Sectoral inputs towards the formulation of
Seventh Five Year Plan (2016 – 2021)

CLIMATE CHANGE AND DISASTER MANAGEMENT

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ACRONYMS

ADB	Asian Development Bank
ADP	Annual Development Plan
AF	Adaptation Fund
AFB	Adaptation Fund Board
ALGAS	Asia Least Cost Greenhouse Gas Abatement Strategy
AWD	Alternate Wet and Dry (a method of irrigation)
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agriculture Research Institute
BCCRF	Bangladesh Climate Change Resilience Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCTF	Bangladesh Climate Change Trust Fund
BDRCS	Bangladesh Red Crescent Society
BFRI	Bangladesh Forest Research Institute
BLRI	Bangladesh Livestock Research Institute
BMD	Bangladesh Meteorological Department
BPI	Bangladesh Press Institute
BRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CBA	Community Based Adaptation
CBO	Community Based Organization
CC	Climate Change
CCA	Climate Change Adaptation
CCC	Climate Change Cell
ccGAP	Gender Action Plan on Climate Change
CDA	Chittagong Development Authority
CDI	Community-based Development Initiatives
CDM	Clean Development Mechanism
CDMP	Comprehensive Disaster Management Programme
CEGIS	Centre for Environment and Geographic Information Services
CFL	Compact Fluorescent Lamps
CNG	Compressed Natural Gas
COP	Conference of Parties (to UNFCCC)
CPP	Cyclone Preparedness Programme
CRA	Community Risk Assessment
CS	Civil Society Organization
CWASA	Chittagong Water Supply and Sewerage Authority
DA	Designated Authority (for Adaptation Fund)
DAE	Department of Agricultural Extension
DBSA	Digital ISD in Action
DCC	Dhaka City Corporation
DDM	Department of Disaster Management (erstwhile DMB)
DER	Disaster and Emergency Response
DeSHARI	Developing & Strengthening Humanitarian Assistance and Risk Reduction Initiatives
DFID	Department for International Development (of UK)

DiPECHO	Disaster Preparedness, The European Commissions' Humanitarian Office
DLS	Department of Livestock
DM	Disaster Management
DMB	Disaster Management Bureau
DMC	Disaster Management Committee
DNA	Designated National Authority (for Clean Development Mechanism)
DOE	Department of Environment
DOF	Department of Fisheries
DOFo	Department of Forest
DOL	Department of Livestock
DORR	Directorate of Relief and Rehabilitation
DPHE	Department of Public Health Engineering
DRR	Disaster Risk Reduction
DWA	Department of Women Affairs
DWASA	Dhaka Water Supply and Sewerage Authority
ECB	Emergency Capacity Building (a project on DRR, implemented in Bangladesh)
EU	European Union
EWS	Early Warning System
FCJ	Food and Climate Justice (a campaign of Oxfam)
FFWC	Flood Forecasting and Warning Centre
GBM	Ganges-Brahmaputra-Meghna
GCF	Green Climate Fund
GCM	Global Circulation Model
GDP	Gross Domestic Product
GED	General Economic Division
GIZ	German Development Cooperation (erstwhile GTZ)
GOB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
HFA	Hyogo Framework of Action
ICDDR,B	International Center for Diarrheal Disease Research, Bangladesh
INCRISED	Inclusive Community Resilience for Sustainable Disaster Risk Management
INDC	Intended Nationally Determined Contribution
INGO	International Non-governmental Organization
IPCC	Inter-governmental Panel on Climate Change
IUCN	International Union of Conservation of Nature
IWFM	Institute of Water and Flood Management
LGI	Local Government Institute
MDG	Millennium Development Goals
MODMR	Ministry of Disaster Management & Relief
MOEF	Ministry of Environment and Forest
MOFDM	Ministry of Food and Disaster Management
MOHFW	Ministry of Health and Family Welfare
MOLF	Ministry of Livestock and Fisheries
MOP	Ministry of Planning
MOWCA	Ministry of Women and Children Affairs
MOWR	Ministry of Water Resources
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action

NARRI	National Alliance for Risk Reduction Initiative
NCTB	National Curriculum and Text Book Board
NDA	National Designated Authority
NGO	Non-Government Organization
NIE	National Implementing Entity
NIRAPAD	Network for Information, Response And Preparedness Activities on Disaster
NPDM	National Plan for Disaster Management
NWP	National Water Policy
PATC	Public Administration Training Centre
PECM	Poverty, Environment and Climate Change Mainstreaming (an initiative)
PKSF	*PalliKarmaSangsthan* Foundation
PRECIS	(A computer aided model)
PRSP	Poverty Reduction Strategy Paper
RCM	Regional Climate Model
SAARC	South Asian Association for Regional Cooperation
SCCF	Special Climate Change Fund
SDC	Swiss Development Cooperation
SFA	SAARC Framework of Action
SIDA	Swedish International Development Agency
SLR	Sea Level Rise
SNC	Second National Communication
SOD	Standing Order on Disasters
SSN	Social Safety Net
SST	Sea Surface Temperature
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Strategy for Disaster Reduction
UNWOMEN	United Nations Entity for Gender Equality and the Empowerment of Women
USAID	United States Agency for International Development
WEDO	Women's Environment and Development Organization
WMO	World Meteorological Organization

GLOSSARY

Afal	The high intensity waves which cause erosion of villages in the *Haor* areas
Aila	A category-1 (i.e., low intensity) cyclone that affected the southwestern region of Bangladesh on 24 May, 2009
Aman	The wet-season paddy
Astomashi	Eight-months long
Bandh	Embankment/ temporary protection structure (made of mud) to protect from inundation
Boro	The dry season paddy which provides for about 59% of all food grains in Bangladesh
˚C	Degree Celsius (a measure of warmth)
Giga	A measure that accounts for a thousand Million
Haor	A depression area consisting of wetlands, located in the northeastern region of Bangladesh
Karma	Work/employment
Kgoe	Kilogram of Oil Equivalent (a measure of energy)
Killa	Earthen mound with a flat top along the coastal zone to allow local people to relocate their livestock following issuance of a cyclone warning
Mohasen	A cyclone that was anticipated to hit Bangladesh in 2012
Palli	Rural
Parishad	A council or a body (generally an elected body)
Pourasava	The urban governance structure at the lowest tier
REDD+	A programme under UNFCCC for reforestation in denuded and degraded forests
Shohayak	Something that provides assistance
Sidr	A catastrophic cyclone (Category-4) that ravaged central coastal areas of Bangladesh on 15 November 2007
Upazila	A sub-district
US$	Dollar, currency of the United States of America

EXECUTIVE SUMMARY

The Government of Bangladesh has initiated the process of formulating its Seventh Five Year Plan for the period 2016-2020. A total of 28 background papers, mostly sector-specific, have been identified – each of which will be completed as inputs towards formulating the Plan. The GOB recognizes that the country is highly prone to a variety of hazards and her disaster risk reduction needs are amongst the highest in the world. Moreover, the country and its poor people are most likely to be severely affected by global climate change, which in turn will exacerbate hazard related adverse impacts. As per GOB decision, a paper on climate change and disaster risk reduction is perceived to provide insight into the GOB's current state of preparation, delivery of services, gaps between needs and services being provided, and future directions to avoid major adverse implications of both climate change and disaster risk reduction. This paper provides information, analyses and recommendations so that the GOB can utilize it towards devising its Plan by integrating concerns and responses on climate change (both adaptation and mitigation) and disaster risk reduction.

The GOB recognizes that the country is still prone to hazards, a few of which often turning into disasters. It also recognizes that frequency of a certain type of hazards has increased over the years. Climate change has slowly been manifesting itself by aggravating a few climate induced hazards. Although, major catastrophic changes in climate system might not occur during the 7th FYP period, the cumulative effect of small changes would still make the country more susceptible to high intensity hazards, which warrant planned approaches towards reducing hazard related risks. The GOB recognizes people's own initiatives and coping strategies towards facing the adverse impacts of hazards. The GOB has also been invested a large amount and deployed institutions to offer protection measures, early warning systems, during- and post-hazards relief and recovery over the past four decades. Although many of the above responses are gender neutral, the GOB is willing to consider gender sensitive responses in its future activities in this regard. Policies and legal frameworks have been formulated in order to equip the GOB machinery to consider steps towards reducing risks of disasters and climate change.

In recent years, the GOB has produced a National Plan on Disaster Management, formulated a (draft) Policy on Disaster Management, revised its Standing Orders on Disaster, and enacted its legal framework for disaster risk reduction. Efforts are being made to fulfill GOB's promises through the Hyogo Framework of Action towards providing DRR services to its citizens. On climate change, Bangladesh Climate Change Strategy and Action Plan has been formulated, which has been complemented by the establishment of a number of institutions and funds so that both adaptation and low carbon development may be addressed adequately through the engagement of various stakeholders including the government agencies. Various initiatives of the GOB has received global accolade and generally accepted as amongst best practices across the globe.

Despite such groundbreaking initiatives and policy frameworks, the GOB recognizes a few challenges which needs to be overcome in order to provide adequate services to the citizens towards reducing risks of hazards and disasters with or without climate change and to steer the country's economy in a low carbon and energy efficient pathway. The following are identified as current limitations which require immediate attention.

- Limited understanding, knowledge and capacity.
- Inadequate management skills at all tiers.

- Adaptation priorities are yet to be set out.
- Inadequate integration of climate risk with development planning and budgeting.
- Weakness in implementation, monitoring and shared learning.
- Limited financing.
- Weaknesses in institutional coordination

There is no denying the fact that all the above issues are needed to be addressed as soon as possible to ensure sustainable journey to development, defying all climate induced hazards and disasters. In both DRR and CCA, the GOB faces a few common challenges. Lack of scientific understanding, knowledge and skills to devise appropriate actions in anticipation of a hazard is a major limitation. It is true that the GOB has developed National Disaster Management Plan and Bangladesh Climate Change Strategy and Action Plan in the past. However, it is the lack of capacity and managerial skills of government officials at all levels which pose an obstacle in translating the plans into tangible and appropriate actions. The 7th Plan will therefore focus on building capacity on both DRR and CCA.

DRR and CCA cut across many sectors. Major actions therefore require inter-agency coordination, which appears to be difficult to achieve given the current institutional arrangements. However, a sustainable solution will not be achieved without ensuring coordination among various agencies, trying to achieve the same goals. Moreover, doing similar things to address a common issue, however without coordination, warrants additional resources due to duplication which needs to be addressed immediately. Therefore, the 7th Plan will emphasize on institutional strengthening and inter-agency coordination. In this pursuit, policies on both DRR and CCA will be developed. The DRR policy is in its draft stage which will be finalized while efforts will be made to develop policy on climate change during the Plan period.

Financing has remained a major issue in implementing many projects which have clear co-benefit opportunities in relation to DRR and CCA. The promised international financing has not been delivered by the international sources, especially on CCA. However, a new financial mechanism in the form of GCF is about to be made functional. Bangladesh must seize this opportunity and exhibit institutional, management and fiduciary readiness in order to tap resources from such international sources. The above mentioned skill enhancement efforts will be useful. However, the country must develop its negotiation skills so that international finance may be ensured during the plan period. Meanwhile, parallel efforts must be made to tap adaptation co-benefit opportunities from all development related spending.

In its journey towards achieving a climate-safer land with sustaining prosperity and people's wellbeing, the GOB recognizes the relentless support it has been received from various development partners over the past four decades. Such institutions have provided grant to administer development projects including DRR projects, also have given loans to provide better support to the people. A few development partners have engaged local as well as international non-government and civil society organizations to address immediate gaps in services rendered by the GOB, innovate new responses that might suit local needs, and set examples of many good practices in the pursuit of Bangladesh which is hazard affected but not devastated and the adverse impacts are adequately ameliorated. The GOB appreciates such pro-active partnerships and wishes to forge future partnerships towards addressing the limitations mentioned above. The 7th Five Year Plan will focus on the above weaknesses and wishes to solve these through an active partnership with development partners and civil society organizations.

It is to be recognized that the GOB has been trying its best to address many of the shortcomings highlighted above. During the 7th Five Year Plan period, the GOB can perhaps address all of the above, however a prioritization of these might possibly yield the best result. The following may be listed as immediate targets for the GOB to achieve during the seventh five year plan.

On Climate Change Adaptation

Within the 7th Five Year Plan period, CCA will be fully mainstreamed into ADP projects.

- The BCCSAP is revised, establishing synergy with 7th Five Year Plan and other emerging strategic decisions and documents on climate change, making it a functional strategic document
- NAP exercise will be completed and synergies established with 7th Plan, the new National Plan on Disaster Management (2016-2020) and subsequent ADP projects
- Technical capacity of all ministries and all newly recruited civil servants will be built on understanding climate change related risks and considering CCA
- Lifesaving infrastructures such as cyclone shelters will be built across the coastal zones, based on population density
- Institutional leadership for leading and coordinating with various stakeholder institutions and local government bodies will be revitalized, strengthened and their human capacities built
- The Gender Action Plan on climate change (ccGAP) will be implemented in collaboration with relevant stakeholders including GOB ministries and departments as per the provisions created in the document.
- Enhance a whole-of-government approach in climate change country readiness for planning, capacity building, designing of bankable programmes-projects, financing, implementation, monitoring-reporting-verification, auditing, oversighting and communication.

The implementing strategy of the above targets on CCA will be the following:

BCCSAP implementation time line is about to be expired. The document needs to be revised following a consultative process. The revision process must attempt to provide for a priority list of actions and a rough estimation of cost of adaptation of prioritized projects so that those may be integrated with both the 7th Five Year Plan as well as the NAP. GOB should have a synchronized prioritization of CCA actions, based on recommended activities under NAPA, BCCSAP and Climate Fiscal Framework, and synergized with NAP, INDC and sectoral priorities of the 7th Plan.

NAP needs to be developed through a participatory process, taking into consideration most vulnerable sectors and areas. It should prioritize projects which will be initiated within the 7th Plan (prioritization will strike a balance between adaptation costs and adaptation needs). Cost of each adaptation project and development of bankable project ideas should be part of the NAP output.

A culture of integrating CCA into all development projects needs to be established so that adaptation co-benefits may be accrued from development spending, with or without international assistance for CCA.

An institutional revitalization and strengthening is an immediate necessity in order to in order to gear up current institutional arrangement and to ensure proper collaboration and coordination involving multiple-tier institutional stakeholders. The current institutional arrangement requires a thorough examination, the prevailing capacity involving technical know-how of officials, financial and coordination strength will be built to make the arrangement more functional.

Bangladesh's readiness to harness available international support is below par, which needs to be addressed on an urgent basis. The NIE for both Adaptation Fund and Green Climate Fund (GCF) to be identified, their capacities enhanced significantly so that these are duly accredited with respective funds. Support from development partners may be sought in order to begin an immediate process to analyze status of potential NIEs as against institutional requirements to do the job and to enhance their respective capacities including fiduciary capacities and practices.

The prevailing knowledge gap between central government institutions and the local government institutions must be addressed by devising plans for capacity building of office bearers of local government. A CCA-DRR consolidated course must be introduced in respective training institutions. The officials involved in civil administration should also be equipped with advanced understanding on climate change. At the Foundation Training stage, the newly recruited Officials, irrespective of cadre, will be provided with training on climate change. The currently used training module needs to be revised. Similar arrangements may be made involving Planning Academy where GOB Officials receive training on planning processes, in order to facilitate integration of DRR-CCA in development.

Greater efforts must be made to understand and respond to gender differentiated impacts of climate change and the adaptive capacity of both women and men. Adaptation must be devised based on gender differentiated vulnerability analyses and implemented in a way that addresses issues of gender equality. In particular, women's adaptive capacity must be recognized and enhanced as key actors in the implementation of CCA activities. The Climate Change Gender Action Plan (ccGAP), developed by the GOB needs to be disseminated amongst stakeholders and implemented within the purview of the 7th Five Year Plan. Since it has linkages with all six pillars of the BCCSAP, the plan must be given due priority for implementation in near future in a bid to integrate gender concerns in all activities on climate change adaptation.

Efforts must be made to develop mechanism to match institutional-led macro and meso-scale adaptation with people-centric micro-scale Community Based Adaptation. The macro- and meso-scale institutional interventions have not adequately addressed micro-scale adaptation needs. At the grassroots, community-based approaches have been proven to be more effective. Efforts must be made to develop mechanisms so that institution-led macro- and meso-scale adaptations make rooms for incorporating local level people-centric participatory CBA planning.

<u>On Low Carbon Development</u>

- NAMA to be completed immediately. A nation-wide consensus is needed for establishing Bangladesh's INDC. The NAMA must be produced in light of INDC, through a participatory process, where emphasis must be placed on MRV readiness to comply with UNFCCC regulations (including institutional strengthening and development of MRV protocols). REDD, promotion of renewable technologies, and demand side management should be emphasized under the Bangladesh NAMA. NAMA to be developed with proper prioritization, costing and result matrix.
- Adaptation-mitigation synergistic initiatives to be given full institutional support and initial incentives
- Mitigation related research to be given priority, research finance will be mobilized
- Anchor institutions for LCD will be identified and their capacities enhanced through targeted training
- A pathway for improved coordination involving various stakeholders/agencies will be devised

- Sector where unnecessary emissions may be significantly reduced needs to be identified and targeted programmes to be devised and implemented in cases of win-win situations.

Efforts will be made to strengthen institutional capacities of relevant institutions (such as Bangladesh Energy Regulatory Commission, Power Cell, Ministry of Industries, Ministry of Commerce, etc.) in relation to mitigation and realizing the national objecting of achieving LCD. LGED has been involved in facilitating urban infrastructure development in major and secondary cities. The unit dealing with urban development will be strengthened to understand the requirements and planning for green urbanization. The early learning on City Region Development Project will be up-scaled to facilitate green urban development.

Efforts will be made to reduce greenhouse gases from manufacturing industries such as cement manufacturing and steel rerolling activities. This will enhance green production in Bangladesh. The emission reduction opportunities in dairy sector will be further given incentives to achieve LCD objectives in livestock management and greener dairy production. Alternative Wetting and Drying method will be promoted through the involvement of Department of Agricultural Extension and NGOs towards reducing methane emission from irrigated agriculture.

REDD potential will be explored further. In this regard, efforts will be made to draw in international process-led financial support for REDD and socially suited REDD+ efforts. Demand side management (DSM) will be given greater emphasis towards further achieving LCD in Bangladesh. Media will be utilized towards bringing in change in DSM by the use of energy efficient technologies.

<u>On Disaster Risk Reduction</u>

- Implementation of the DM Act, distinguishing the appropriate methods of mitigation for all hazard types. Prevailing gaps in terms of 'specific rules' need to be formulated to make the DM Act functional.
- Identification of adequate national resources to finance risk reduction and enable appropriate allocation of resources to vulnerability reduction through local level mechanisms. International financing can also play a positive role, but should not be considered the main source.
- Robust financing policies and mechanisms for disaster recovery and reconstruction should be developed, including elaboration of the role of private finance through capital markets, insurance industry and how the GOB may contribute to the development of effective market mechanisms to support risk hedging.
- DRR and CCA policy frameworks continue to be developed, strengthened and implemented by MODMR and across the GOB.
- Knowledge, understanding and requisite skills for DRR are developed by GOB officials at all levels and that relevant knowledge and information is also available for households.
- Coordination and collaboration between GOB and non-governmental institutions, volunteer organizations, private enterprise and others are developed and maintained.
- Regional cooperation should be further strengthened for disaster management, in particular on trans-boundary data sharing with India on climate, rainfall and river flows.
- Gender, vulnerability and inclusivity issues should be considered across all the sectors and ministries in all the phases of disasters

- DDM leadership on humanitarian coordination should be enhanced and a resilience perspective integrated.
- Knowledge management, in particular dissemination of knowledge products, should be strengthened.
- Resilient recovery will be pursued as a means to sustainable development
- National Disaster Management Policy has been finalized.
- Gender issues are integrated into all disaster risk management policies, plans and decision-making processes, including risk assessment, early warning, information management and education and training.
- The new organogram for DDM is approved and implemented. Specific institutional development targets for MODMR and DDM are developed and implemented with a focus on financial performance, monitoring and evaluation, technical assistance for DRR mainstreaming.
- Targets for implementation of HFA 2 priorities and a more robust monitoring mechanism are accepted and institutionalized.
- National budget for DRR and local level DRR financing mechanism is established and funded.

MODMR will seek to progressively develop the capacity of its officials at all levels to manage the many disaster risks faced by Bangladesh. It will ensure that adequate national financing, supported by international financing where needed, will be available and that appropriate and accountable disbursement mechanisms are put in place. MODMR will develop the capacity to provide technical assistance and capacity development to other ministries and agencies of the GOB and monitor their performance on DRR within their own policy and planning frameworks. It will support the work of civil society and volunteer organizations through policy development, coordination, knowledge management and financing to deliver measurable reduction in vulnerability.

Gender issues will be integrated into all disaster risk management policies, plans and decision-making processes, including risk assessment, early warning, information management and education and training. Budgetary allocations will be increased to achieve this objective.

Specific institutional development strategies for MODMR and DDM will be developed and implemented with a focus on financial performance, monitoring and evaluation, technical assistance for DRR mainstreaming.

National budget for DRR and local level DRR financing mechanism will be established and funded. DRR activities will be integrated with CCA activities in order to reduce duplication of financing and to achieve greater value for money. The National Plan for Disaster Management (2016-2020) will be developed and synergies will be made with the efforts of preparing the National Adaptation Plan. Local level Adaptation Plans for at least two vulnerable Upazilas will be elaborated and tested under the 7th FYP. In such plans, DRR will be completely integrated to exhibit early results of resilience building and coordinated development in relation to DRR and CCA.

1. INTRODUCTION

In recent decades, Bangladesh has made bold strides towards development (PC, 2014). The country has achieved commendable success in economic and social indicators. Not only that it is about to lift itself from the list of least developed nations, it's recent progresses on a number of indicators have surpassed its neighbouring developing nations in South Asia (Social Progress Imperative, 2014). Analysts believe that Bangladesh will emerge as a middle income country by 2021 – the 50th anniversary of its independence. Now the development challenge is to maintain the strides and sustaining the achievements.

Over the past four decades, Bangladesh has been able to reduce disaster mortality significantly. Yet exposure of its economy to disaster losses continues to grow given the multiple and high frequent large-scale hazards; and other factors such as higher economic growth, increase in assets and urbanization. With a conservative estimation, five major disasters since 1998 caused damage to roughly 15% of GDP with an average of 2.7% per event (GoB, 2011). Many of such hazard-related losses may be attributed to climate induced events. Recent analyses suggest that such losses and damages will most likely to be exacerbated under climate change (MOEF/GOB, 2012). There is an array of reasons that attribute to Bangladesh's high exposure to climate change impacts:

- About 88% of the landmass is consisting of floodplain, sitting in a delta (Rashid, 1991);
- The topography is flat and majority of the landmass lies within 10 meters above mean sea level;
- The geographic location is such that it is heavily influenced by monsoon and the landmass consisting of only 7% of the combined catchment areas of three great rivers, the Ganges, the Brahmaputra and the Meghna (GBM), which has to drain over 92% of rainfall runoff generated in the combined GBM catchment, that too within four and a half months (June to mid-October) (Ahmad *et al*., 1994);
- The monsoon season is followed by a prolonged dry season, where lack of appreciable rainfall and almost continuous evaporation from the top soil give rise to aridity and subsequent (phonological) moisture stress (Asaduzzaman *et al*., 1997; Karim *et al*., 1998);
- The rivers are braided and still undergoing erosion-accretion cycle, resulting in severe erosion in one bank and accretion in the other (Rashid, 1991);
- The inverted funnel shaped shoreline is located on the path of cyclonic storms and associated surges, both occurring in the northern Indian Ocean (Ali, 1999); and
- The neap tides during peak monsoon are high enough to penetrate into coastal plains those are apparently protected by embankments, leaving entire area under such embankments inundated with saline water (Ahmed, 2008).

Beside these hydro-geophysical reasons, developmental factors also exacerbate the disasters and climate change impacts. These include: population density, high poverty, income inequality, fragile infrastructure, limited integration of disaster risk into national and local planning and low human development progress (Ahmed, 2013). In a bid to reduce household and community level vulnerability, Bangladeshi people have been devising new coping strategies and sharpening millennia old ancestral response modalities to face such hazards and disasters (MOEF/GOB, 2012). Widespread hazard withstanding culture and practices has made Bangladeshi people resolute, although they deserve much better management systems to be able to defy odds and become resilient.

Since independence in 1971, the GOB has made considerable investment on improvement of country's disaster management system. Development partners, United Nations, International Financial Institutions and non-government organizations (NGO) made significant contributions to GOB's effort. As a result of people's own initiatives in the disaster hot-spots, government's autonomous and planned responses, donors' relentless supports and NGOs voluntary supplementary interventions have been making Bangladesh gradually more able to cope with disasters. A culture of disaster management has been evolved through a combination of autonomous actions and institutionally driven targeted responses.

However, by the time the GOB has been formulating legal as well as policy measures on disaster management, it has started to confront a wicked problem such as climate change. The wasteful lifestyle in the advanced economies and continuous emissions of greenhouse gases in the atmosphere due primarily to fossil fuel burning has been causing global warming (IPCC, 2007). The phenomenon in turn is having discernable adverse impacts on earth, not only in the atmosphere but also in the human systems across the world. It is now acknowledged globally that Bangladesh will be at the forefront of adverse impacts of climate change, while her marginal population will bear the brunt of most of the adverse impacts (Huq *et al*., 1996; MOEF-GOB, 2012).

Scientific analyses suggest that warming of the surface will aggravate moisture stress and drought (Habibullah *et al*., 1998; Selvaraju *et al.*, 2006), while excess evaporation of moisture will give rise to wetter peak monsoon in the country (Alam *et al.*, 1998). Therefore, the phenomena of too much water during monsoon and too little water during drought will exacerbate the prevailing situations under climate change, affecting lives and livelihoods of people and putting subsistence based agriculture at severe risks (MOEF/GOB, 2012). Meanwhile, a change in cyclonic behavior would further deteriorate coastal living conditions. Sea level rise (SLR) is expected to push saline front propagating inland, which will further complicate coastal productive system (CEGIS, 2006). With increasing flow volume in monsoon, the erosion problem will be aggravated along the braided rivers. Coastal erosion in the sea facing areas will force people to leave their ancestral lands as agriculture in those areas will become extreme hazardous (Ahmed, 2008). All these snapshot effects will have secondary implications such as food and health insecurity, loss of lives and livelihoods, damage to infrastructures, loss of productive assets and damage to national/local economy (MOEF/GOB, 2012; Yu *et al.*, 2010).

The IPCC Fifth Assessment Report has provided a projection of likely adverse impacts of climate change for South Asia, also indicating probable impacts on Bangladesh (IPCC, 2014). IPCC assessments therefore endorse the above mentioned impacts on the country. Global literatures have been recommending the GOB to consider early adaptation actions due to the fact that the atmospheric loading of greenhouse gases has been continuing almost unabated and the giga ton gap of GHGs is increasing with time. With the likelihood that climate change will manifest itself in aggravating known climate related hazards in Bangladesh, the GOB has considered that it will pursue a climate safe pathway to safeguard its development (MOEF, 2009), the latter offering adaptation co-benefits for the millions of citizens throughout the country.

The GOB acknowledges that there is convergence between climate change adaptation (CCA) and DRR (MOEF-GOB, 2012). Extents of known hazards are well understood, including their usual variability. Design criteria for infrastructure are set accordingly and those infrastructures are functioning reasonably well under usual variability. These infrastructures, a few offering DRR services, are proven to be critical for the growth of national economy. However, climate change will

influence hazardous conditions so much so that usual thresholds will no longer be useful for estimating risks and to ameliorate adverse impacts. Hydrogeophysical parameters those are triggering hazards beyond management capacities will likely to surpass both upper and lower thresholds to induce hazards in extents which would be greater compared to usual extents, therefore resulting in much adverse conditions than generally observed. The national preparation for DRR must therefore accommodate parameters and thinking regarding climate change and devise plans for effective CCA.

Since independence, Bangladesh has chosen a planned development trajectory by means of devising medium term plans. Investments in development have been following a planned approach and such approaches have generally paid dividends in terms of achieving development targets in many sectors. Population below poverty line has come down from around 57% in 1991% to 24.7% in 2014-15 (BBS 2013; PC, 2014), which enabled many poor families to become increasingly reliant against vagaries of nature. Investments in infrastructure along the floodplains and in the coastal zones has enabled people to save lives despite being faced with major catastrophic events, while bouncing back was achieved by providing assistance through social safety net allocations – the latter further consolidating infrastructural development. Development itself worked as a springboard to reduce vulnerability and address abject poverty.

However, while the GOB has been striving for development, proneness to hazards and a few hazards turning into disasters had eroded the past achievements in social and economic sectors. The relentless fight against poverty, hunger and malnutrition did not yield lasting positive results due to frequently occurring hazards. Despite significant progress in disaster management, a comprehensive culture of resilience has remained a long struggle to achieve resilience against recurrent shocks and hazards. This will require a lot of investments, technology adoption and promotions across the GOB to help evolution and sustenance of the disaster management culture in the country.

Now that the country is about to attain a state of development where issues concerning poverty, hunger and malnutrition should ideally be addressed adequately, the adverse impacts of hazards and climate induced invigorated hazards have been counteracting all efforts and posing a major risk towards sustainable development. Both CCA and DRR therefore be simultaneously addressed, where possible, in order to sustain economic growth and development. The adverse impacts of climate change are disproportionately felt across the country with women, as well as minority groups (such as the elderly, and the disabled) suffering the most. Therefore, addressing CCA and DRR in collaboration with these citizens becomes important for sharing the growth equitably. This approach is likely to yield an opportunity to transform development activities as pathways towards making the country more resilient.

2. SCENARIO, VULNERABILITY AND PAST RESPONSES

2.1 Known Hazards/Disasters and Their Broad Socio-economic Implications

Disasters are frequently occurring phenomena in Bangladesh, a land of about 160 million people within its 147,570 sq. km territory. The country is exposed to several geological, hydrological, meteorological as well as human induced hazards and disasters such as floods, river erosion, cyclones, droughts, tornadoes, cold waves etc. Bangladesh is also facing the challenges of river bank erosion, arsenic contamination in ground water, salinity intrusion, drainage congestion, water

logging, and land slide along the slopes of hills. However, the nature of occurrence, season and extent of effect of the hazards are not the same in all places.

Disasters are having adverse impacts on humans, natural ecosystem and quality of living standards. Health, especially reproductive health of women, is another impact from disasters on human life. A recent study (Nasreen, *et al.*, 2014) entitled 'A Rapid Assessment on the situation of Sexual and Reproductive Health during Emergency' concludes that women prone areas often suffer more from sexual and reproductive health related problems during and after a disaster as opposed to normal times. Disasters, be in natural and human induced in nature, affect social and economic development of the country, gradually erode assets of citizens, increase social and economic inequity, and often divert critical resources from development towards creating humanitarian goods and services for the affected people (Ahmed, 2013).

2.2 Climate Scenarios: What Science Projects About Future

The scientific (mathematical model-based) projections regarding global warming gives indications that with increasing concentration of greenhouse gases in the atmosphere, the earth surface will be warmed up gradually and depending on the emission trajectory, the rate of warming may be within 3 to 6 degrees Celsius by 2100 (IPCC, 2007). According to IPCC's Fifth Assessment Report, the general surface warming will be no lesser than 3 degrees Celsius (IPCC, 2014). Since pre-industrial era, the earth surface is now 0.8^{o}C warmer, while the atmospheric GHG concentration is about 397 parts per million by volume.

The surface warming is also contributing to the general rise in sea surface temperature. The latter is responsible for both oceanic expansion of water volume, while warming in general has been contributing to increase melting of permafrost, in high mountains, Arctic as well as Antarctic regions. The combined effect is swelling up of world's oceans and a net rise in sea level across the shores of the world. The Fifth Assessment Report of IPCC has confirmed that sea level rise as a consequence of ice sheet melting has been occurring much faster than it was previously projected (IPCC, 2014). Sea level rise will tend to inundate unprotected low lying coastal areas. A few large megacities across the globe, most of them located in the coastal areas, will face discernable problems to maintain economic progress as well as human livability.

With increased temperature and increased vaporization of oceans' waters, the total rainfall across the globe will be significantly increased. However, imbalance in seasonal temperature regime will destabilize rainfall patterns throughout the world. Higher temperature and dwindling rainfall will adversely affect food production systems across the world, making subsistence farming difficult and capital intensive, particularly for the smallholder farmers. Rise in surface temperature and dwindling supply of drinking water will have significant adverse impacts on human and livestock health.

Several attempts have so far been made to understand scientific projection of climate change in Bangladesh. The background observed datasets clearly indicate that surface temperature in Bangladesh has been increasing gradually since 1950s (Choudhury *et al.*, 2003; Islam *et al*., 2008). Although there has not been any significant change in average annual rainfall across the country, an initiation of a bimodal peak of rainfall in pre-monsoon and late-monsoon season has taken place between 1950s and present timeline (Chowdhury, M.R., 2007), with an increase in sharp rainfall episodes throughout the monsoon period.

Early modeling exercises all indicated a general increase in surface temperature, with higher rate of change during the drier periods (Ahmed and Alam, 1998; Agrawala *et al*., 2003; Mondal *et al*., 2013). Higher than average monsoon rainfall has also been reported (Islam and Neelim, 2010; Choudhury *et al*., 2003), which indicated frequent occurrence of high intensity floods over the vast floodplains. Moreover, reduction of already insignificant rainfall during the drier months (November to March), combined with higher surface desiccation, would increase moisture stress and phonological drought, especially in the western parts of the country (BCAS-RA-Approtech, 1994; Huq *et al*., 1996). Outputs of PRECIS model resolved at less than 25 km X 25 Km or smaller grids over Bangladesh have indicated a significant change in rainfall pattern throughout the country (IWFM, 2013). For example, the pre-monsoon rainfall in the northeastern Haor basin will tend to occur a few weeks earlier than normal, which will significantly increase occurrence of flash flood in the Haor region (IWFM, 2013).

Although the national capacity for climate modeling, which too resolved at a finer scale than for the large GCM domain, has been very modest, GOB has been using datasets published by Agrawala *et al*. (2003) in its key documents. The following table summarizes the modeling data that represents climate change scenarios of the country under three different timelines.

Timeline	Mean Temperature Change (˚C)			Mean Precipitation Change (%)			Sea Level Rise (cm)
	Annual	DJF	JJA	Annual	DJF	JJA	
2030	1.0	1.1	0.8	5	-2	6	14
2050	1.4	1.6	1.1	6	-5	8	32
2100	2.4	2.7	1.9	10	-10	12	88

Note: DJF indicates dry season, comprising of December, January and February, while JJA indicates peak monsoon, comprising of June, July and August months.*Source: Agrawala et al., 2003; MOEF-UNDP, 2005*

However, it is important to recognize that climate cannot be only element that will change in future. Other important elements which will indeed change and shape up the future contexts of national vulnerability include (a) population and demographic patterns, (b) economic progress and ability to invest in enhancing national adaptive capacity, (c) technological breakthrough and likelihood of adoption of technologies, (d) reduction of poverty and number of people who might be requiring support from national social protection schemes for recovery from hazards and disasters including those inflicted upon by climate variability, and (e) institutional and governance ability to steer development defying adverse impacts of climate change.

Within the seventh cycle of Five Year Plan period (2016-2020), population is projected to increase to 172 million (MOEF-GOB, 2012). Bangladesh is destined to embrace a coveted interim goal of meeting requirement for becoming a middle income country by 2021. Much of this stride will be achieved during the plan period. The population below poverty line will decrease by approximately 20 million, who would no longer be requiring GOB support from social safety net (SSN). Early warming capacity for lesser known hazards such as frequent occurrence of oceanic depressions and lows will be developed further while dissemination of currently circulated warnings will be made efficient so that precautionary measures are taken by people to reduce their vulnerability, losses and damages. New and improved technologies will be acquired to enhance protection schemes, safeguard current investments, and provide improved livelihood supports to vulnerable population. The gains of economic progress will be better utilized and complemented with international support

to procure such technologies. Moreover, the institutional limitation will be removed gradually with much enhanced capacity of the government.

2.3 Implications of Climate Change in Bangladesh

There are a plethora of research papers which indicate assessed vulnerabilities of Bangladesh to climate change and sea level rise (Huq *et al*., 1998; Huq *et al*., 1996; Yu *et al*., 2010; Mirza, 2004; World Bank, 2000; Ahmed, 2005; Rahman *et al*., 2010; MOEF-UNDP, 2005; MOEF/GOB, 2012). A summary of the statements on assessed vulnerabilities is provided below:

Surface and oceanic warming: The global phenomena will warm up the near atmosphere and land surface across South Asia and also Bangladesh. Compared to 1950s, a surface warming of 0.74 Celsius has been observed and the trend is increasing (Islam and Neelim, 2010). A general warming up of Sea Surface Temperature (SST) has also been observed over the northern Indian Ocean (Khote, 2005). While land surface warming will tend to aggravate loss of moisture from the top soils and also exacerbated evaporation from water bodies, wetlands and vegetation, an increased SST will tend to drive tidal waves with invigorated energy to the shore. The latter effect will have higher levels of interactions with the shore line.

Rainfall patterns: There is a general agreement between various climate models regarding an increase in total monsoon rainfall (Agrawala *et al*., 2003). Regional climate models (RCM) with much increased resolution echoed with earlier projections regarding total annual rainfall, though the general observation during the past five decades does not provide ample evidence of such changes. In general, the peak monsoon rainfall is supposed to be much wetter with increasing atmospheric forcing (Ahmed and Alam, 1998; Agrawala *et al.*, 2003). RCMs such as PRECIS resolved monsoon for Bangladesh and projected an increasing anomaly in rainfall trends compared to earlier decades. It is found that the peak monsoon will be wetter and the pre-monsoon rainfall will occur a few weeks earlier than usual. Moreover, peak monsoon rainfall episodes will be constituted by sharp short-lived rainfall spells. Finally, the winter rainfall will be diminished from its current low base, which will further aggravate surface desiccation.

The above changes in rainfall pattern will have the following manifestations in the country, which will have further implications on lives and livelihoods of people. The actual impact of these climatic changes on human life differs based on individual's access to resources and the ability to make decisions that can build resilience. Due to the social, economic and political context, women in Bangladesh are affected by climate change in different ways than men. Therefore, the implications listed below will vary for women and men.

Floods: An increase in peak monsoon will aggravate drainage problem, leading to frequent floods. High intensity floods will likely to become common, with higher frequency and their duration might be increased. Lives and livelihoods of poor people will be at risk throughout the country. Frequently occurring high intensity floods will tend to devastate infrastructure, adversely affect food production potential, counteract current thrusts in industrialization and put additional pressure on investments in Social Safety Net (SSN). As a consequence, national economy will suffer.

If pre-monsoon rainfall advances a days to weeks, flash floods will become common, especially in the Meghalaya region of India and neighbouring northeastern hills of Bangladesh. As a consequence, the Sylhet basin will face frequent flash floods, which will tend to affect *Boro* harvest in the *Haor* region.

Short sharp rainfall episodes will significantly aggravate urban drainage congestion. This, in addition to earth filling of available wetlands and ponds will significantly accentuate urban flooding, causing loss of livelihoods of urban poor people.

Sea level rise (SLR), in combination with monsoon flood, will contribute to the formation of water pool due to backwater effect, which will decelerate recession of flood waters, aggravating floods.

Dry season issues: Increased surface desiccation will lead to aggravated moisture stress, resulting in exacerbated (phonological) drought. The potential bimodal distribution of monsoon rainfall might aggravate drought condition so much that rainfed Aman cultivation might no longer be a viable practice. The poor men and women farmers will find it difficult to economically produce staple grains due to much increased cost of irrigation.

During the dry season, rivers will tend to suffer from low flow conditions due to loss of rainfall runoff. Surface irrigation might thus become difficult. Low flow in coastal rivers may result in ingress of saline front towards inland. Quick drying up of surface will aggravate capillary rise of salinity, making coastal lands less suitable for economic crops.

Tidal interaction: A combination of SLR and SST will drive the tides with invigorated energy, thereby causing greater tidal interaction. As a consequence, failure of embankment along the coastal shores might occur frequently – especially if sections of available embankments are not maintained properly. SLR will cause inundation of foreshores. Frequent embankment failures and/or overtopping of embankments will spread salinity in apparently protected coastal areas, adversely affect coastal agriculture and export-earning aquaculture, causing significant difficulties in maintenance of food security amongst poor smallholders. Sea level rise and tidal interaction will also adversely affect coastal wetland functioning and diminish potential for accruing good and services from mangrove ecosystem of the Sundarbans.

Frequent low formation and depressions in the Bay: Increasing SST will tend to cross the threshold for the formation of low and depressions in the Bay of Bengal, which will adversely affect livelihoods of coastal fishermen by abandoning trips during peak fishing season. It is not decisive to project an increase in frequency of occurrence of high intensity cyclones as a consequence of warming. A few Scientists have projected an increase in intensity of cyclones by 10%, which others have not agreed to. However, it is found that intensity of storm surges will significantly increase as a consequence of increased SST, which will tend to devastate coastal plains. Using the Bay of Bengal in a hydrodynamic model, the World Bank estimates that cyclone exposed areas in Bangladesh will increase by 26% and the affected population will grow as high as 122% by 2050.

Riverine and coastal erosion: Exacerbated rainfall will cause increased runoff through the floodplains. It is argued that higher flow volumes will have greater potential to erode riverbanks, while high wave interaction will tend to erode sea facing coastal lands. Not only people's dwelling units will be severely affected, erosion of prime agricultural lands located next to braided rivers will have significant adverse impacts on livelihoods of poor people. Erosion will damage infrastructures such as schools, markets and roads.

Increased cloud outbursts and resulting mud slide in eastern hills: The cloud outburst episodes have been found to be occurring at higher frequencies in recent times, which has triggered frequent mud slides in the eastern hills areas. In particular, the hill slopes of Chittagong area had slid several times

over the past decade or so, taking lives of many poor inhabitants including minority people. The risk of such incidents will tend to increase under climate change.

Food security: As discussed earlier, an increase in occurrence of hazards and their frequencies is generally translated in Bangladesh as food insecurity for women and men, particularly amongst smallholder households. Production potential, despite advancement of new varieties and other inputs, will tend to be diminished with increasing temperature, particularly beyond a threshold of 2˚C.

Human health: Heat stress is likely to affect elder groups and toddlers. Higher temperature might cause propagation of new pests and disease vectors, while common diseases such as dengue, malaria and water borne diseases (such as cholera) will take significant toll on human health conditions.

Damage to infrastructure: Available infrastructures will be affected adversely by climate induced effects, especially cyclonic storm surges, high intensity floods, wave interactions and *afal* and to a lesser extent salinity ingress. Increased intensity of cyclonic storm surge will damage coastal infrastructure including people's dwellings, road networks, water supply and sanitation systems, administrative buildings and cyclone shelters. Similarly, high floods will tend to erode roads. Coastal erosion, particularly of coastal polders will damage agricultural potential of coastal areas, rendering greater vulnerability of poor and marginal population, in particular women, who would suffer the most.

Stress to urbanization: Many of the unplanned urban areas have already been suffering from drainage congestion and to a lesser extent, from urban heat island effect. Increased flood, storm surge, erosion, etc will complicate urban based livelihoods and affecting urban infrastructures. Since urban poor tend to concentrate on already vulnerable sections of any urban area, they will bear the brunt of such adverse impacts. Increased in migration to urban areas is most likely to create burden to existing services and facilities.

Damage to industries: Industrial activities, if located in climate change hot spots, will find it difficult to sustain due to variety of adverse impacts of climate change. If proper designing is not followed, many such industrial units will tend to become sick and non-viable in the long run, leaving their employees jobless. Productivity would also suffer in adversely affected and damaged units.

Economic impacts: While recouping damages will have significant negative impacts on national economy, recovery from particular climate induced hazards might require diversion of investments from development, which would tend to decelerate future development thrust in the country. If not managed well through appropriate adaptation means, adverse impacts of climate change pose significant threat of national economic downturn.

Loss of Livelihoods Leading to Migration: In many pockets, it will be difficult for the poor and the marginalized population to maintain livelihoods, especially those based on fragile natural ecosystems. Loss of livelihoods may trigger secondary effects such as perpetuation of poverty, even may lead to forced out-migration. Migration into urban periphery and major urban corridors will lead to hasty urbanization process, further complicating living conditions.

Poverty and Inequity: The current fight against poverty eradication might face extreme difficulties due to disproportionate impacts of climate change on extreme poor and differentiated impacts on women and men. Many marginalized groups in extremely vulnerable areas (such as in the *Haor* and

southwestern region) will face 'Loss and Damage', lose employment opportunities, which will erode current gains in terms of gradual eradication of poverty. These climate vulnerabilities, coupled with existing gender inequalities will see women in worsening situations as compared to men and the current gap in social inequality widened.

2.4 Gender Equality in Disasters and Climate Change

Climate change will contribute to increased frequency and severity of disasters with adverse impacts on human life. Although disasters and climate change affect all segments of the population, there are gender variations to vulnerability, capability and resilience. The impacts of climate change and disasters are differentiated for women and men. Climate change impacts are also far more severe for women, the poor and marginalized groups because of societal inequality such as unequal power, lack of information and lack of decision making ability (Alam *et al*., 2008; Ahmed *et al.*, 2007). Women also lack access to productive resources, in particular land. Often more women than men are affected in their multiple roles as food producers and providers (Parvin and Ahsan, 2013), as guardians of health, caregivers to the family and community and as economic actors (Dankelman, 2010). As access to basic assets and natural resources, such as shelter, food, fertile land, water and fuel becomes hampered, particularly women's workload increases. Lack of natural resources, caused by flooding, drought and erratic rainfall cause women to work harder to secure natural resources and livelihoods (Dankelman, 2010).

The consequences of climate change are also disproportionate for women and men; increase in violence against women during and after a disaster; increase in unpaid care work for women such as collection of water and fuel; marginalization of women in the labour market; girls dropping out of education, even forced into early marriage; deterioration of reproductive health due to lesser intake of food and water; and increase in unplanned migration and trafficking of women and girls (Ahmed *et al*., 2007; Ahmed *et al*., 2012). Loss and Damage burden following climate change induced hazards and disasters will be disproportionately greater among women than men in developing countries, particularly Bangladesh (Neelormi and Ahmed, 2012). More women than men die in disasters, not just because they do not receive early warning information in time, but due to their limited decision making abilities in how to respond when disasters hit (Ahmed *et al*., 2007).

A study on violence against women in disasters is one example of how issues of gender inequality can be one cause of the disproportionate effects of climate change on women and men. The pioneering study (Nasreen, 2008) indicates that a large number (71.6%) of women studied were subject to more violence during disasters. Married women mentioned an increase in violence, specifically physical and psychological forms of violence. Sexual harassment including forced sex, rape at home and in shelters were also reported by some women and girls. Many women and girls do not take refuge in shelters during disasters due to a lack of personal security. The effectiveness of state mechanisms to provide security for women in disaster shelters around the country is very limited. Women and girls with a disability are the most vulnerable compared to women and girls without a disability (Nasreen, 2012). Although rights violations of women is not only limited to times of disaster, it is evident that violence against women during disasters is common phenomenon. Yet there is no specific policy or social protection to combat violence against women during disasters (Nasreen, 2008; Nasreen, 2012).

However, women perform a long range of activities in order to cope and adapt with a climate change induced and other forms of disasters (Dankleman, 2010).Women draw upon their own store; procure food and process; draw upon own assets; adjust their own consumption pattern; draw upon

aquatic food; draw upon social network (Dankleman, 2010). Further work needs to be done to explore how women cope and adapt as a result of climate change and disasters and recognition of how this unpaid work contributes to community resilience across Bangladesh.

Gender issues have largely been overlooked in the global negotiation processes on climate change. Despite the fact that general gender related discourse on disaster has been known, little has been done or promised so far to address the vital issues. A thorough analysis of available documents of Bangladesh on climate change clearly highlights lack of gendered analysis and sensitivity in adaptation design and delivery (Neelormi, 2014). Establishing linkages between gender and mitigation has also been largely absent. There is international recognition that the gender dimensions of climate change need to be better understood and reported (UN Women, 2014). As governments and donors increasingly target women in their programs on community based climate change adaptation (UN Women, 2014), more attention needs to be brought to the gender dimensions of climate change and disaster in Bangladesh, in order to identify and reduce gender based inequalities and build a resilient population.

The importance of gender mainstreaming in environmental efforts and poverty eradication has been recognized in a wide range of global agreements and conventions and within this context governments have equipped all three of the Rio Conventions with strong mandates on gender equality and women's empowerment for the first time. By signing and ratifying the United Nations Conventions on Biodiversity (CBD), on Climate Change (UNFCCC), and on Desertification (UNCCD), governments officially committed to implement these agreements and monitor and report on their progress. Implementation of these international agreements at national level now requires urgent attention. Over the last decade, some new knowledge has been generated that allowed for a clearer understanding of the linkages between gender and adaptation (Ahmed *et al*., 2007; Alam *et al*., 2008) however there is a need for more to be done. This task is becoming more urgent with the increasing attention given to adaptation under the United Nations Framework Convention on Climate Change (UNFCCC).

2.5 Impacts of Climate Change on ADP of Bangladesh

Adverse impacts of climate change is likely to wash away economic progress made through development programmes and projects. Based on global level estimation of damages due to climate change induced hazards and disasters, Haque (2009) inferred that the corresponding cost for Bangladesh will be in the order of US$4 to 14 billion per annum. Compared to current level of investments in development by means of Annual Development Plan (ADP), such cost appears equivalent to at least 40% per annum!

On an average, about 900-1,000 projects are being proposed per annum under ADP and are implemented following approval of ECNEC and concerned authorities/ministries. In general, the Ministry of Planning approves development projects under ADP, categorized under 18 different sectors (Haque, 2009): (i) agriculture, (ii) rural development & institutions, (iii) water resources, (iv) industries, (v) power, (vi) oil, gas and natural resources, (vii) transport, (viii) communication, (ix) physical planning, water supply and housing, (x) education and religious affairs, (xi) sports and culture, (xii) health, population and family welfare, (xiii) mass media, (xiv) social welfare, women affairs and youth development, (xv) public administration, (xvi) science and technology research, (xvii) labor and employment, and (xviii) block allocation.

Climate change and sea level rise are likely to affect overall functioning of many of these projects. If planned well, both adaptation and mitigation co-benefits may be also acrued from many of these development projects. Integration of adaptation as well as mitigation into project design is therefore extremely critical towards enhancing project functioning or safeguarding development investments or to acrue adaptation/mitigation co-benefits.

An effort was made to analyze a total of 1,901 projects under ADP for fiscal years 2004-05 and 2008-09 (Haque, 2009). Adaptation and mitigation possibilities were found in about 41% and 6% projects, respectively. It is found that the most potential sectors where CCA could be possible being water resources, agriculture, rural development and institutions, physical planning, water supply and housing, and transport. Out of an overall miniscule opportunity for mitigation projects, the maximum opportunity lied in power sector, followed by industries and agriculture sectors. It is inferred that an additional 10-30% fund may be needed to retain the current level of benefits of the projects. In other words, if such measures are not considered, an overwhelming proportion of annual development investment might not acrue desirable outcomes in future under climate change.

2.6 Generic Responses to Climate Change

2.6.1 Overview of achievements of the Sixth Five Year Plan and lessons learnt

The Sixth Plan of the GOB (GED, 2011) pronounced targets and objectives on climate change (including adaptation and mitigation) and disaster risk reduction. Despite the fact that there exists steep and recurring challenges towards implementing programmes on both climate change and DRR, as highlighted in the Sixth Plan, the GOB has made significant progress as per the Sixth Plan. The following table summarizes targets/objectives of the Sixth Plan and achievements till date.

Relevant areas of intervention	Targets/Objectives of the Sixth Plan	Achievements till date	Expert opinion and challenges
DRR	Integrated disaster risk reduction and CCA approaches	Mainstreaming efforts being undertaken/ initiated	PECM has been a good start, however needs a second phase for capacity building of actors/stakeholders and to facilitate implementation
	Community based programming for DRR and CCA		Needs programme development and implementation, focusing on Loss and Damage. Emphasize on participatory monitoring and evaluation to improve upon MRV for global compliance.
	Create legal and institutional framework for effective response management	Constitutional amendment addressed legal issues with emphasis on GOB compensation for the disaster victims. Insurance against flood given new impetus.	The SSN allocation needs to be aligned with constitutional provisions. Limited trial on flood insurance has been given in Sirajganj char areas.
	Strengthening search and rescue capabilities	Coast Guard has been given charge to perform better towards rescue of storm victims	Equipments procured and given to Coast Guard. The erly warning system needs to be improved for low intensity events.
	Improve cyclone and storm	Review underway.	Needs immediate programme,

	surge warning		especially to address warning for low intensity events that affect fisherfolks lives and livelihoods.
	Awareness raising on public dissemination		Not much progress since both BCCTF and BCCRF avoided programmes on awareness raising. It was limited to NGO-led projects/programmes.
	Risk assessment against loss of income and property	BCCRF initiated/ completed a few studies. Livelihood-specific studies are yet to be undertaken/ launched.	Limited understanding on scenario-specific impacts of various (dominant) livelihoods groups. Needs immediate attention in future research.
	Repair and maintenance of existing flood embankments	A few projects are being launched	Needs improved monitoring, especially to understand the efficacy of embankments in medium- to major floods.
	Repair and maintenance of existing cyclone shelters	Projects ongoing.	A significant proportion of the existing shelters are in dilapidated condition, needs immediate attention.
	Repair and maintenance of existing coastal polders	Projects launched/ ongoing.	Results yet to be seen. Aila affected polders have been refurbished.
	Urban drainage capacity building	Need assessment are being carried out for Dhaka and Khulna cities.	Major emphasis should be given on this issue to create healthy living condition in future cities/ urban centres.
	Construction of new embankments/ shelters	BCCRF and other allocations have been utilized to build new cyclone shelters.	Many more new shelters need to be built, based on population density across the coastal zone.
	Adaptation against tropical cyclones and storm surges through land use planning	Activities yet to be launched	Needs immediate attention under the seventh plan
	Resuscitation of rivers and khals, river training works	A few projects being undertaken	Need massive mobilization of funds, needs coordinated action across sectors and geographical areas
	Professionalizing DM system	Graduate level DRR/DM courses being offered in about 18 universities under CDMP	Human capacity needs to be continuously enhanced
	Strengthening DM system	DM Act has been promulgated	Specific by-laws are yet to be enacted, therefore the DMA has largely remained ineffective
CCA	Mainstream poverty, environment, climate nexus in national planning process (including planning, budgeting and implementation)	Process has been initiated by undertaking PECM project. A manual has been produced (GED, 2014c). Budgetary allocations for CCA have been made.	In line with GOB Perspective Plan and commitments to UNFCCC and HFA. Needs immediate capacity building programme to facilitate implementation.
	Promote indigenous and scientific strategies for adaptation to CC	Institutionally driven CCA projects have been initiated/ undertaken.	Most of the projects are still being rolled out, their collective efficacy towards resilience building is yet to be evaluated.
	BCCSAP to be implemented	Over 300 CCA+LCD projects have been initiated/ implemented	Partial implementation has started. However, no significant projects on research and knowledge management, capacity building and institutional strengthening has been undertaken.
	Improving productivity, resilience and adaptability of local, sectoral, national	Over 300 projects have been launched/ implemented under BCCTF and BCCRF	More projects are needed, based on location specific needs, focusing on affected communities and marginal

	and global social and economic systems		groups across the country
	Ensuring a culture of resilience in all development activities across sectors	Process has been initiated by undertaking PECM project. A manual has been produced (GED, 2014c).	The process has just been initiated. Institutions must be made capable of delivering the commitment.
	Ensuring capacity building of poor and vulnerable group and local government in sustainable natural resource management, CCA and DRR	Sporadic projects, mostly driven by NGOs, have been undertaken.	NO major GOB effort has been observed. BCCTF largely avoided financing projects with similar objectives. Needs immediate attention.
LCD/ Mitigation	Promote indigenous and scientific strategies for mitigation to CC	A few projects have been initiated during the Sixth Plan period. Emphasis given on promoting renewable technologies.	Instead of emission reduction, the major focus has so far been on carbon capture through afforestation programmes.
	Promoting 3R (Reduce, Reuse and Recycle) strategy for waste management	A few projects have been rolled out under BCCTF and BCCRF.	Heavily focused on afforestation, coastal green belt, and promotion of renewable technologies. Needs attention in energy efficiency and demand side management.
	Reduce dependency on fossil fuel by promoting solar/green energy	Solar technologies have been promoted in both rural and urban areas. Green tax introduced for cars, in order to impose disincentive for emitting technologies.	GOB committed natural gas as the primary source of producing secondary energy (i.e., electricity), also committed to supercritical technologies for future coal fire power plants. Green energy pricing policy needs special attention during 7th FYP.
	Ensure greater contribution of forestry sector in the economic development	Afforestation programme undertaken in GOB forest areas and also promoted for social forestry. People from all walks of life have been involved in tree plantation. Agro-forestry technologies have been promoted. Forestry extension service strengthened.	A culture of tree plantation across the nation has been established. Private plantation of rubber, teak has'nt been successful yet, however orchard plantation has been increased significantly. Mass initiative for CDM and REDD has not yet been taken, as promised in the Sixth Plan.
	Managing urban wastes	Two CDM projects being undertaken, several are in the pipeline	New sources of funding needs to be searched. Needs immediate actions in GCF readiness programme, INDC and MRV (as per UNFCCC guidelines)
	Rapid expansion of energy saving devices	CFLs are distributed to promote	People have accepted energy efficient products, however tax structures are not yet conducive to attract low income energy users.
	Improve energy efficiency in transport sector	Green tax imposed	Tax structure needs to be made conducive to promote adoption of hybrid cars and LED technologies (i.e., TVs and lights)

2.6.2 GOB's past responses to adaptation

Since early 2000s, GOB recognized risks associated with climate change and has taken keen interest to address those with (a) whatever limited means it has, and (b) with financial and technical support

from international sources including the multi-lateral process driven sources such as LDC-fund, Special Climate Change Fund (SCCF) and Adaptation Fund (AF). By 2005, GOB has developed National Adaptation Programme of Action (NAPA), which has highlighted adaptation projects those have been needed on an immediate and urgent basis (MOEF-UNDP, 2005). GOB has taken a number of initiatives in 2009-2010 fiscal year:

(a) GOB has set aside a budgetary allocation of BdTaka 700 crore (US$100 million Equivalent) to advance climate change activities with its own resources;
(b) GOB has revised the 2008 early version of Bangladesh Climate Change Strategy and Action Plan (BCCSAP), published the revised version showing GOB's full commitment to implement programmes on both adaptation and low carbon development (LCD); and
(c) Initiated legal processing of two funds to administer multi-institutional implementation of climate change related activities in Bangladesh: (i) with own fund (therefore creating Bangladesh Climate Change Trust Fund, BCCTF) and (ii) with bilateral funds (therefore creating Bangladesh Climate Change Resilience Fund (BCCRF).

By 2010, GOB has taken initial steps towards institutionalizing the implementation of BCCSAP through a coordinated fashion, by engaging almost all the national stakeholder institutions. Since 2009-2010 fiscal year, GOB has allocated a dedicated amount of Bd Taka 2,700 crore for adaptation and mitigation, enabling its institutions to carry out projects under BCCSAP (MOEF, 2014).

A number of institutions have been established by the GOB to address climate change, especially in view of BCCSAP. A brief account of the major new institutions is introduced below:

(a) ***Climate Change Trust***: The latest institution has been set up within the ministry of Environment and Forest (MOEF) to assist the ministry for back stoppage regarding implementation of various activities under the BCCSAP and especially to provide secretariat support services for the BCCTF.
(b) ***Bangladesh Climate Change Trust Fund***: The Bangladesh Climate Change Trust Fund (BCCTF) has been set up by the GOB and is managed and coordinated by the Ministry of Environment and Forests (MOEF). Government dedicated funding is provided to projects under the main pillars of the BCCSAP, which include food security, social protection and health; disaster management; infrastructure; knowledge management; climate change mitigation; and capacity building and institutional strengthening. A high powered Trustee Board involving a number of ministers has been set up, supported by technical evaluation committee, to examine relevance of project requests and decide for eligible projects to be implemented by utilizing the dedicated national fund for climate change being set up through budgetary allocation.
(c) ***Bangladesh Climate Change Resilience Fund***: The Bangladesh Climate Change Resilience Fund (BCCRF) is a multi-donor grant fund, set up jointly by the GOB and its bilateral development partners. The objective of the Fund is to provide donor-funded support to the implementation of BCCSAP. The World Bank is invited by the GOB to administer the BCCRF, scrutinize projects, provide administrative supports towards forwarding the fund and monitor and evaluate progress of awarded projects. 10% of the fund is being handed over to Palli Karma Sangsthan Foundation (PKSF) to run an NGO-window to award and implement community based small scale projects to build local level adaptive capacity.
(d) ***Designated Authority***: A person representing the GOB to liaise with the AF has been nominated by the MOEF to perform the role of the Designated Authority (DA). The DA is

supposed to work with a National Implementing Entity (NIE) to seek project specific funds from the AF and to help the said NIE to identify fundable projects and their respective Executing Agencies. However, NIE accreditation has not yet taken place due to lack of decisions regarding identification of a suitable national institution with adequate fiduciary track records and project management capabilities. GOB has not yet been successful in ensuring accreditation of its NIE.

(e) ***National Designated Authority***: The Economic Resources Division of the Ministry of Planning has been identified as the National Designated Authority (NDA) for Bangladesh to deal with the formalities with the Green Climate Fund (GCF). The NDA will work in between the NIE and the GCF to identify fund-worthy projects and to seek GCF finance towards implement the project following a stringent fiduciary management practices.

So far, over 300 projects have been awarded financing for adaptation and mitigation (MOEF, 2014), by utilizing roughly about 60% of the BCCTF. Similarly, with the World Bank's administrative assistance, GOB has been able to identify and implement about 7 projects involving about 190 million US$ by utilizing BCCRF. About 10% of BCCRF has been set aside to provide support to NGOs for implementing small-scale and/or pilot projects, mostly community based projects. The latter is being administered by *PalliKarma Shohayak* Foundation (PKSF). World Bank has been utilizing BCCRF to conduct a few research projects on climate change adaptation and cost of adaptation.

Major spending has been in water sector that involves refurbishing old protection measures such as riverbank embankments, measures to facilitate drainage, town protection measures, etc. Drainage capacity of roads has also given due priority in project implementation. Construction of new cyclone shelters and promotion of adaptive farming involving smallholders are amongst a few interesting adaptation projects. Although most of the projects are for adaptation, a few mitigation projects are also being implemented by the GOB institutions.

In the *Haor* areas, a project has been implemented to provide better village protection works in at least 10% of the villages against climate-invigorated *afal*. Moreover, value chains are being established by involving poor *haor* women and ecosystem based production system. Meanwhile, a number of micro-scale urban centres have been identified in Dhaka and Khulna region which will be developed in a climate sensitive manner.

GOB has been implementing the top-most priority project of NAPA with support from LDCF, through the involvement of UNDP. The project has been highly successful in promoting agricultural adaptation in the coastal zone through community level horticulture, livestock and forestry related activities. The project has a strong community orientation, which enabled the project to work directly with vulnerable men and women in the coastal areas including offshore islands. The project has been received UNFCCC Best Practices Award on Adaptation.

A Climate Public Expenditure and Institutional Review was conducted in Bangladesh which revealed that the GOB typically spends around 6 to 7% of its annual combined development and non-development budget on climate sensitive activities. The amount was estimated at about US$ 1 billion/annum (GED, 2012). The review also revealed that other than major 37 ministries, a large number of local government institutions at Upazila and Union Parishad carry out climate sensitive activities. Disaster management sector generally spent about 17.5% of all direct spending in CCA (GED, 2012).

Meanwhile, the development partners have been supporting GOB efforts, although in real terms the monetary support has been little compared to the need of GOB to address its ever increasing adaptation gap. Since the formation of the BCCRF, a total of 190 million US$ has been given to GOB. In 2009, GOB indicated a requirement of US$10 billion between 2010 and 2015 (MOEF-GOB, 2009). Clearly, the support received so far has been infinitesimally small and inadequate. Support from the donors to NGOs in the implementation of community based adaptation (CBA) enhanced local innovation, capacity of the vulnerable people and local government institutions.

It is to be noted here that, many of the projects implemented by GOB agencies do not have any theoretical construct in relation to address gender sensitivity in the project design and various elements. The Ministry of Women and Children Affairs (MOWCA) has taken an initiative under the BCCTF to help other ministries to integrate gender sensitivity in their respective project designs. Various NGOs have taken initiatives to train gender focal points regarding inclusion of gender sensitivity in project design and monitoring aspects. However, gender inclusion has been rather slow in projects led by GOB institutions.

Other than allocating funds, GOB has set up an institutional approach to address adaptation to climate change. Currently, as the focal point of all climate change related activities on behalf of the GOB, the Ministry of Environment and Forest (MOEF) is the key institution on climate change. Not only MOEF has been the custodian of the two major funds, it has been given the charge to coordinate relevant activities involving other ministries and agencies. MOEF representative sits as the Chair of the highest Committees for both the BCCTF and BCCRF.

The MOEF has set up a Climate Change Trust, a technical wing under the ministry itself, so that technical issues are better taken care of and technical support may be provided to other stakeholder national agencies. MOEF has extended its collaboration with other ministries, especially with the Ministry of Disaster Management and Relief (MODMR). Under this collaboration, a number of academic institutions have been approached to offer tertiary level courses on disaster management and climate change adaptation.

The GOB recognizes lack of coordination as one of the major limitations of the current institutional set up to address climate change issues (MOEF-GOB, 2009). To address inter-agency coordination gap, focal points have been designated in each ministry and a few specialized and relevant agencies. The MOEF has trained them up so that climate change issues are better integrated at national level activities. The current set up is still weak in terms of human capacity to steer all the relevant activities. BCCSAP has duly highlighted capacity building as a fundamental building block towards addressing climate change nationally (MOEF-GOB, 2009). However, other than a few sporadic efforts to enhance national human resources capacity on climate change issues, little effective measures have so far been observed to address this very issue.

The Ministry of Planning (MOP) has taken steps towards integration of climate change in national development processes through a coordinated manner. The General Economics Division (GED) of the Ministry of Planning has formed an inter-ministerial body to review the current processes of formulation any development project and found gaps in addressing climate change in the processes (GED, 2014a). The inter-ministerial body has recommended changes in the format of designing any development project (by any ministry) under Annual Development Programme and recommended integration of climate change issues along with gender issues, environmental issues and poverty issues in the format. Accordingly, the MOP has finalized a manual that allows any proponent of a

national development project to integrate climate change at the outset, at design level, so that the MOP may coordinate and ensure integration of climate change in all projects (GED, 2014b). GOB is committed to promote whole of the government approach to address the climate risk.

Currently, the size of ADP is about US$10 billion, easily the highest amongst all the Least Developed Countries. It is expected that if MOP can successfully integrates climate change concerns in ADP projects, not only all the current investments will be safer under climate change, the adaptation co-benefits of development will serve the country and its vulnerable population for years to come.

2.6.3 GOB's past responses to low carbon development and mitigation

The BCCSAP highlighted areas where LCD objectives may be achieved in future. The following modalities have been mentioned in the BCCSAP:

- Develop a strategic energy plan and investment portfolio to ensure national energy security and power greenhouse gas emissions;
- Expand the social forestry programme on government and community lands throughout the country;
- Expand the 'greenbelt' coastal afforestation programme with mangrove planting along the shoreline;
- Seek the transfer of state-of-the-art technologies from developed countries to ensure that we follow a low carbon growth path (e.g., clean coal and other technologies); and
- Review energy and technology policies and incentives and revise these, where necessary, to promote efficiency production, consumption, distribution and use of energy (MOEF-GOB, 2009).

Energy efficiency is on top GOB's agenda (GED, 2011). GOB took a policy stance in 1994 to consider natural gas as the prime fuel source to produce electricity (MOEF-GOB, 2012). GOB has been popularizing energy saving technologies such as compact fluorescent lamps/bulbs, Light emitting diode electric bulbs and solar energy trapping technologies. In the latter case, not only 3 million homes are brought under solar-technology based electrification (IDCOL, 2014), the urban power authorities in major cities have made it mandatory for new electricity consumers to install solar-based renewable units to cover up 3% of estimated power demand for the respective house/multi-storied buildings. In the transport sector, the GOB has imposed a ban on the import of old passenger cars which is more than three years old. In doing so, the GOB expects to achieve higher energy efficiency as well as reduction of particulate emission – a characteristic of old motor engines.

The GOB has proposed a significant tax remission for imported cars having upgraded and energy saving technologies. For example, hybrid cars with much higher energy efficiency up to 2,500cc engine are allowed to be imported in the country without having to pay direct tax that are generally imposed for cars with regular engines (GOB, 2014). Bangladesh has shown her intent to lose out tax revenues in a bid to achieve greater energy efficiency.

In order to facilitate smoother freight and passenger transportation along the Dhaka-Chittagong (i.e., Capital to Port city and vice versa) corridor, the GOB has been implementing a project towards making the highway consisting of four lanes instead of two lanes. In doing so, the unnecessary traffic congestion will be significantly reduced and higher efficiency in passenger-kilometer or ton-kilometer will be achieved from the busiest transportation corridor of the country. Notably, several

segments of road networks within the capital has been equipped with dedicated overpasses (i.e., flyovers) in a bid to reduce traffic congestion and thereby saving fuel from urban transport sector.

The GOB has allocated about BdTaka 400 crore (i.e., 40 million) to promote renewable technologies in Bangladesh (GOB, 2014). This shows strong GOB commitment towards low carbon development in the country.

The concerned authority under the GOB has been promoting electrified irrigating pumps in place of diesel based pumps so that greater energy efficiency may be achieved in agricultural sector. Till date, over 20% of an estimated 1.7 million shallow pumps have been running on electricity across Bangladesh (PC, 2014). This has been further supplemented by a decision to run these electrified pumps after peak (demand) period (i.e., after 11:00 PM) so that somewhat wasted/unutilized energy during non-peak hours may be utilized for an activity which is absolutely crucial for maintaining food security and which would have consumed an increased amount of electricity without such a regulatory decision. Transforming the technology and demand management enabled Bangladesh to save energy, thereby reducing carbon footprint of staple production in the country.

Paddy production is a water intensive activity, which cannot be done without having to consume energy (either electricity or diesel). To save water and thereby pumping time for drawing unnecessary amount of water for irrigation, the Department of Agricultural Extension has been given the task to promote 'alternate wet and dry' method for application of irrigation in paddy fields.

GOB has considered coastal green belt project and promoted strip plantation along embankments and roads under its participatory afforestation programme in the past (MOEF-GOB, 2012). Juvenile mangrove tress are visible in many sea facing chars which have been the result of a green belt afforestation programme. The villages in Bangladesh appear a lot greener these days due to continued programming and awareness raising for dwelling afforestation across all agro-ecological areas of the country. In the Chittagong Hill Tracts, large degraded forest areas under the Department of Forest have been brought under rubber plantation, involving private afforestation programme. Although there has been debate regarding planting exotic tree species such as Eucalyptus and acacia, poor people have been happily planting such species and helping themselves to increase their household income in many parts of the country. Women are primarily responsible for taking care of courtyard based forests in villages across the country.

There is a lack of understanding on gender differentiation on Low carbon development (LCD). A pathway for addressing gender friendly energy efficiency will be developed with special emphasis to LCD. The ccGAP has highlighted the following issues on gender and LCD (MoEF, 2013).

Research indicates that economic growth contributes to an increase in emissions. With growing income, carbon emissions typically rise and the IPCC reports already as early as 1992 pointed to the relationship between carbon emissions and economic growth (IPCC, 1992; South South North, 2013). Such a relationship seems to suggest that there is a trade-off to be made between slowing climate change on the one hand and economic growth and development on the other. By enlarge economists would also argue that with such economic growth, environmental outputs would often also decrease. Whilst these assumptions hold a measure of truth, there are several means by which women can contribute in a positive manner economically, environmentally and socially to climate change action and, mitigation in particular.

Unfortunately, the discourse on climate change does not adequately take into account gender - either at international negotiations, or at the implementation/project level. The role of women are still not taken fully into account in policies, the needs of women are not considered in the development of new technology or the refinement of existing ones, and more often than not, women are under-represented in planning, decision-making and implementation in key sectors such as energy and transport, for example.

As the impact of climate change affects women and men differently, women are thus unable to voice their specific requirements and needs. Moreover, their potential as agents of change on mitigation also remains insufficiently exploited despite various surveys indicating that women tend to be more concerned about climate change and would prefer more ambitious efforts to reduce greenhouse gas emissions than men. Evidence from studies conducted on single-person households in Europe, for example, shows, that there is evidence that the sources and level of emissions of women and men differ substantially, independently of their age and income. This difference stems from factors such as car use and food preferences (GenderCC, 2014).

Whilst there are a number of possible reasons for the absence of gender in mitigation action, the lack of information, gender-disaggregated data, knowledge and therefore also our lack of understanding of the gender differentiated impacts of mitigation activities and the potential role of women as agents of change significantly contribute to this omission.

Women's extensive theoretical and practical knowledge of the environment and resource conservation is also not given due consideration despite their involvement fostering economic growth and socio-economic development, reducing poverty, keeping environmental problems in check, and increasing the wellbeing of societies as a whole. Women generally lag behind in access to education and training, they have less access to and control over productive resources, including access to land and ownership rights, access to services, markets (including land, labor, financial and product markets), public funds and the general discretion on how to generate income independently.

Women are not paid for the environmental services that they already provide (e.g. reforestation). Their potential contribution to climate mitigation by being part of the economic cycle, therefore, remains untapped (OECD, 2010). As part of agroforestry and afforestation efforts, women can also plant trees that not only sequester emissions, but also produce crops which may provide them with an alternative source of income, or have distinctive co-benefits such as assisting in disaster risk management, alternative household energy and others. These projects could also be tied to emissions trading, and reduced emissions resulting from afforestation could be traded in the form of certificates. This could be used to fund further measures and related services in such projects. Complementary training programs that focus on the processing and marketing of these products would further enhance the economic benefits for women (OECD, 2010).

In Bangladesh, women are actively engaged in various forestry programs. The idea of 'social forestry' started with loans from the Asian Development Bank (ADB) since the late 1980s, enabling women and local poor people to have an alternative source of income and to overcome the rural fuel crisis through the planting of quick growing tree species.

As the latest country to join the Mangroves for the Future Initiative (MFF), it is therefore an important entry point for mainstreaming gender in climate action in Bangladesh as the Initiative is

committed to ensuring that equality between men and women, or gender equality, is an integral part of its work. The MFF's Gender Equality Strategy recognizes gender equality as fundamental to conservation and sustainable development. The strategy addresses gender equality across the regional, national, and project levels of MFF, and recommends approaches based on the specific needs of the various MFF stakeholders. The Initiative aims to ensure that equality of outcomes for both men and women is achieved in the management of coastal natural resources and promotion of sustainable livelihoods.

The energy sector, key to mitigation efforts, is furthermore also largely a male dominated environment in need of transformation. In most countries of the developing world, including in Bangladesh, domestic energy (e.g. for cooking, heating or lighting, is still obtained from the energy-inefficient and toxic burning of biomass such as wood, charcoal or agricultural waste which is traditionally a women's work (Carlsson, 2007). Women are the major consumers of energy in rural areas as they are responsible for gathering fuel for cooking and heating. More than 100 million people in Bangladesh - about 63 percent of the population - live in rural areas, where annual per capita commercial energy consumption averages less than 100 kilograms of oil equivalent (kgoe), considerably lower than the average international levels (UNDP-World Bank, 2004).

Women in the country do not have any access to modern energy or technology. In their role as the main providers of family and community care, they have different needs in terms of energy than most men and this need to be taken into account in policy development and implementation. As women, on average, also have lower incomes than men, measures leading to higher energy prices for end users, for example, might therefore also affect women more strongly. Conversely, women and men might benefit differently from the positive effects of climate policy, for example from job creation in various sectors including the renewable energy, energy efficiency and waste management/recycling.

The promotion of renewable energies that help avoid greenhouse gas emissions could provide an interesting approach for promoting women's economic participation in climate action. Not only are jobs created for women who can be engaged in the upkeep and maintenance of solar plants, but solar powered lamps also extend the productive time available to street vendors.

Women in communities can collaborate to maintaining a healthy community environment, whilst at the same time benefitting economically by generating much needed income. One opportunity presented is through "waste-to-wealth" initiatives whereby women are paid for bringing recyclable waste materials like plastic, paper and iron or steel to centrally located facilities that then re-use these materials in various other ways. Taking this initiative a step further, women themselves could establish cooperatives and use these materials to produce economically feasible goods such as carpets, furniture, household goods, fertilizer, and many more.

Gendered impacts of climate policy are an issue that therefore clearly deserves more attention. As yet, research has hardly looked at these impacts systematically. However, there are indications that various policies and measures will affect women and men differently.

On their website, GenderCC highlights a number of interesting differences in the attitude of men and women as it relates to mitigation (GenderCC, 2013):

- Women are more willing than men to change their behavior in order to save energy and purchase low-carbon emitting products; however, they often know less about their own energy consumption and they reject measures that would burden them with extra work;
- Women and men have different preferences in terms of technologies to reduce greenhouse gases – a majority of women rejects risky technologies such as nuclear power and carbon capture and storage; and
- A majority of women prefers to rely on lifestyle changes rather than on technological progress only.

3.7 Past Responses to Disaster Risks

Bangladesh has become well known for her disaster management and risk reduction approaches within the South Asian region. Being the most disaster prone country within the region Bangladesh is the first to establish a separate Disaster Management Bureau (DMB) in early nineties. The country has also introduced other departments and programmes for disaster response (Disaster Relief and Rehabilitation). Bangladesh has drafted a well designed document- Standing Orders on Disasters (SOD) in 1997 (revised in 2010), which explains specific roles of relevant stakeholders during different phases of a disaster (DMB, 2010). In 2004 the Ministry of Food and Disaster Management (in 2012 the Ministry has been named as Ministry of Disaster Management and Relief/MODMR) launched the Comprehensive Disaster Management Programme (CDMP) to facilitate the reform of the disaster management approach by expanding its focus from reactive emergency response to proactive risk reduction. Over the last few years the country has initiated a good number of institutional structures to achieve technical monitoring, capacity building, preparedness and response in reducing disaster risks. The MODMR, with its line agency Department of Disaster Management, is responsible for coordinating national disaster management efforts across all agencies.

The basic strategy for disaster management in Bangladesh has been involved a combination of autonomous people-centric micro-scale interventions and institution-led responses to hazards. The former has been dominated by efforts towards averting anticipated damages, planned, designed and executed by general mass in areas those are susceptible to hazards. In contrast, the latter has taken into consideration people's autonomous responses, combined it with early warning system and capital-intensive structures that would offer protection to hazard-prone villages, prime crop lands, cities and business centres and places to take shelter during major hazards.

People have been facing hazards since millennia. Many of the responses have been quite common, involving ancestral know how and rudimentary technologies. People's own responses have been supported by institutionally driven responses, often through the participation of government agencies. A few prominent ones deserve special mention:

- Protection of coastal plains by erecting embankments/polders;
- Protection of prime agricultural lands from being inundated (as in the case of Meghna-Dhonagoda embankment);
- Development of computer-aided models towards generation and issuance of early warning and dissemination of early warnings by availing all forms of communication means (i.e., flood warnings/ advisories, cyclone warnings, etc.);
- Protection of cities and towns from flooding (as in the case of Rajshahi city, Dhaka city, etc.);

- Protection of areas, including cities from river/tidal erosion (as in the case of Brahmaputra Right bank protection);
- Supply of water to offset moisture loss during the dry season to avoid crop loss from phonological droughts (as in the case of Barind and other drought prone areas);
- Putting water infrastructure in embankments/roads to facilitate drainage (i.e., culverts on roads, sluice gates in embankments, etc.);
- Excavation/re-excavation of rivulets/*khals* to facilitate drainage;
- Deployment and use of pumps to throw water from occasional water pool during peak monsoon in embanked areas (as in the case of Dhaka);
- Use of pumps to lift water from groundwater aquifers to irrigate moisture-stressed lands (happens throughout Bangladesh during Boro cultivation);
- Building structures where people can temporarily relocate themselves during high intensity cyclones and storm surges (throughout the coastal zone);
- Relocation of people from affected areas (under special circumstances as in the case of cyclone Mohasen);
- Post-hazard relief distribution (as in the cases of floods of 1998, 2004 and 2007; the cyclones of 2007 and 2009); and
- Post-hazard rehabilitation (as in the case of all moderate to severe hazards and disasters).

As part of the above strategy, the GOB has been allocating a significant chunk of cash and kind, mostly by budgetary allocations on a regular basis, to promote people's during-hazard own initiatives to bounce back or to offer post-hazard aid and relief. The Social Safety Net (SSN) spending has been quite substantive in Bangladesh, especially over the past decade or so (Ahmed, 2013). GOB runs Gratuitous Relief, Test Relief, Food for Works, Cash for Works and Employment Generation Program for the Poorest (EGPP) with SSN allocation.

Many of these responses have regional and location-specific ramifications. People prepare early, in anticipation of a seasonal hazard and store food and fuel. The GOB, likewise, keeps a healthy storage of staple (i.e., rice and wheat) so that sudden food insecurity may be tackled by ensuring availability. Only recently, the GOB has enhanced its food storage capacity from about 12 million metric tonnes to over 16 million metric tonnes, by building silos across the country.

Small scale surface irrigation schemes are considered to address drought. Electricity is preferentially made available in the rural areas to promote tube-well based irrigation. Subsidy is provided in diesel just to enable poor farmers to run their irrigating machines. About 99 designated flood shelters are identified which would be used by local people as temporary shelters in case flood occurs in the neighbourhood. Community based relocation programme is also facilitated so that people can safeguard their lives and belongings. *Killas* (high earthen mounds) are built along the coastal plains to relocate livestock in anticipation of a high intensity cyclone and storm surge.

The Government realizes the importance of flow regime in regional rivers towards addressing water shortages and subsequent salinity ingress during the dry season. A treaty on the sharing of the Ganges water has been signed by GOB with the Indian counterpart in 1996 (GOB, 1996). Under the regional cooperation agreement, a process has just started to make a regional food bank operational which will further ensure food availability if somehow stock gets alarmingly depleted. The silos

mentioned above and the storage will then become part of the regional food bank. Moreover, Bangladesh has an agreement with India on sharing of on-time data on water levels at various points so that floods may be better understood with a sufficient lead time. That will ensure issuance of early warning on flood.

3.8 Synergy Between DRR and CCA: Past Lessons

National understanding on ameliorating disaster risks and loss burden is rather deep rooted and widespread amongst communities. Although climate change induced high intensity events are yet to occur in Bangladesh, many of the suggested responses to adverse effects of climate change are rather practiced in the country in disguise of disaster risk reduction/amelioration. Although there are academic debates regarding synergies and differences between DRR and CCA, in practice the Bangladeshi communities have brought the two concepts rather closer. The thin borderlines between definitions and nomenclatures still remain, however their practical relevance are becoming increasingly non-existent in people's understanding, knowledge, behavior and practices in Bangladesh.

The following table demarcates commonalities and differences in various concepts in relation to the two concepts, DRR and CCA.

<table>
<tr><th colspan="3">Disaster Management</th><th colspan="2">Climate Change</th></tr>
<tr><td>Approach</td><td colspan="2">What it entails?</td><td>Approach</td><td>Effective meaning towards implementation</td></tr>
<tr><td>Disaster Prevention</td><td colspan="2">Reducing hazard (hypothetical)</td><td>Climate Change Mitigation</td><td>If carbon emission is reduced, frequency and intensity of hazards will decrease</td></tr>
<tr><td>Disaster Mitigation</td><td>Reduce the exposure of the hazards, either reducing impacts of hazard or increasing resilience of the exposed elements.</td><td rowspan="2">Disaster Risk Reduction</td><td rowspan="2">Climate Change Adaptation</td><td rowspan="2">Practical steps to protect countries and communities from likely disruption and damage that will result from effects of climate change (mostly in the form of frequent and intense hazard onset). This will require adjustment in natural, built and human system in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Requires specific design criteria for responses with respect to a time-specific climate scenario.</td></tr>
<tr><td>Disaster Preparedness</td><td>Managing residual risks after mitigation measures through several contingency measures in saving life, reducing injuries, minimizing loss of assets and economy and contain the minimum level of human rights (civil and economic).</td></tr>
</table>

	Early warning, evacuation, search and rescue and shelter are major aspects of preparedness.			
Emergency Response	Deals with management of the catastrophe after hazard onset and if the damage is about to cause a 'disaster', exogenous assistance are inevitable to sustaining life and livelihoods.		Falls within climate change adaptation	Emergency responses following a climate induced very high intensity hazard turning into a disaster
Early Recovery	The immediate recovery from the impacts of catastrophe	DRR perspective is highly relevant	Climate Change Adaptation (which includes Loss and Damage)	There are ample opportunities to consider in increasing adaptive capacity of natural, built and human systems.
Rehabilitation	Planned return to normal or transformed better life and living conditions.			

2.9 Various Supporting Initiatives by the Donors, NGOs/CSOs and Concerned Communities

There is no denying the fact that concerned communities, especially in the affected areas, consider a variety of responses with or without the facilitation of government agencies deployed at the grassroots. Bangladeshi people do rely on community knowledge and try to offer the first resistance in any instance of hazard turning into a disaster. Many across the world have acknowledged and praised courage and willingness of Bangladeshi common people to fight against vagaries of nature. They deploy their wisdom, physical labour and financial means to avert any perceivable hazard.

These autonomous efforts of managing both slow and rapid onset disasters, both of climatic and non-climatic origins, constitute the majority of the national efforts. The GOB generally plays its supplementary roles with whatever limited resources it may mobilize. The development partners of the government often come forward either to build resilience through a well chalked out preparedness plan, or to overcome a continuing disaster or to take part in post-disaster relief and rehabilitation. The support has been received by the GOB from its development partners for building over a thousand coastal cyclone shelters, over 7,000 kilometers of embankments, protecting over a dozen of hazard-prone cities including the capital city, building water structures such as sluice gates and regulators, culverts for water passage and rubber dams for helping micro-scale irrigation, etc. (MOEF-GOB, 2012). Such joint efforts have gradually made the country less vulnerable to natural hazards, if not it made the country less prone to hazards.

In flood management, it has been observed that one-fifth of all support provided to the stakeholders is contributed by the development partners, with direct involvement of humanitarian NGOs. The entire SIDR recovery and rehabilitation activities have been shouldered by the NGOs alongside GOB efforts, that enabled the affected population to bounce back within a few years. The globally reputed Cyclone Preparedness Programme (CPP) would not have been implemented had it not been

supported by Bangladesh Red Crescent Society and its thousands of volunteers, in association with local level administration. Local disaster management committees do play a role, however it is the innovative dissemination of the CPP and the concerned agencies of GOB (i.e., Bangladesh television, Bangladesh Radio, etc.) which alert local people, and the shelters which allow people to stay in safety during the onslaught of a ravaging cyclone. The combination of the GOB, the donors and the NGOs/CSOs has been proven to be the key to address both CCA and DRR in Bangladesh.

The donors have mobilized a significant amount of money to engage NGOs and CSOs for a variety of activities towards reducing risks from known hazards and building resilience towards facing the climate change challenge in future (MOEF-GOB, 2012). The creation of knowledge base on climate change vulnerability and adaptation assessments has been materialized primarily by generous support of the donors that mobilized the research community and action research by the NGOs and culminated into a solid knowledge base to fight against future threats of climate change (Asia Foundation, 2012). On adaptation, a number of experimentations have been conducted by the NGOs/CSOs, extending the ideas of DRR to build confidence on community based adaptation (CBA). GOB acknowledges the leadership of NGOs and CBOs in promoting CBA, which came along with the support from the donors (MOEF-GOB, 2012).

Although in CCA and DRR, there have been a tripartite collaboration between GOB agencies, the donors and the NGOs/CSOs that enabled communities to do better, it is unfortunately not yet the case for promoting LCDs. Likewise GOB agencies, there has been little inspiration from either the donors or the CSOs in Bangladesh to devise new LCD policies, challenge existing policy structures which have been hindering the penetration of LCD technologies and to implement pilot projects to exhibit LCD outcomes in Bangladesh.

The GOB recognizes the ALGAS study and its recommendations, which paved the way for the banning of high emitting two stroke engines, allowed penetration of energy efficient four stroke engines and conversion of vehicles into CNGs, and promotion of CFLs. Since the release of ALGAS report in 1998, no significant research has been carried out towards promoting LCD in Bangladesh. A new thrust is needed to identify energy efficient technologies that suits to Bangladesh's particular situation so that all the win-win opportunities may be tapped in the country. The GOB encourages the development partners to provide adequate support towards enhancing local understanding and greater efforts on relevant research so that a LCD pathway may be followed in order to ensure the country's energy security.

Of the different government actors in Bangladesh, Department of Disaster Management (DDM[1]) is a key institution.In 2004 MOFDM, with the support of UNDP, launched the Comprehensive Disaster Management Programme (CDMP) to facilitate the reform of the disaster management approach by expanding its focus from reactive emergency response to proactive risk reduction. The Comprehensive Disaster Management Programme (CDMP[2] I, II) is popularly known as the disaster management programme of the Government of Bangladesh (GOB), especially of the MODMR. There are a large number of partners of CDMP including government ministries and their technical

[1] DDM is the former Disaster Management Bureau/DMB and Disaster Relief and Rehabilitation, the two wings used to serve the MoFDM merged into DDM in September, 2012 after the MoFDM changed to MoDMR.

[2] Supported by UNDP, EU, DFID, UKaid, AusAid, Sida, and Norwegian Embassy.

agencies[3]. Bangladesh has created a simplistic model to guide disaster risk reduction and emergency response management efforts in the country. The model attempts to move to a more comprehensive disaster risk reduction (DRR) culture and aligns its efforts to achieve this goal. The second Phase of CDMP (2010 - 2014) is functioning with the financial support from multiple donors (UNDP, UKaid, AusAid, DFID, EU, Norwegian Embassy, Sida). Both the phases of CDMP have a focus on vulnerability, risks associated with poor and women.

Bangladesh has successful experiences of working with community based organizations in disaster management involving different partners. Initiatives have been taken to revise the national Platform to develop partnership with civil society organizations (CSO), private sector, and different non-governmental actors in DRR practices. Budgetary provision has been included in the GOB plan to enhance the Public-Private partnership in this regard.

Almost all of the development partners have a focus on gender. Although gender issues are getting attention in the disaster management efforts of different actors, concise efforts are yet to be given in a systematic manner. A considerable number of development partners have been supporting the effort of the GOB including INGOs and NGOs to integrate gender sensitivity and gender related services in relation to disaster and climate change adaptation responses. CDMP considers gender as a focal theme. In Phase I CDMP developed a tool for Community Risk Assessment (CRA) with specific guideline, which also has a focus on gender.

DIPECHO of EU is a good practice of bringing different actors working in DRR issues. Six INGOs have been working with DIPECHO in a concerted way on DRR and Humanitarian Assistance under one umbrella named NARRI Consortium to ensure that different development actors work together for better synergy and effectiveness from local to national level. The Katalyst Approach is an indirect initiative to bring systemic changes through improving and safeguarding women's access to income and jobs and enhancing their participation in the male domain, e.g. markets of services, inputs, products. Some of the good practices of involving women in adaptation activities include: dissemination of early warning by young women volunteers and also work in response and recovery; women are exchanging views with family member and neighbours; women are planting more trees than before; taking necessary steps for prepare houses before the disaster risk; during the cyclone Aila most of the women took shelter earlier (SDC initiatives).

Other than supporting CDMP, UNDP developed a unique set of resources to assist high-risk countries in gender-sensitive disaster risk reduction and recovery planning and programming, which include awareness and advocacy; analysis and review; capacity development; gender-aware DRR knowledge products; gender-sensitive risk assessment; gender-responsive recovery, etc. Other development partners, e.g. FAO, GIZ, JICA, Netherlands, USAID, World Bank, ADB and so on are either directly or indirectly supporting disaster management or risk reduction activities, with or without providing specific focus on gender. In early 2007, UNISDR launched an initiative to build global partnerships for mainstreaming gender concerns and needs into DRR. The initiative provides a platform for gender activists and different stakeholders to: share information, knowledge and experience in addressing gender issues. FAO has been promoting gender-sensitive 'climate smart agriculture'.

[3] Such as DMB, DORR, MOP, Ministry of Education, NCTB, Ministry of Local Government, Rural Development and Cooperatives,Ministry of Agriculture, Ministry of Livestock and Fisheries, Ministry of Environment and Forests (MOEF), Ministry of Home Affairs,Ministry of Water Resources, Ministry of Women and Children Affairs, Ministry of Health and Family Welfare, Ministry of Power Energy and Mineral Resources and other respective technical agencies.

INGOs such as Bangladesh Red Crescent Society, Oxfam GB, CARE Bangladesh, ActionAid, IUCN and others have been working in the fields of disasters since long. Most INGOs have policy on gender and mandate for DRR. Bangladesh Red Crescent Society works through building community disaster preparedness, Community-based Development Initiatives and community based disaster management etc. Action Aid focuses on "Rights Based Approach" and works on improving the structural, the ideological and practical aspects of women and girls' lives, enabling them to claim their rights as full and equal citizens. CARE Bangladesh's SHOUHARDO programme and Oxfam GB Bangladesh's Disaster and Emergency Response Programme have strong gender focus in programe delivery. IUCN have been working jointly with UNDP and UNISDR to integrate gender issues into disaster risk reduction across the board. IUCN also involved in policy formulation process of the GOB and has developed a Climate Change Gender Action Plan (ccGAP).

Most of the programmes run by NGOs in Bangladesh are related to the micro level community based DRR. NGOs have been working on disaster preparedness and mitigation activities with community and some from an inclusive and gender focused strategies. The first community based adaptation project has been tested in southwestern region of Bangladesh, which had a strong gender component along with various responses to climate change in order to improve adaptive capacity of individuals and households in target communities (Neelormi, 2010).

UN Women has been working with a vision for eliminating discrimination against women and girls as well empowerment of women. It focuses on the achievement of equality between women and men as partners and beneficiaries of development, human rights, humanitarian action and peace and security. In Bangladesh Country Office UN Women has initiated a project towards reducing women's particular vulnerability to climate change in 2012. The first outcome of this project is to have 'gender sensitive policy measures adopted to mitigate women's vulnerability to the effects of climate change' while the second is to have 'enhanced economic opportunities for women living in areas vulnerable to the effects of climate change'. UN Women is engaging with other UN partners in supporting the GOB with background studies in preparation for the 7th 5 Year Plan. One of the background studies is 'Devising of Strategy for Adaptation and Mitigation to Climate Change'. UN Women sees this as an opportunity to advocate for more sensitive gender climate change policy and is consequently going to engage a national expert consultant to achieve this (UN Women, 2014).

3. STATE OF DRR, CCA AND LCD IN BANGLADESH

3.1 Responding to the Future Challenges of Climate Change

3.1.1 Climate change adaptation

It is well understood that the adverse impacts of climate change will increase with time. In future decades, Bangladesh will face exacerbated implications of climate change in terms of aggravated hazards and extreme weather events, people's lost livelihoods, potential non-availability of ecosystem services, loss of national economy and greater expenditure away from development to safeguard people's lives and livelihoods. GOB therefore must consider these challenges and gradually enhance its capacity to prepare its machinery to transform the vulnerable country into a resilient one. The 7th Five Year Plan will contribute significantly towards shaping up the country and its citizens towards meeting the future challenges posed by climate change.

The BCCSAP has emphasized on climate change related activities to be drawn upon the principles of sustainable development and such activities to become part of routine works (MOEF-GOB, 2009).

The BCCSAP has laid down major programmatic areas where GOB must intervene to make Bangladesh more resilient. GED revealed that on an average about 6 to 7% of all development and non-development expenditure, an equivalent of US$ 1 billion per annum, has been spent in climate sensitive activities. On an average, about 175 million US$ has been spent only in DRR related activities per annum (GED, 2012). In reality, very little direct investment could have been made between 2009 and 2014 compared to the estimated financial requirement to achieve enhanced resilience.

According to BCCSAP, ***the priority areas*** of adaptation where GOB should mobilize finance and its machinery in the short and medium term include the following:

On food security, social protection and health

- GOB will increase resilience of vulnerable groups, in particular women and children, through development of community-level adaptation, livelihood diversification, better access to basic services and social protection (e.g., safety nets, insurance) and scaling up
- GOB will develop climate change resilient cropping systems including hazard tolerant varieties suited to the need of resource poor farmers, fisheries and livestock systems to ensure local and national food security
- GOB will implement surveillance systems for existing and new disease risks and ensure health systems are geared up to meet future demands
- GOB will implement drinking water and sanitation programmes in areas at risk from climate change (e.g., coastal areas, flood- and drought-prone areas)

On managing hazards and disasters

- GOB will strengthen capacity of the government's and that of civil society partners, volunteer organizations, and communities to manage natural disasters
- GOB will further mainstream DRR and CCA in the policy and planning frameworks of all relevant ministries and departments
- GOB will commit to funding from national budget to finance CCA, DRR and Recovery, in addition to contributions from development partners and other stakeholders
- GOB will strengthen community-based adaptation programmes and establish them in each of the disaster prone parts of the country
- GOB will strengthen national early warning systems regarding cyclone, storm surge and flood to enable more accurate short, medium and long-term forecasts
- GOB will strengthen coordination and information management at national and local level

On infrastructure functioning and maintenance

- GOB will repair and rehabilitate existing infrastructure (including coastal embankments, river embankments and drainage systems, urban drainage systems) and ensure effective operation and maintenance systems
- GOB will plan, design and construct urgently needed new infrastructure (various types of shelters, low cost disaster resilient housing, protection schemes, water management structures

including drainage infrastructure) to meet the changing conditions expected with climate change

- GOB will undertake strategic planning of future infrastructure needs, taking into account the likely a) future patterns of urbanization and socio-economic development, and b) the changing hydrology of the country, because of climate change

The strategic steps considered in the BCCSAP, as stated above, have also been reiterated in subsequent national documents such as the Sixth Five Year Plan and the Second National Communication (SNC) (GED,2011; MOEF-GOB, 2012). The two dedicated funds established towards financing climate change related activities in Bangladesh (i.e., BCCTF and BCCRF) have been utilized largely towards the above mentioned strategic pathways. For example, river resuscitation programmes have been implemented towards improving drainage condition in a bid to reduce flood vulnerability. River training and embankment protections works have also been funded by utilizing BCCTF. Similarly, efforts have been made to build multi-purpose cyclone shelters across the coastal areas by utilizing BCCRF where gender-sensitive design has been integrated in the shelters.

While these are a few examples of dedicated funds led CCA activities, the GOB has taken a simultaneous strategy to safeguard its current spending on projects under Annual Development Plan (ADP) from climate induced hazards and using such development practices to ensure adaptation co-benefits from development activities. The UNDP provided assistance to the GOB through the Ministry of Planning (MOP) to mainstream CCA along with DRR, poverty alleviation and gender inclusion in all projects under ADP (GED, 2014a). The Poverty, Environment and Climate Mainstreaming (PECM) project formed an inter-ministerial body to revise the general format for designing and planning any development project, integrated concerns of climate induced vulnerability, and thereby intended to mainstream CCA in all projects under ADP. A manual has been published so that sectoral ministries can consult technical steps towards integration of CCA in ADP projects. Adequate capacity in the Ministries to mainstream climate change into planning, programming and budgetary process remains a gap (as highlighted in the Sixth Five Year Plan of GOB), which should be prioritized during the 7FYP implementation.

3.1.2 Low carbon development

In the recently concluded Conference of Parties (COP) under UNFCCC, the country parties including Bangladesh has endorsed a decision towards determining and subsequently implementing Intended Nationally Determined Contribution (INDC) (UNFCCC, 2014). To comply with the global decision, GOB must keep an eye on energy efficiency and reducing GHG emissions from various sectors. These efforts must then be reflected in INDC communications as well as in the Nationally Appropriate Mitigation Actions (NAMA) documents. Since Bangladesh's economy is growing fast, both these documents should attempt to find out energy options that are win-win in terms of energy as well as economic efficiency.

As indicated in earlier sections, the Sixth Five Year Plan initiated a few strategies (GED, 2011), which prompted national relevant agencies to develop and implement a few projects. However, a greater emphasis must be given under the Seventh Plan so that by the time Bangladesh becomes a middle-income country, she may prepare to take appropriate measures to achieve higher energy efficiency and remain competitive in global economy.

In 2015-2016 timeframe, GOB must produce INDC and NAMA and communicate those vital documents to UNFCCC. Projects will follow the formulation of such documents. It is already reported that the GOB has been popularizing energy saving technologies such as compact fluorescent lamps/bulbs, Light emitting diode electric bulbs and solar energy trapping technologies. Over 3 million solar-technology based homes are brought under electrification by April 2014 (IDCOL, 2014), the urban power authorities in major cities have made it mandatory for new electricity consumers to install solar-based renewable units to cover up 3% of estimated power demand for the respective house/multi-storied buildings. Since LED lighting is lot cheaper and highly efficient, effort must be made to address the issue towards guiding/ managing the demand side with appropriate tax restructuring. By the Seventh Plan period, incandescent lighting technologies should be phased out and instead, LED needs to be popularized. The past effort towards popularizing CFL has been quite useful, similar efforts are needed to graduate Bangladesh into much improved energy efficiency regime within the next five years. For the transformation in managing demand side, private sector must be inspired through regulatory and tax regime so that investment flows to promote such technologies.

The Prime Minister of Bangladesh has made bold statement in the recently convened Global Summit of Climate Change (held in 23 September 2014 in UN HeadQuarters) regarding energy efficiency, proliferation of Renewable technologies and reducing global emission in favour of early peaking of emissions. The past initiatives on renewable technologies must be given additional emphasis so that off-grid electricity may be made available in hard to reach villages including coastal chars. However, when the formal electricity grid will be made accessible across the country (in not so distant a future), there will be no necessity to use such technologies which have much higher capital cost to begin with. The efforts towards harnessing wind and tidal energy, especially in the coastal islands, must be given renewed impetus.

Government is keen to improve energy efficiency in transportation sector (in terms of passenger kilometer traversed), as it has been suggested in the Sixth Five Year Plan (GED, 2011). A mono-rail based mass transit system for the capital Dhaka has been proposed and given endorsement. The project is likely to be implemented within the 7^{th} Five Year Plan period. Once implemented, it will contribute immensely to further reduce traffic congestion in Dhaka and help achieve high energy efficiency in passenger transportation, especially during the peak hours when traffic congestion is inevitable.

In a bid to achieve LCD objectives, the GOB has examined the power generation sector and intends to address realities as well as tapping LCD opportunities. Greater emphasis has been placed on efficient power generation technologies. It is well understood that the power generation sector can no longer commit to gas based power generation due to over-commitment of available/proven natural gas for multiple usages: (a) power generation, (b) nitrogenous fertilizer production, (c) supplying as raw material for certain industries, (d) supplying as cooking fuel in urban areas, and (e) supplying a CNG for motorized vehicles. By recognizing a possible shortfall in natural gas in coming years, the GOB has decided to establish a few new power generation units which are based on coal as primary fuel. However, in order to achieve greater energy efficiency improved technologies are being sought. In a bid to compensate for reduced efficiency in coal based power generation (compared to natural gas as fuel), the GOB has decided to pay for extra amounts for high efficiency super-critical gasifier technology involving coal as the primary fuel. In doing so, the GOB has taken a

bold decision to spend US$2 billion equivalent of additional capital investment for a 1,320 megawatt coal fired thermal power generation unit, to be set up in Matarbari, Cox's Bazaar.

The AWD method has been slowly gaining popularity. Such techniques are useful to reduce the use of energy for irrigation optimally. Extension of AWD technologies must be given priority during the 7th FYP period so that Bangladesh not only saves energy for irrigation and reduce undesirable load shedding of power, a large amount of wasted water is saved to contribute to overall sustainability in irrigated agriculture.

The ongoing thrust on coastal afforestation and strip plantation along roadsides will be continued in order to capture atmospheric carbon within vegetation. The degraded 'forest areas' will be subject to reforestation activities under the REDD+ programme of the UNFCCC. Bangladesh will be looking at international financing opportunities to go for participatory afforestation programme, keeping in mind particular involvement of women, as well as reforestation in already degraded forest areas. There exists a significant opportunity for sequestration of carbon in vegetation and simultaneously ensuring greater benefits reaching to the poor women and men.

During the 7th Plan, pre-2020 GCF financing for mitigation and REDD will be released. About US$5 billion is about to be invested globally to promote early energy efficiency, demand side management, renewable technologies, emission reduction from agriculture (including enteric fermentation and land use change) and REDD. Bangladesh must try to exhibit readiness and align/ prepare its institutions accordingly. While enlistment and accreditation of national implementing entities (NIEs) are prerequisites, establishing norms and protocols for Measuring, Verification, Reporting and compliance (MRV) will be critical to continue to receive international finance. A number of bankable projects must be analyzed and dossiers to be made available for seizing international financing opportunities for mitigation, afforestation and low carbon development.

It is uncertain whether the anticipated global treaty on climate change in Paris (during COP-21 in 2015) will be a reality or not. Even if GCF does not materialize, the efforts to align Bangladesh with UNFCCC related opportunities must continue so that the local institutions and agencies 9including the private sector) are capable of making rationale decisions regarding energy production, conversion and manage usages in various sectors. In case the anticipated Paris protocol fails, the learning will be extremely useful towards harnessing from win-win options in the national journey towards sustainability.

3.2 GOB's Commitment to Disaster Risk Reduction

Disaster Management has been GOB's one of the top priorities, which now focus on shifting from a relief to a disaster risk reduction culture. This also gradually focused on mainstreaming efforts adopting inclusive approach including gender mainstreaming in DRR. The National Plan for Disaster Management (2010-2015) and the Disaster Management Act (2012) have become functional. A Disaster Management Policy has also been prepared and is waiting for final approval. In addition to MODMR, DRR issues have also been taken as one of the key components of several policies and legislations in Bangladesh. Some of the DRR inclusive documents can also be found in the plans and policies of other Ministries, few of them are: the Sixth Five Year Plan (2010-2015, Ministry of Planning), BCCSAP (MOEF-GOB, 2009), National Women's Advancement Policy (Ministry of Women and Children Affairs/MoWCA, 2011), National Child Policy (2011) and Children Act (MOWCA, 2013), National Education Policy (Ministry of Education, 2010), National Agriculture policy (MOA, 1999),

Post-2015 Development Agenda (Ministry of Planning, 2012), Post HFA 2015 progress agenda (MODMR, 2013) etc.

BCCSAP, 2009 and National Plan for Disaster Management (NPDM), 2010-2015 and DM Act promote planning process by addressing the vulnerabilities, risk reduction through climate change adaptation related to climate changes in all sectors (DDM, 2013).

In the post-2015 agenda formulation process DRR is be given due emphasis, especially in context of management (Ahmad, 2012). It has been argued that an effective DRR programme can help reduce adverse impacts of natural disasters which are induced and intensified by climate change. It is well known from available research that per unit monetary spending in DRR results in saving 4 to 10 units by reducing risks and safe guarding assets (Khan, undated). In this context a separate Goal as 'Environmental Protection and Climate Change Management' has been suggested considering the issue of DRR with appropriate indicators and relevant targets.

Bangladesh has also been responding to the international policies on disaster risk reduction such as to build the world community resilience to disasters the *Hyogo Frameworkfor Action (*HFA, 2005-2015*)* has been promoted. HFA aims to substantially reduce the loss of life as well as the social, economic and environmental losses caused to communities and nations as a result of disasters. The National Plan for Disaster Management (2010-2015) has been prepared in line with HFA priority areas (Nasreen, 2014), and will be updated and implemented during the 7th FYP period. Bangladesh is also keen in promoting gender and DRR/CCA agenda (Nasreen, 1995; 2012) within South Asia and has received global recognition for gender mainstreaming efforts.

The National Plan for Disaster Management (NPDM, 2010-2015), led by Ministry of Disaster Management and Relief (MODMR)[4], is an outcome of the HFA and of the process of regional cooperation in South Asia (i.e., the SAARC Process). The NPDM focuses on disaster management vision of Bangladesh, takes into consideration hazards, climate change, linkages between disasters and development, national and International drivers for change (MDGs, PRSP, Hyogo Framework of Action (HFA), SAARC Framework of Action (SFA), BCCSAP, etc. All the issues involving methods, strategic goals, regulatory framework, plans for disaster management, implementation of the plan, financing and follow up are planned to be executed in collaboration with stakeholders including the UN agencies, INGOs and NGOs (MOFDM, 2010).

The revised Standing Orders on Disaster (MOFDM, 2010) includes various stakeholders such as Ministry of Women and Children Affairs (MOWCA) in Risk Reduction activities. Such activities involve responses during normal, warning, disaster and rehabilitation stages. Department of Women Affairs is assigned to carry out specific activities such as ensuring participation of DWA representatives in different disaster management committees (DMC), ensuring women's participation in the preparedness and disaster management activities, play active role in identifying the gender gap and ensure its implementation in all disaster management activities, provide livelihood support to women and children affected by disaster. The National Policy for Women's Advancement, 2011 has endorsed women in disaster as a separate theme for the first time in Bangladesh. The DWA has completed a program (2010-2012) on gender and disaster in 413 *upazilas,* involving 1,500 organizations in Bangladesh.

[4]In 2012 MoDMR has been separated in two Ministries- Ministry of Food and Ministry of Disaster Management and Relief. The two wings Disaster Rehabilitation and Relief and Disaster Management Bureau of MoDMR has been merged to the Directorate of Disaster Management under the Disaster Management and Relief.

Although the people of Bangladesh are praised by others for their brave efforts in managing hazards, there is a dearth of advanced technical know-how regarding DRR activities in all levels. The regulatory framework is found to be less than optimally functional because of low level of understanding amongst the LGI representatives. The DMC members at Upazila and Union Parishad levels do not often know their legal responsibilities in relation to facilitating DRR. Inter-agency coordination, at all levels, has been functioning below par due to general lack of institutional capacity. Web-based knowledge management has not found to be as successful: the web-based dissemination of flood warning has largely remained unused due to poor dissemination of information and warning from the web site of Flood Forecasting and Warning Centre. Lack of systematic management of disaster information is a major challenge.

3.3 Challenges Faced by GOB Towards Effective Implementation of CCA

The following appears to be general limitations that are being faced by GOB institutions regarding implementation of CCA.

Understanding, Knowledge and Capacity: Particularly in tiers below the central Government level, GOB officials have been lacking in terms of understanding, knowledge and management skills to deal with CCA. There is some capacity and understanding amongst officials serving the central government institutions that too limited to a few individuals working in a few technical institutions. However, most of the officials need immediate capacity enhancement trainings in order to equip themselves to act as per mandate of the BCCSAP and project designing under ADP.

Weak Capacity: GOB Officials and elected office bearers of local government institutions (LGI, e.g., Union Parishads, *Pourasava* Councils, Municipal Corporations, etc.) have lacking in management skills to deal with needs emanated from impacts of climate change, which in turn has been making institutional efforts not adequately effective. Performance management processes within GOB institutions are not adequate to improve performance of officials or to hold them accountable for delivery of results. Bureaucratic processes also increase complexities and undermine available national capacities to deal with DRR and CCA issues. However, at the grassroots level, affected population has laudable social capital and general understanding on climate driven hazards and coping with them.

Priorities are not set out: The BCCSAP has given a list of programmes under its six pillars, however no effort has since been made to elaborate financial requirements for each of the identified programmes and prioritize projects based on current and projected financial capabilities and arrangements. Having the lack in prioritization of thematic projects and programmes, relevant ministries and their officials are finding it difficult to identify projects that might be more useful towards reducing vulnerability. The Roadmap for a National Adaptation Plan (NAP) is already developed by MOEF. The proposed NAP will set priorities of projects in the medium and short run and forge national consensus towards a comprehensive coordinated institutional mechanism for advancing actions on climate change.

Weak Integration With Development Efforts: The outcomes of PECM Project of the MOP towards integration of CCA in projects under ADP has been noteworthy. However, there exists a general lack in understanding regarding the fact that most of the development activities have direct or indirect linkages with impacts of climate change. This has resulted into rather weak integration of CCA efforts with implementation of development programmes/projects.

Weakness in Implementation, Monitoring and Shared Learning: The prevailing system has difficulties in designing and implementing projects in a participatory manner. Recognizing that adverse impacts of climate change will be location specific, it is generally recommended that CCA-sensitive projects should be designed through a proper participatory process, involving local people and vulnerable groups in particular. Moreover, project monitoring should also allow people's voice to be incorporated and evaluated. In the initial efforts of implementing CCA and DRR projects, there have been weaknesses regarding implementation and monitoring.

Lack of Financing: A simple analysis of BCCSAP clearly highlights the lack of financial resources towards meeting the objectives of both adaptation and low carbon development. The US$10 Billion requirement for the 10 year period appears too high for a Least Developed Country (LDC) such as Bangladesh to bear on its own. The appallingly low levels of international financing for CCA (i.e., US$190 million between 2008 and 2014) fell significantly short compared to what GOB had allocated so far through its budget. Lack of financing has been crippling the GOB to implement BCCSAP, especially its priority projects and programmes. The NAP and INDC will provide the financial strategy towards implementing CCA in Bangladesh, in line with the Climate Fiscal Framework. Opportunities for private sector will be accommodated in financing strategy.

Institutional Coordination: Climate change adaptation is a multi-dimensional response and to be dealt with by the involvement of multiple institutions through a coordinated fashion. A whole of the government approach is best suited to achieve this objective. The task of coordinating with a variety of institutions has already become overwhelming for the focal point on climate change, the MOEF. Lack of coordination has been counteracting the accrual of expected benefits from any given project. Inadequate institutional coordination capacity of MOEF has been manifested in the monitoring and evaluation of already financed projects under the BCCSAP. In almost three years, a deserving and capable NIE could not be selected and accredited with the Adaptation Fund, which could have facilitated implementation of a few more CCA projects. The readiness of GOB regarding accessing of directly accessible international funds has been put into question. It is of paramount importance that the coordination capability of the Government will be increased in order to deliver the gigantic task outlined in the BCCSAP. The NAP process will forge a national coordination and institutional mechanism for CCA activities across various actors and sectors.

There exists a lot of overlap in context as well as approach involving the two issues: climate change adaptation and responding to disaster risk reduction. Many of the adverse impacts of climate change will be exhibited in the form of increased/aggravated disasters and extreme weather events. CCA therefore must be viewed in line with DRR, especially in terms design and delivery of projects and programmes. These obvious overlaps must be recognized and addressed through inter-agency coordination, which is currently weaker than expected. Institutional coordination roles and functions are not fully developed and /or utilized to achieve the best results. Enhancement of coordination role of leading GOB institutions therefore deserves special attention.

GOB recognizes the above mentioned major limitations in its journey towards implementing BCCSAP and safeguard lives and livelihoods of affected women, men and children and towards reducing unnecessary loss burden on GOB assets. It is expected that during the 7th Five Year Plan, the GOB will consider planned approach to enhance its capability, especially on institutional arrangement to pave the path towards a safer and resilient Bangladesh.

3.4 Challenges faced by GOB towards effective implementation of LCD

The GOB has also been faced with a variety of challenges towards implementation of Low Carbon Development. The following challenges may easily be identified which have been encountered by the GOB institutions and officials.

Understanding on LCD: Despite the fact that the GOB is keen on achieving LCD, the existing resource pool having full understanding on LCD is rather small, which is a limiting factor towards achieving LCD. Addressing LCD appears viable only to those who are on top of technological advancements in energy production related technologies and/or technologies those are marketed for providing energy services at lower energy costs. As in most LDCs, the officials of the GOB do have lacking in understanding regarding cutting edge technologies, which is why effective measures often cannot be considered.

Weaknesses in Analysis and Seizing Available Opportunities: As a consequence of lack of technical knowledge and understanding regarding LCD and related technologies, there is a clear lacking in terms of analysis of current efficiency as against technologies that are already available. Light Emitting Diode (LED) based energy saving technologies are regarded as luxury items in Bangladesh and their high tax structures are forcing the users to continue to use wasteful technologies such as 'usual CRT televisions' and incandescent electric bulbs. Dearth of analyses has been depriving the country to seize opportunities brought forward by the advancement of science.

Lack of Ability of Energy Saving Sectors: Energy saving industries/sectors have limited capacity to coordinate with National Board of Revenue to periodically review and reset conducive tax and tariff structures towards better management of demand side.

Weakness in Coordination and Communication Among Institutions: Various stakeholders involving climate change do not often share ideas, information and available literature to form a nation-wide understanding regarding LCD.

Lack of Investment in Research: Research is key in LCD. There is a lack of investment in research regarding identification of thrust areas to achieve LCD objectives. Since primary objective of Bangladesh has remained adaptation, stakeholders are sluggish to pick up LCD as an area of national interest.

It is understood that the country will have to address the above shortcomings in order to achieve LCD. The 7th FYP will place LCD agenda in the focus so that the country can address the above mentioned shortcomings.

3.5 Challenges Faced by GOB Towards Effective Implementation of DRR

Despite having policy, institutional arrangements and legal framework for spearheading DRR activities, the entire operation of disaster management is yet to be decentralized. DRR in a warmer world is becoming more challenging for Bangladesh due to its multifaceted and multilayered governance involving a variety of actors in different tiers. South Asian regional risk reduction issues, often shaped by political norms and practices, are also creating challenges.

Resource constraint, both financial and non-financial (*human and others*), has been identified as a key impediment for integrating DRR in sustainable development processes. Meeting the needs of local population, as well as involving them in the decision making processes in DRR are also required.

Effective coordination and management, inclusion for participation of all groups, relief oriented response expectations from local government and community level, lack of access to and dissemination of information as well as limited technical support have also been identified as limitations by different stakeholders.

It is questionable whether the GOB has been able to benefit from the full potential of its major DRR technical assistance program, CDMP, due to a combination of circumstances including, but not limited to, the restructuring of the MOFDM around the mid-point of implementation. Given that this major program will end in 2015 it is certain that follow on technical assistance will be required by the MODMR to further advance DRR specifically and disaster management capacity in general.

Bangladesh has a long tradition of coping with disasters, where women are key contributors. People in the community have also developed adaptive and resilience capacities to face the challenges of climate change and CC induced disasters. However, these strategies have largely been overlooked and not integrated into a systematic approach. Although the country has attempted to strengthen risk reduction approaches into the designs and implementation of recovery and reconstruction programmes at affected communities, replication and scaling up of the DRR approach at the local and community level remains a key challenge.

A case study on Sidr recovery indicates that post-disaster recovery and reconstruction is rather weak as a policy measure, taking into consideration housing as a sector (Alam, 2014). Lack of a comprehensive policy on recovery and reconstruction is a major challenge in disaster recovery and rehabilitation phases following disaster events.

Mainstreaming gender in disaster risk reduction involves assessing and analyzing situations through a gender lens. It helps to understand both the vulnerability and capabilities of women in disaster prone areas. Gender is recognized as an important cross cutting issue in the DRR approach of Bangladesh. The DMCs and other standing committees on response and DRR initiatives include women representation. As a consequence, women's participation has been increased in different Committees at local and national level. However, initiative and appropriate tools to gather gender disaggregated information and analysis has not yet been considered/developed. Gender sensitive disaster response mechanism and improvement of mechanisms for dissemination of information using gender sensitive tools are to be devised.

Despite attempts, a gap has been observed in sharing the experiences of gender and DRR of different actors due to absence of concise analysis of the existing initiatives. The initiatives those have been taken by Government and other actors are not always functioning as expected. There are many social, economic and political factors which are contributing to the challenges which are encountered by the country's policy.

The following challenges in implementing DRR initiatives have been identified:

- In most cases the DRR initiatives are implemented in isolation and are, often, too narrowly focused on structural interventions without considering the knowledge, skills and behavioral aspects.
- DRR is yet to be mainstreamed into development planning and budgeting of the local government bodies.
- The National Plan for Disaster Management (NPDM) has not been implemented in full due to various reasons including lack of funding.

- The Community Risk Assessment (CRA) guideline developed by MODMR through CDMP, but it has not been mainstreamed yet. As a result, risk assessment has been implemented in limited geographical areas and not been updated on a regular basis.
- The short-term and project based disaster management approach used over the last few decades by the GOB and different NGOs in Bangladesh has made the community more 'relief oriented'. An effective communication strategy is needed to increase understanding of and demand for risk sensitive community development and resilience building.
- Dealing with rural power structures to implement DRR options is a challenge as well as a threat, to ensure the participation and control of vulnerable people over decision making and the implementation process.
- Minimizing the opportunity cost of project participants is crucial for a project; and particularly of community based activities, because they require time consuming participation.
- The weakness in coordination of DRR across sectors.
- Limited resources from national and international sources for DRR from national and international sources and insufficient effort to increase risk sensitivity of existing GOB investment.
- A coherent policy on financing disaster risk reduction is needed for the whole of GOB, not just in the MODMR. The Disaster Management Fund envisaged by the DM Act of 2012 has not been established.
- Women's participation in decision making, infrastructure design and other aspects of DRR is not sufficiently prioritized or realized in the disaster management system at any level.

3.6 Recommendations for 7FYP

To address the challenges and limitation in current implementation outlined in previous sections, the 7FYP should include the following priorities:

3.6.1 Climate Change Adaptation

<u>Promoting a whole-of-government approach for climate change readiness</u>

- Develop a national institutional architecture for allocating role and responsibilities for different ministries and institutions for various roles (Policy and Strategy Development, Long-Mid-Short Term Planning, Financing, Capacity Building, Developing Bankable Projects/Programmes, Implementation of Monitoring-Reporting-Verification, Auditing, Oversight and others).
- Enhance the governance standards of climate change finance both at national and local level.
- Development of macroeconomic framework for climate change in Bangladesh and integration into long and midterm economic frameworks.
- Implementation of NAP, NAMA, BCCSAP, NAPA, Climate Fiscal Framework (CFF), Local Climate Fiscal Framework (LCFF) and other instruments, plans and strategies developed for climate change in Bangladesh.
- Promote full use of country system in dealing climate change (Planning-ADP, Financing-MTBF/MBF, Monitoring-IMED, Auditing-AG, etc.)

Enhancing Understanding, Knowledge and Capacity

- Revise curricula at different levels of education so that the future citizens are better prepared to serve, having proper knowledge base.
- Invest in leadership and management capacity development of civil servants and other stakeholders at all level.
- Strengthen institutional capacity within planning cells/units, finance/budget cell, and monitoring cell/unit of each ministry and department so that climate change may be integrated in planning, financing and implementation monitoring process of all sectoral development projects and initiatives.

Enhancing Management Skills

- Revise all design criteria and management manuals in a bid to incorporate CCA, irrespective of sectors
- Incorporate CCA module and administer CCA courses in Foundation Training for civil servants (to be conducted by Public and Private Sector Training Academies)
- Incorporate CCA module and administer CCA courses for the training of office bearers of LGIs (to be conducted primarily by National Institute for Local Government and if needed by other private and public sector training institutions).

Prioritization and Costing of Programmes and Projects

- Costing of all climate change planning by relevant sectors.
- Conduct Full scale economic analysis of CCA projects and initiatives, organize national dialogues towards prioritization and participatory decision making.
- Projecting the prioritized and costed actions in annual, three years, five year and long term budget framework to demonstrate demands of climate budget.

Coordination

- Invest in up-gradation of current institutional set up to utilize whole of government approach to combat climate change impacts. A consultative process based national consensus will be forged under the NAP formulation process to develop a comprehensive coordination and implementation mechanism across sectors and actors on CCA.
- Strengthen institutional capacity for greater and effective coordination.

Strengthen Integration of CCA with Development Efforts

- Build institutional capacity to integrate CCA in Development programming.
- Prioritize development projects which have proven adaptation co-benefit potential.
- Put greater investment in the environmental and natural resource management.

Improved Implementation, Monitoring and Shared Learning

- Develop mechanisms and modalities towards performing participatory reality checks at project locations regarding project adequacy during early design phase.
- Develop joint monitoring protocols and ensure shared learning with stakeholders.

Enhance CCA Financing

- Increase financial allocations to implement CCA elements in addition to usual development.
- Consider greater efforts to seek international financial support.
- Consider immediate steps towards creating greater capacities to complete accreditation of NIE for both Adaptation Fund and for Green Climate Fund.

Integration of Gender Responsiveness in Project Design

- Build capacity of planning units of ministries and departments/directorates within GOB regarding analyses of gender sensitivity in climate related vulnerabilities and conceived CCA initiatives and projects
- Revise modalities and criteria for ensuring incorporation of gender equality concerns in project design at the grassroots (involving affected communities), develop a toolkit and indicators for that purpose

3.6.2 Low Carbon Development

The following steps may be necessary to address lacking and shortcomings identified above on LCD:

Enhance understanding on LCD

- Build capacity of officials and stakeholders on LCD through targeted training and dissemination of information.

Improve capacity in analysis and seizing available opportunities

- Build capacity through targeted training and information sharing
- Identification of an anchor institution and empower such potential anchor institution on LCD

Enhance capacity of energy saving sectors

- Build capacity by means of offering training
- Interact with targeted programmes involving private sector institutions including various Chambers of Commerce and Industries, Manufacturing Association, etc.

Improve coordination and communication among institutions

- Identification of an anchor institution and empower such potential anchor institution on LCD.
- Build capacity through targeted training and information sharing.

Ensuring investment in research and innovations

- Increase budgetary allocation and let such allocations be utilized for targeted research and innovations.
- Embark upon research/innovation on how gender sensitivities in energy services in various sectors and both rural and urban areas, reform national energy delivery policies/modalities based on research/innovation findings.

- Liaise with development partners for collaborative research on LCD technologies, taxation policies and tariff structure.
- Complete NAMA, highlighting INDCs by sector.
- Invest in the capacity building of the city corporation on sustainable city.

3.6.3 Disaster Risk Management

From the stakeholders participation in developing the Progress Monitoring Report of HFA (2013) it has been identified that investment in structural risk reduction measures is the most vulnerable areas. The following have been suggested for addressing the challenges:

Knowledge, skills and capacity for Disaster Risk Reduction

- Extend capacity and knowledge development opportunities to GOB officials at all levels through pre and in-service training.
- Establish a national DRR communication strategy, run by MODMR, to ensure that households have access to relevant DRR information and improve their understanding of concepts and practices.
- Promote a broad concept of DRR (as per NPDM 2010-15) emphasising both structural and non-structural interventions.

Decentralisation and local level mainstreaming of DRR

- Require local authorities to incorporate DRR and CCA into district level development plans.
- Operationalize, with adequate financing, and develop capacity of coordination bodies and their member agencies / departments stipulated in the SOD at the district and sub-district levels. Strengthen coordination between GOB and civil society at the district level.
- Create incentives for design, implementation and maintenance of DRR investments at local level.
- Encourage the mobilization of informed communities and implement processes for downward accountability to ensure demand for DRR and CCA is met by local authorities.

Build National DM Capacity and Financing Systems

- Operationalize SOD coordination bodies at national level and strengthen coordination with civil society. Establish clear line ministry responsibilities and targets for DRR and CCA mainstreaming and develop technical capacity within DDM to support mainstreaming.
- Develop a costed GOB policy on DRR financing, considering different financing models, and allocate sufficient national budget to initiate action whilst welcoming international contributions in support of national efforts.
- Strengthen DDM financial management, monitoring and evaluation and other relevant business processes to deliver DRR, response and recovery services in a transparent, accountable and cost effective manner.
- Overhaul the relationship between GOB and civil society on DRR and CCA and start GOB financing of civil society as service providers.
- Strengthen disaster information management, analysis and dissemination systems.

- Institutionalize the DM Act of 2012 through rules that achieve adequate decentralization and accountability while considering the whole DM cycle of risk reduction, preparedness, response, recovery and reconstruction.

3.7 International Process-led Opportunities

The GOB has been taking part in international negotiations and discussions at various fora on climate change as well as on DRR. There are international, particularly multi-party processes that are launched by the United Nations as well as organizations set out for promoting regional cooperation (such as SAARC), which may facilitate the future development of these sectors. By taking part in these international processes, the GOB has shown its interests to contribute and to benefit from such process-led opportunities. A few Opportunities are discussed below.

3.7.1 International Process-led Opportunities in CCA

Since the establishment of IPCC and the UNFCCC, the GOB has been taking part in negotiation processes under the UNFCCC. Till date, the UNFCCC processes have given rise to the decisions regarding Nairobi Work Programme (NWP), formation of Adaptation Fund (AF), Special Climate Change Fund (SCCF), and LDC Fund (LDCF). Although Bangladesh has received international process-led support far below its fair share from such windows of opportunities, the GOB acknowledges receipt of finance through LDCF towards the formulation of NAPA via UNDP, receipt of AF via UNDP for the implementation of one priority pilot project for improvement of livelihoods of stakeholders living in the coastal areas. The GOB also has received finance for completing the Initial National Communication and the Second National Communication (SNC) for the country, both via GEF support.

The GOB has been working with the Adaptation Fund Board (AFB). As an integral part of AFB, the GOB has already nominated its Designated Authority (DA) to AF. Bangladesh has been struggling to identify and go through accreditation process of its National Implementing Entity (NIE) by engaging its DA and through the AFB. It is understood that, unless a suitable NIE is duly accredited, Bangladesh will not be able to access AF directly. Several development partners such as the UNDP, GIZ and KFW, and CDKN have shown interests to provide technical support for the identification and accreditation of NIE to the AF. By the beginning of the 7th FYP, the GOB intends to overcome the barriers of accreditation of its NIE to AF and start accessing funds for advancing CCA in Bangladesh.

Similarly, the GOB is keen on accreditation of its NIE with the Green Climate Fund (GCF). There may be more than one NIE for GCF. A pre-requisite is to establish a National Designated Authority (NDA) and enlist it with the GCF. It is expected that NIEs will help the NDA to access funds from GCF in order to implement CCA as well as LCD projects in Bangladesh. To enable Bangladeshi institutions to take the onus, the GOB encourages its development partners to facilitate the processes by means of considering Technical Assistance projects.

One of the pre-requisite for the selection and implementation of priority adaptation projects is to complete the National Adaptation Plan (ADP) for Bangladesh. The GOB, with UNDP assistance, has been one of the first few countries to develop its ADP Roadmap. The Roadmap has highlighted what must be done prior to and during the course of the NAP process. The NAP Roadmap has highlighted gender sensitivity issues that must be plugged in towards developing CCA projects in Bangladesh. International support is necessary to both enhance GOB capacities to carry out the task and to

mobilize external support in the form of technically sound personnel and/or consultants to complete the task within the first two years of the 7th FYP.

3.7.2 International Process-led Opportunities in LCD

The GCF is expected to mobilize a big amount per year starting 2020 to address climate change and to finance LCD initiatives in developing countries. As indicated above, identification of an NIE only to facilitate accessing finance for LCD and administering LCD projects will be the first step, while the second step will be to complete accreditation process with GCF. In doing so, likewise the case of CCA, the GOB would require international technical assistance. Once these steps are completed, the GOB will be able to access finance directly from GCF and to implement LCD projects.

Although the revival of the Kyoto Protocol is heavily debatable and uncertain, the Clean Development Mechanism (CDM) is still an opportunity for Bangladesh. The country has tapped CDM opportunities for two projects, while the third is still in the pipeline after initial nod. The GOB has established Designated National Authority (DNA) to support CDM-able activities in the country.

As in the case of CCA, climate change mitigation activities in the developing countries will only be commencing under GCF if developing country parties devise their respective Nationally Appropriate Mitigation Actions (NAMA). Bangladesh has not started working on its NAMA. To facilitate the process, similar to that of NAP Roadmap, the GOB must take initiative to prepare a Roadmap for NAMA. The NAMA is expected to explain sector-wise Intended Nationally Determined Contributions (INDC), which is yet to be analyzed. The existing institutional set up has limited capacity to deliver the needful along these lines. This must be done in the initial years of the 7th FYP. Moreover, the GOB expects that it's NAMA along with INDC analyses to be completed within the first three years of the 7th FYP period.

On mitigation, one of the internationally known modalities is Reducing Emissions from Deforestation and Forest Degradation (REDD). A socially sensitive REDD programme in Bangladesh (REDD+) has to be developed, so that Bangladesh may benefit from the financial window that is likely to be created under GCF. For the REDD+ readiness, the GOB has developed a framework on REDD+. The framework needs slight revision towards accommodating gender concerns in REDD+ programme in Bangladesh. Moreover, the necessary institutional architecture has yet to be established and nurtured in order to tap resources likely to be available under GCF.

3.7.3 International Process-led Opportunities in DRR

The National Disaster Management Plan (NDMP), the Disaster Management Act and other relevant documents on DRR are fully aligned with the Hyogo Framework of Action (HFA). Global efforts on HFAs are being coordinated by United Nations International Strategy for Disaster Reduction (UNISDR). Although UNISDR does not have the projected finance as in the case of GCF to facilitate DRR efforts in developing and most vulnerable countries, the HFA offers a platform to cooperate with a large number of UN agencies to devise particular plan and implement projects throughout the developing world. Bangladesh has been taking parts in HFA collaborative programme. The World Meteorological Organization (WMO) has been supporting Bangladesh advancements towards improvement of early warning systems (EWS) for flood, cyclone and tsunamis.

Bangladesh is also playing active role in developing an Inclusive Framework to address gender and social inclusion in the DRR through INCRISED (Inclusive Community Resilience for Sustainable

Disaster Risk Management) from regional perspective supported by DIPECHO since 2013. A simplistic Gender Toolkit for DRR and climate change adaptation has been developed by the Directorate of Women Affairs, MoWCA to be used by the all stakeholders including community people.

FAO has been collaborating with the GOB on promoting disaster resistant cropping systems. IFAD has been supporting GOB's efforts to develop its EWS for flash flood region, protecting villages on earthen mounds against powerful wind interactions (i.e., *afal*). The Early Recovery Facility of UNDP works closely with the MoDMR, DDM, NGO partners and other stakeholders ensuring post disaster response and recovery integrate "build back better" approach and set the path for resilient communities. These are a few examples of strong international collaboration that have been reducing risks of disasters. The GOB will continue to work with international development partners throughout the 7th FYP period so that existing and future risks of disasters may be reduced considerably.

4. THE WAY FORWARD UNDER THE SEVENTH PLAN

4.1 Towards a Climate Resilient Bangladesh

4.1.1 Targets on climate change resilience

Within the 7th Five Year Plan period, CCA will be fully mainstreamed into ADP projects.

- The BCCSAP is revised, costed, prioritized, measurable and establishing synergy with subsequent Five Year Plan (most probably in 8th FYP or Mid Term review of 7th FYP) and other emerging strategic decisions and documents on climate change, making it a functional strategic document
- NAP exercise will be completed and synergies established with 7th FYP (likely in Mid-term review) and 8th FYP and subsequent ADPs.
- Technical capacity of all ministries and all newly recruited civil servants will be built on understanding climate change related risks and considering CCA
- Lifesaving infrastructures such as cyclone shelters will be built across the coastal zones, based on population density
- Institutional leadership for leading and coordinating with various stakeholder institutions and local government bodies will be revitalized, strengthened and their human capacities built
- Implementation of Gender Action Plan on Climate Change (ccGAP, MoEF, 2014) in collaboration with relevant Ministries.
- Enhance a whole-of-government approach in climate change country readiness for planning, capacity building, designing of bankable programmes-projects, financing, implementation, monitoring-reporting-verification, auditing, oversighting and communication.

4.1.2 Strategic actions regarding climate change resilience

Revising BCCSAP: Given that the timeline of BCCSAP implementation is about to be expired, the document should be revised. The revision process must attempt to provide for a priority list of actions and a rough estimation of cost of adaptation of prioritized projects so that those may be integrated with both the 7th Five Year Plan as well as the NAP. GOB should have a synchronized prioritization of CCA actions, based on recommended activities under NAPA, BCCSAP and Climate Fiscal Framework, and synergized with NAP, INDC and sectoral priorities of the 7th Plan.

Complete NAP: Develop NAP through a participatory process, taking into consideration most vulnerable sectors and areas and prioritize projects which will be initiated within the 7th Plan (prioritization will strike a balance between adaptation costs and adaptation needs). Cost of each adaptation project and development of bankable project ideas should be part of the NAP output.

Ensuring Climate Finance Readiness: GOB must siege the opportunities provided for under the UNFCCC processes and exhibit readiness towards accessing internationally available funds for implementing CCA and LCD activities. Readiness should entail strengthening its relevant institutions and bringing synergies within national institutions and plans/programmes dealing with CCA and LCD (i.e., CFF, BCCSAP, NAP, NAMA/INDC, NCSA, NPDM and HFA). Climate Fiscal Framework needs to be implemented towards exhibiting evidence of national capacity for absorption of international as well as national funds and to establish the above mentioned synergy.

To this end, a few other important steps must be considered under the plan period. The NIE for both Adaptation Fund and Green Climate Fund (GCF) to be identified, their capacities enhanced significantly so that these are duly accredited with respective funds. The National Designated Authority for GCF needs to be identified and its capacity strengthened. Support from development partners may be sought in order to begin an immediate process to analyze potential NIEs and to enhance their respective capacities including fiduciary capacities and practices.

Private sector's involvement in both CCA and LCD must be encouraged, where possible. The instruments such as green taxing needs to be implemented and opportunities created under Green Banking needs to be further extended.

Consider a planned development approach, integrating CCA into development: Establish a culture of integrating CCA into all development projects so that adaptation co-benefits may be accrued from development spending, with or without international assistance for CCA.

Revitalize and strengthen institutional leadership for improved coordination: Recognizing that the current institutional arrangement has been sluggish towards implementing BCCSAP and the prevailing bottleneck in inter-agency coordination involving multiple and multi-tier stakeholders has been hindering integration of CCA with development projects, an institutional revitalization and strengthening is an immediate necessity. The current institutional arrangement requires a thorough examination, the prevailing capacity involving technical know-how of officials, financial and coordination strength will be built to make the arrangement more functional

Bridge the knowledge gap: The prevailing knowledge gap between central government institutions and the local government institutions (LGI) must be addressed by devising plans for capacity building of LGI office bearers. A CCA-DRR consolidated course must be introduced in NILG. Considering that a centrally located NILG cannot possibly train all the LGI Office bearers, efforts must be made to decentralize NILG activities in all divisional cities and subsequent trainings are arranged for the LGI office bearers.

The officials involved in civil administration should also be equipped with advanced understanding on climate change. In the Foundation Training at PATC, the newly recruited Officials, irrespective of cadre, will be provided with training on climate change. The PATC module needs to be revised. Similar arrangements may be made involving Planning Academy where GOB Officials receive training on planning processes.

Develop mechanism to match institutional-led macro and meso-scale adaptation with people-centric micro-scale Community Based Adaptation: The first five years of functioning of BCCTF and

BCCRF indicate that the macro- and meso-scale interventions have not adequate addressed micro-scale adaptation needs. For the latter, CBA approaches have proven to be more effective. Efforts must be made to develop mechanisms how institution-led macro- and meso-scale adaptations may integrate CBA, especially making rooms for incorporating local level people-centric participatory CBA planning. The 'whole of government approach' must be made central to ensure coordination across tiers, involving Local Government Division of the GOB.

Disseminating and Implementing ccGAP:A Gender Action Plan (ccGAP), already been published based on the four pillars of BCCSAP, (MoEF and IUCN, 2014) with women's gender specific climate change resilience and adaptation as well as future strategies, need to be implemented and disseminated across sectors. The ccGAP has been developed for MoEF, GoB, who will play in initiating and facilitating efforts internally, as well as with strategic partners at the national, regional and international levels. It seeks to mainstream gender in climate change action as outlined in the BCCSAP and the National Adaptation Plan of Action (NAPA) - and take advantage of - opportunities that promote gender equality and facilitate change.

4.2 Towards Energy Efficient Development Pathway

Following targets are recommended to be included in the 7FYP:

- ***Complete NAMA***: The NAMA document must be prepared and submitted to UNFCCC, as it has been promised under the COP decision taken at Durban in 2012. The NAMA must be produced in light of INDC, through a participatory process, where emphasis must be placed on MRV readiness to comply with UNFCCC regulations (including institutional strengthening and development of MRV protocols). REDD, promotion of renewable technologies, and demand side management should be emphasized under the Bangladesh NAMA. NAMA to be developed with proper prioritization, costing and result matrix.
- Adaptation-mitigation synergistic initiatives to be given full institutional support and initial incentives
- Mitigation related research to be given priority, research finance will be mobilized
- Anchor institutions for LCD will be identified and their capacities enhanced through targeted training
- A pathway for improved coordination involving various stakeholders/agencies will be devised
- Sector where unnecessary emissions may be significantly reduced needs to be identified and targeted programmes to be devised and implemented in cases of win-win situations

4.3 Making Bangladesh Less Vulnerable to Disasters

Following targets are recommended to be included in the 7FYP:

- Implementation of the DM Act, distinguishing the appropriate methods of mitigation for all hazard types. Prevailing gaps in terms of 'specific rules' need to be formulated to make the DM Act functional.
- Identification of adequate national resources to finance risk reduction and enable appropriate allocation of resources to vulnerability reduction through local level

mechanisms. International financing can also play a positive role, but should not be considered the main source.

- Robust financing policies and mechanisms for disaster recovery and reconstruction should be developed, including elaboration of the role of private finance through capital markets, insurance industry and how the GOB may contribute to the development of effective market mechanisms to support risk hedging.
- DRR and CCA policy frameworks continue to be developed, strengthened and implemented by MODMR and across the GOB.
- Knowledge, understanding and requisite skills for DRR are developed by GOB officials at all levels and that relevant knowledge and information is also available for households.
- Coordination and collaboration between GOB and non-governmental institutions, volunteer organizations, private enterprise and others are developed and maintained.
- Regional cooperation should be further strengthened for disaster management, in particular on trans-boundary data sharing with India on climate, rainfall and river flows.
- Gender, vulnerability and inclusivity issues should be considered across all the sectors and ministries in all the phases of disasters
- DDM leadership on humanitarian coordination should be enhanced and a resilience perspective integrated.
- Knowledge management, in particular dissemination of knowledge products, should be strengthened.
- Resilient recovery will be pursued as a means to sustainable development
- National Disaster Management Policy has been finalized.
- Gender issues are integrated into all disaster risk management policies, plans and decision-making processes, including risk assessment, early warning, information management and education and training.
- The new organogram for DDM is approved and implemented. Specific institutional development targets for MODMR and DDM are developed and implemented with a focus on financial performance, monitoring and evaluation, technical assistance for DRR mainstreaming.
- Targets for implementation of HFA 2 priorities and a more robust monitoring mechanism are accepted and institutionalized.
- National budget for DRR and local level DRR financing mechanism is established and funded.

4.3.1 *Implementation Strategy on Disaster Management*

MODMR and DDM are the GOB institutions responsible for the reduction of vulnerability to disasters in Bangladesh. The MODMR plays the lead role on policy development and coordination of disaster management. The DDM ensures that systems, processes and resources are available and functional. Both departments will work closely with a wide range of stakeholders to ensure the creation of a rational, decentralized, cost effective disaster management system that is responsive to the risks

faced by communities and addressing differentiated needs of the most vulnerable women, men, girls and boys.

MODMR will seek to progressively develop the capacity of its officials at all levels to manage the many disaster risks faced by Bangladesh. It will ensure that adequate national financing, supported by international financing where needed, will be available and that appropriate and accountable disbursement mechanisms are put in place.

Recognizing that DRR is “everyone’s business” MODMR will develop the capacity to provide technical assistance and capacity development to other ministries and agencies of the GOB and monitor their performance on DRR within their own policy and planning frameworks. It will support the work of civil society and volunteer organisations through policy development, coordination, knowledge management and financing to deliver measurable reduction in vulnerability. Adequate attention should be paid on women leadership in disaster management across levels.

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