise confirms the causes of changes in water regime, water conflicts and constraints to resolve the problem. Water regime changes due to construction of dams, removal of green cover, loss of biodiversity, multiple and intensive cropping and improper land use policies.

Water conflicts: Water resources most often create conflicts among different user groups. As urban-rural conflicts, upstream-down stream conflicts, transboundary conflicts, high land vs. low land, environment vs. agriculture and above all social conflicts. To resolve water conflicts water laws should define clearly, improve water conservation with catchments and basin area and cooperation between co-riparian countries and among states/provinces.

Constraints: Water conflicts resolution impeded for lack of cooperation in the region, poor scientific data, lack of political commitment to efficient use of water. Besides, there are political conflicts, weak policies and very poor implementation of water projects.

8.3 Group Exercises 3 and 4

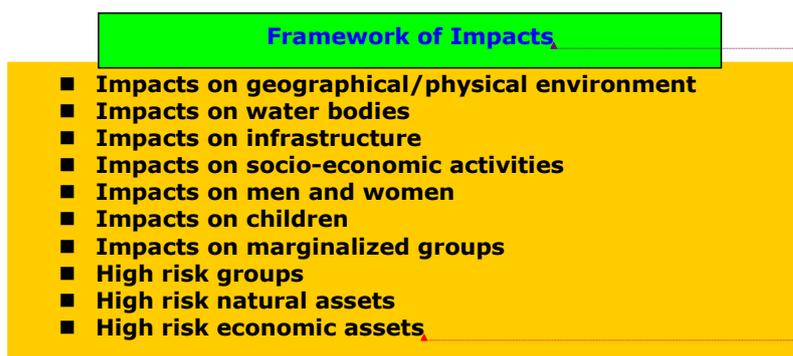
Two group exercises completed in three consequent phases conducted in day 3 and day 4. Phase-1: Analysis of climate change impacts on water use sectors was under Group exercise-3; and Phase-2: Analysis on adaptation measures for various sectors and Phase-3: climate change adaptation strategies and measures into sustainable water resources planning and management under Group exercise 4.

8.3.1 Group exercise-3 (Phase-1: Analysis of climate change impacts on water use sectors)

The group exercise-3 focused on framework of climate change impact. The impact analysis has done through different group. Each group made a presentation on the following topics. These groups have discussed on two geographical contexts-

- a. Climate Change impacts on water use in Coastal Areas and
- b. Indo-gangetic zone (Case of Nepal)

The framework of the group exercise given below:



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a. Climate Change impacts on water use in Coastal Areas

1. Impacts on geographical/physical environment

- Changes in land use pattern
- Sea level rise (Gradual land inundation, loss of agricultural land)
- Frequent cyclone
- High temperature and irregular rainfall

2. Impacts on water bodies

- Saline water intrusion I ground and surface water
- Low flow in rivers
- Scarcity of fresh water

3. Impacts on infrastructure

- Damages of infrastructure due to flooding, storm surge

4. Impacts on socio-economic activities

- Rise of social conflicts with social inequity
- Greater demand of drinking water
- Migration of small farmers due to crop pattern changes
- Loss of fertile land

5. Impacts on men and women

- Increased burden on men and women to cope with household challenges
- Scarcity of water force women to bring water fro long distance.

6. Impacts on children

- More vulnerable to water borne diseases
- High rate of Malnutrition, orphaning, mortality

7. Impacts on marginalized groups

- Fishing community mislays skills and poverty increases

8. High risk groups

- Income decline of daily wages labor
- Fishing activity decline

9. High risk natural assets

- Water, marine life
- Forests

10. High risk economic assets

- Communication and livelihood
- Industries
- Infrastructures (harbor, embankment, flood protection structures etc.)

b. Climate change impact on Indo-Gangetic Zone (Case of Nepal)

1. Impacts on geographical/physical environment

- Landslide, flash floods and sedimentation
- Glacial lake outburst flood

2. Impacts on water bodies

- In case of floods – water logging, water pollution, loss of aquatic flora and fauna
- In case of droughts-depletion of water table, drying of water sources

3. Impacts on socio-economic activities

- Impacts of floods force social conflicts, food insecurity, out migration, inundation, loss of properties

- Impacts of droughts forces-loss of crop production, fodder and livestock

4. Impacts on infrastructure

- Destruction of roads, house, electricity, water reservoirs, sanitation

5. Impacts on men and women

- In men-Loss of job, income, migration to nearby city
- In women-burden to provide food, rearing of cattle

6. Impacts on children

- Malnutrition, higher mortality, retarded mental development

7. Impact on marginalized groups

- Huge migration, loss of traditional profession
- Creating political conflicts

8. High risk groups

- Children and women
- Total dependency on agriculture
- Marginalized ethnic group

9. High risk natural assets

- Productive land
- Forest, river basin

10 High risk economic assets

- Demand-supply chain
- Small cottage industry
- Livestock

8.3.2 Group exercise-4 (Phase 2: Analysis on adaptation measures for various sectors)

Four groups worked out on structured topics under phase 2 and phase 3. The members of the two groups exercised on two case studies; one is Climate Change Impacts on a Coastal City Karachi and another case was Panchkhal (Nepal). Two other groups exercised on The Analysis of Climate Change Adaptation use in Coastal Area of Bangladesh and Ganges River Basin.

The detail outcome of group presentation based on structured topics putted in the appendices. Here a brief of the outcome are discussed. The topic encompasses group work of phase-2 is given below:

Group Exercise 4 (Phase 2)
Analysis on adaptation measures for various sectors

1. Pick out an area/location to which your case applies
2. Pick out 2 impacts (one should be a natural impact)
3. For each impact carry out the following:
 - 3.1 Details of the impact
 - 3.2 High risk groups in that particular impact
 - 3.3 Mitigation measures in place and required
 - 3.4 Adaptation measures:
 - Reactive/ad hoc measures already in place
 - Anticipatory (e.g. cyclones, floods, droughts)
 - Autonomous (actions taken by various groups)
 - Planned (policy, planning, mainstreaming by government)

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A. Analysis on adaptation measures for various sectors in coastal area

Two major impacts:

- Salinity intrusion (Natural)
- Destruction of infrastructure (Physical)

High risk group of the impact:

- Poor people
- Fishermen
- Farmer
- Ethnic group

Mitigation measures in place:

- Afforestation

Adaptation measures: Ad hoc

- Coastal embankment
- Cyclone centre
- Early warning
- Awareness raising
- Crop diversification

Adaptation measures: Anticipatory

- Raising of embankment height
- Raising of house plinth
- Planned relocation

Adaptation measures: Autonomous

- Short height house
- Rain water harvesting for drinking

Adaptation measures: Planned

- Implementation of climate change issues in respective policies
- Upstream flow management
- Incorporation of climate change in IWRM

B. Analysis on adaptation measures for various sectors in Ganges River basin

Two major impacts:

- Changes in rainfall pattern
- Impact due to deforestation

High risk group

- Farmers (Rice, wheat, beans, vegetables)
- Men
- Women
- Children
- Herders
- Livestock/cattle (Cows, Buffalos, Goats)
- Wildlife animals (Tigers, Monkeys, etc)

Mitigation in place and required

- Reduced Grazing
- Less burning of fuels/woods
- Reforestation
- Micro Hydro power
- Alternate appropriate technologies (Biogas, Advanced wells, improved cooking stoves)

Adaptation measures:

Reactive

- Reforestation activities

Anticipatory

- Enhancing forest coverage by planting new trees, community awareness, Using more of alternate technologies

Autonomous

- Enhancing forest coverage by planting new trees, community awareness, Using more of alternate technologies

Planned

Motivating people, conducting training for the people, develop and amend policies fit for changing situation

8.3.3 Group exercise 4 (Phase-3: Climate change adaptation strategies and measures into sustainable water resources planning and management

The structured topics of this exercise were on adaptation strategies and possible IWRM input in planning and management of water resources. The topics of the exercise are given below:

Group exercise 4 (Phase 3) Climate change adaptation strategies and measures into sustainable water resources planning and management	
☐ For your selected case area, make a list of agencies whose activities directly affect water management	Formatted: Bullets and Numbering Formatted: Font: 11 pt
Make a list of plans, policies and strategies that the government has in the context of the two selected impacts	
☐ Keeping in view the planned adaptive measures for each impact, identify possible IWRM inputs (economic efficiency, environmental sustainability and equity)	Formatted: Bullets and Numbering Formatted: Font: 11 pt

Here a brief of the group exercise on IWRM possible input in the planning and management noted.

IWRM Inputs in Economic Efficiencies

- Water Pricing
- Allocation of Water
- Tariff Management
- Enforcement of Laws and Regulation
- Improving irrigation system
- Improving irrigation management
- Appropriate technology for domestic water supply/harvesting (rain water harvesting, hand pumps)

IWRM Inputs in Environmental Sustainability

- Water Conservation
- Regional Cooperation
- Ecosystem Management
- Ensure Environmental Flow
- Basin wise Water Management
- Improving irrigation system
- watershed/land cover management
- Crop diversification

IWRM Inputs in Equity

- Water allocation for different purposes
- Balance between Supply and Demand
- Good Governance
- Gender Perspectives
- Community awareness/empowerment
- Promote better utilization of water

7. Climate Change Negotiation Updates (Copenhagen and Post Copenhagen)

A brief discussion was run by Dr. Saleemul Huq, IIED. He discussed on the Copenhagen climate change negotiation (COP 15) and concluded with remarks that the negotiation must be based on equity and responsibility of countries role emission of GHG.

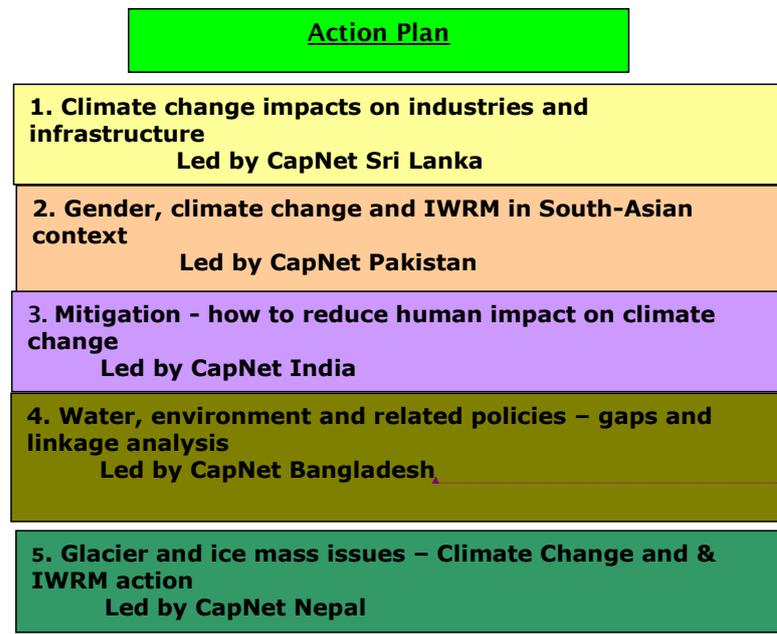
8. Workshop feedback

At the end of the workshop the participants summarizes the workshop strengths and weakness, with some recommendations for future progress. The agreed comments will conclude:

- I. Helped in putting together regional perspective on Climate change
- II. Workshop learning put in practice
- III. Future workshop should structured and output driven
- IV. Converting data into decision
 - V. More field work based activity
 - VI. Workshop content useful for field implementation
 - VII. Expand the network to Bhutan and Afghanistan
 - VIII. Future- Invite practitioners from other sectors; e.g. Agriculture
 - IX. Strengthen SAARC network on Climate Change
 - X. Ensure student participation from all countries
 - XI. Present More Videos

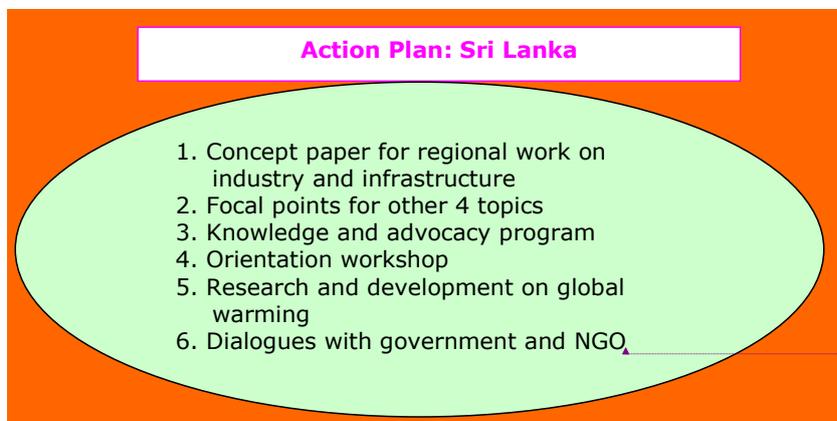
9. The Way Forward

The five day conference provided basic and advance knowledge about IWRM and climate change at the beginning followed by sharing of case studies from across the region on impacts of climate change on water use sectors like agriculture, water supply, sanitation, health, industry, energy, etc. The conference agreed to combat through a common consensus to adapt and mitigate climate change impacts on water resources in South Asian countries using IWRM as a tool. The proposed action plans are given below:



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The participants of each country presented country specific action plan working steps. The working components of each country vary some degree depending on their country needs and demand.



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Action Plan: Pakistan

1. Concept paper
2. Four focal point
3. Theme paper on CC and Water
4. Orientation workshop with partner
5. Regional workshop
6. Dialogue with government and NGO

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Action Plan: India

1. Concept paper
2. Focal points
3. Capacity building
4. Research project on CC and Water
5. Orientation workshop
6. Dialogue with government and NGO

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Action Plan: Bangladesh

1. Concept paper
2. Focal points
3. Policy work by government
4. Orientation workshop
5. Integration of CC and IWRM in education sector
6. Dialogue with government and NGO

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Action Plan: Nepal
1. Concept paper

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UNIQUENESS OF THE REGIONAL CONFERENCE

- *Participation from all section of society from Students to Scientists, Grass-root level Managers to Policy makers ;*
- *Clearance of doubts and concepts on IWRM and climate change through group exercises ;*
- *Generation of quality material on IWRM and Climate Change through exchange of ideas ;*
- *Capacity building of all the participants throughout the workshop through group exercises.*

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12. Financial Statement

In the workshop, a total expenditure was forty thousand and five hundred (40,500) USD under the agreed budget of the total 40,900 USD. The details of which will be sent to you by post. Here the brief summary expenditure given as per budget.

Financial Statement

No	Event/Work	Amount (US\$)
1	Coordination and management	2500
2	Logistic support(including workshop materials and transport)	
2(a)	Workshop materials(bag, flipchart, pen, pencils etc)	2673
2(b)	Stationeries	1845
2 (c)	Local transport for participants (Pick up, Drop and Movement)	3353
2 (d)	Field visit including snacks	586
3	Accommodations for participants from other countries (India, Sri Lanka, Nepal and Pakistan) including Bangladesh (including 10 % service charge and 15 % VAT)	10799
4	Air travel for 14 outside participants	7931
5	DSA for participants (For foreign and local)	3606
6	Lunch/Dinner/Tea (including 10 % service charge and 15 % VAT)	4939
7	Venue rent with services (including 10 % service charge and 15 % VAT)	2268
Total		40500

Appendices

Appendix-1: Workshop program

Programme of Regional Workshop

On

Climate Change and Water Resources: IWRM as a tool to cope with changing condition of the climate system

10th-14th January 2010
BCDM, Gazipur, Dhaka, Bangladesh

10 January 2010 (Sunday); Day- 1	
<i>Registration and Opening</i>	
<i>Welcome Address</i> -Dr. Atiq Rahman, Executive Director, BCAS, Secretariat CapNet SA	
Introduction of Participants	
Introduction and process of the workshop - Golam Rabbani, Senior Research Officer, BCAS and Focal Point, CapNet South Asia	
Tea/Coffee	
Theme 1	<i>IWRM and Climate change: Concepts, science, uncertainties, impacts and vulnerabilities</i> Chair: Simi Kamal (Session-I) and Dr. Atiq Rahman (session II and III)
Session-I	Climate Change Science, climate change impacts and vulnerabilities (Global, South Asia and Bangladesh perspectives) Dr. Atiq Rahman, Executive Director, BCAS
Group Exercise -1	Group Exercise -Golam Rabbani and Sanaul Kafi
Group Presentation	
Lunch/Prayer	
Session-II	Introduction to Integrated Water Resources Management (IWRM) and implications of climate change on water management in Bangladesh-Jahir Uddin Chowdhury
Tea/Coffee	
Group Exercise-2	Group Exercise -Golam Rabbani and Ashraful Amin
Group Presentation	
Session-III	Techniques/Tools for assessing climate change impacts Mozaharul Alam Babu
Questions/ Clarifications/Discussion	
Closing of the day	
Dinner	
11 January 2010 (Monday); Day- 2	
<i>Recapitulation of the previous day</i> -Simi Kamal	

Session-IV	<i>Climate Change and climate variability: Dealing with Uncertainties</i> - Ashrafal Amin, BCAS
Theme 2	Case Studies: Impacts of climate change on water use sectors Chair : Dr. Veena Khanduri (morning) and Representative of Nepal (afternoon)
Case study-1	Climate change and climate variability : Hydrological changes in Bangladesh/South Asia - A.H.M. Kausher, Chief Engineer, Hydrology-BWDB
Tea/ coffee	
Case study-2	Climate change impacts on water resources in Sri Lanka - Prof. Sohan Wijesekera, University of Moratuwa
Case study-3	Climate change impacts on agriculture - Shakeel Ahmed Ramay, SDPI, Pakistan
Questions/clarifications and open discussion	
Lunch and prayer	
Case study-4	Climate change impacts on water supply, sanitation and health - S.M.A. Rashid, Executive Director, NGO Forum Bangladesh
Case study-5	Climate change impacts on water supply, sanitation and health - Manoj Kumar, DA, India
Tea/ coffee	
Questions/clarifications and open discussion	
Closing the day	
<i>Dinner</i>	
12 January 2010 (Tuesday); Day- 3	
<i>Recapitulation of the previous day</i> -Prof Sohan Wijesekera	
Session-V	Climate change and Gender vulnerability - Golam Rabbani, BCAS
Group Exercise -3	Group Work -Golam Rabbani and Simi Kamal Analysis of climate change impacts on water use sectors: Scenario 1. Climate change and agriculture Scenario 2. Climate change and water supply, sanitation, health Scenario 3. Climate change and industry, energy and infrastructure Scenario 4. Climate change and fisheries, forestry, livestock and other biodiversity
Tea/ coffee	
Group Exercise-3	Group Work Continue.....
Group Presentation (15 minutes/presentation)	
<i>Lunch and prayer</i>	
Field Visit Dhanmondi Lake Improvement Project/International Trade Fair <i>B-B-Q/ Dinner</i>	

13 January 2010 (Wednesday); Day- 4	
	<i>Recapitulation of the previous day</i>
Theme 3	Instruments and Measures for Adaptation Chair: Khandaker Mainuddin, BCAS
Session-VI	Concepts, types of adaptation and possible adaptation measures for various sectors to climate change impacts; few cases in Bangladesh - Dr. Moinul Islam Sharif, UNEP Riso/Golam Rabbani, BCAS
Group Exercise -4	Analysis on adaptation measures for various sectors: Scenario 1. Climate change and agriculture Scenario 2. Climate change and water supply, sanitation, health Scenario 3. Climate change and industry, energy and infrastructure Scenario 4. Climate change and fisheries, forestry, livestock and other biodiversity
	<i>Tea/coffee</i>
	Group work continues
	Group presentation
	Lunch and prayer
Session-VII	Adaptation to Climate Change in Water Management - Dr. Mashfiqus Salehin, BUET
Group Exercise-5	Groups work to incorporate climate change adaptation strategies and measures into sustainable water resources planning and management
	Group Presentation
	Tea/Coffee
Theme 4	Theme 4. Strategy Development and Action Plan for Adaptation to climate change Chair: TBC
Session-VIII	International Response to Climate change and water management ✓ UNFCCC Guidance ✓ UNEP/UNDP response ✓ International dialogue/networking
	<i>Questions/clarification</i>
14 January 2010 (Thursday); Day- 5	
	<i>Recapitulation of the previous day</i>
Session-IX	Economics of adaptation, challenges and opportunities in integration of adaptation into national planning Prof. Rezaur Rahman, IWFM, BUET
Group Exercise-6	How climate change can be integrated in national water policy, plans, programs and projects?
	<i>Tea/coffee</i>
	Group work continues.....
	Group Presentation
Climate Change Negotiation Updates (Copenhagen and Post Copenhagen) - Dr. Saleemul Huq/Golam Rabbani	

Country Work plans: What is our next step? Course evaluation and closing of the workshop
Lunch
<i>Dinner</i>

Appendix-2: List of Participants

Workshop on

**Climate Change and Water Resources:
IWRM as a tool to cope with changing condition of the climate system**

A. RESOURCE PERSON

No.	Name	Organization	E-mail
1.	Prof. Jahiruddin Chowdhury	IWFM, BUET	iuc@iwfm.buet.ac.bd Ph: 9665601 (7364)
2.	Dr. Atiq Rahman	BCAS	atiq.rahman@bcas.net
3.	S.M. A. Rashid	NGO Forum for Drinking Water	ngof@banpla.net Cell:0171154356
4.	Mozaharul Alam	UNEP	mozaharul.alam@unep.org
5.	Golam Rabbani	BCAS	golam.rabbani@bcas.net Cell: 01713248362
6.	Ashraf Amin	BCAS	ashraf.amin@bcas.net
7.	Dr. M. Salehin	IWFM, BUET	mashfiqussalehin@iwfm.buet.ac.bd Cell: 01199111402
8.	Prof. Rezaur Rahman	IWFM, BUET	rezaur@iwfm.buet.ac.bd Cell:01714337758
9.	Dr.Moinul Islam Sharif	BCAS	moinul.sharif@bcas.net
10.	A.H.M. Kausher	Hydrology, BWDB, Government of Bangladesh	Cell:01714404293 engineerkausher@yahoo.com
11.	Khandaker Mainuddin	BCAS	Cell: 01713023856

B. PARTICIPANTS

No	Name	Organization	E-mail	C
1.	Mamata Sayami Manandhar	Tribhuvan University	mamatasayami@gmail.com	Nepal
2.	Rabi Wenju	Nepal Engineering College	wenju_rabi@hotmail.com	
3.	Ujjwal Meghi Gurung	School of Environmental	ujjwalmeghi@gmail.com	
4.	Simi Kamal	HISAAR FOUNDATION	simisadaf@yahoo.com	Pakista
5.	Shakeel Ahmed	SDPI	shakeel@sdpi.org	

6.	Zohair Ashir	Hisaar Foundation	z.ashir@accesstoconsulting.com	Sri Lanka
7.	Nasir Ali Panhwar	Hisaar Foundation	napanhwar@gmail.com	
8.	Dr. Lal P Vidhna Arachchi	University of Sri Lanka	pvalal@sab.ac.lk	
9.	(Eng). L.L.A. Peiris Sri Lanka	National Water Supply and	wbdgmncnw@waterboard.lk	
10.	Dr. Champa Nawaratne Sri Lanka	Senior Lecturer, University of	champa_m2004@yahoo.com	
11.	Prof N.T.Sohan Wijesekera	University of Moratuwa	sohanw@gmail.com	INDIA
12.	Manuj Pandey	Pan Himalayan Grassroots	apaul@grassrootsindia.com	
13.	Dr. Veena Khanduri	India Water Partnership (IWP)	veenakhanduri@yahoo.com	
14.	Manoj Kumar	Development Alternatives	manoj.0878@gmail.com	
15.	Sonia Binte Murshed	IWFM	sonia@iwfm.buet.ac.bd	
16.	Mohammad Alamgir	WARPO	alamgirforester@yahoo.com	
17.	Mobassarul Hasan	IWM	mbh@iwmbd.org	
18.	Syed Waliul Islam	NGO Forum	wali@ngof.org	
19.	Alauddin Ahamed	ITN Center	cermoffice@cerm.buet.ac.bd	
20.	Syed Hafizur Rahman	Dept. of Environmental	hafizsr@yahoo.com	
21.	Amirul Hussain	BWDB	amirulbd63@yahoo.com	
22.	Md. Fardoush Anwar	Department of Environment	fardoush@doe-bd.org	
23.	Dr. Dwijendra Lal Mallick	BCAS	Dwijen.mallick@bcas.net	
24.	Dr. Hamidul Huq	BUET		