Government of the People's Republic of Bangladesh

United Nations Development Programme

ENABLING ACTIVITIES FOR THE PREPARATION OF THE SECOND NATIONAL COMMUNICATION OF BANGLADESH TO THE UNFCCC

The proposed project will enable the Government of the People's Republic of Bangladesh (GOB) to prepare and submit its Second National Communication (SNC) to the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The enabling activities and the envisaged processes under the SNC formulation project are essential parts of a continuum with an overarching goal of reducing overall vulnerability of the country to climate change related adverse impacts and to ensure a climate resilient development in all spheres of life in the country. This will also be an update of the activities undertaken by the GOB under other enabling activities including the Initial (i.e. the First) National Communication, which was prepared and duly submitted to the UNFCCC in 2002.

The proposed project has five main outputs: (a) inventories of anthropogenic emissions of greenhouse gases for 2000-01 & 2004-05; (b) state of present and possible future impacts and vulnerability to climate change; (c) programmes and measures to facilitate mitigation of GHG emission and adaptation to adverse impacts of climate change; (d) proposed institutional setting including policy measures to advance both mitigation and adaptation as well as mainstreaming and integrating them with national and sectoral programmes and policies; and (e) preparation of the SNC of Bangladesh, by incorporating all the above. In addition, the process towards preparation of the SNC envisages to contribute to build national capacity to prepare GHG emission inventory, to build awareness towards mainstreaming both mitigation and adaptation, and to strengthen cooperation between all relevant stakeholders by means of participation, sharing, reviewing, and feedback.

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Acronyms

ALGAS	Asia Least Cost Greenhouse Gas Abatement Strategy
BARC	Bangladesh Agriculture Research Council
BBS	Bangladesh Bureau of Statistics
BCAS	Bangladesh Centre for Advanced Studies
BIWTA	Bangladesh Inland Water Transport Authority
BMD	Bangladesh Meteorological Organization
BPC	Bangladesh Petroleum Corporation
BR	Bangladesh Railways
BRTA	Bangladesh Road Transport Authority
BUP	Bangladesh Unnayan Parishad
CBFM	Community-based Flood Management
CCC	Climate Change Cell
CDS	Coastal Development Strategy
CNG	Compressed Natural Gas
CNT	Core National Team
COP	Conference of the Parties
CTA	Chief Technical Adviser
DNA	Designated National Authority
DOE	Department of Environment
FAO	United Nations Food and Agricultural Organization
FR	Financial Report
GBM	Ganges-Brahmaputra-Meghna (Rivers)
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GOB	Government of the People's Republic of Bangladesh
GSB	Geological Survey of Bangladesh
HACT	Harmonized Approach to Cash Transfer
INC	Initial National Communication
IPCC	Inter-governmental Panel on Climate Change
IR	Inception Report
KNoCC	Knowledge Network on Climate Change
KP	Kyoto Protocol
LDC	Least Developed Country
LULUCF	Land Use, Land-use Change and Forestry
MDG	Millennium Development Goals
MOP	Meeting of the Parties

NAPA	National Adaptation Programme for Action
NAS	National Adaptation Strategy
NCSA	National Climate Self Assessment
NPD	National Project Director
NSC	National Steering Committee
NTAC	National Technical Advisory Committee
NWMP	National water Management Plan
PC	Planning Commission
ppp	Purchase power parity
RHD	Roads and Highways Department
RMG	Ready Made Garments
RVCC	Reducing Vulnerability to Climate Change
SNC	Second National Communication
SSN	South-South North
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNDP-CO	UNDP Country Office
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USCCCSP	United States Climate Change Country Studies Programme
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention on Combating Desertification
WARPO	Water Resources Planning Organization
WTO	World Trade Organization

1. ELABORATION OF THE NARRATIVE

1.1 Situation Analysis

Bangladesh is a low-lying deltaic country which is highly vulnerable to climate variability and change. It is a least developed country (LDC) with the highest population density of about 930 persons/km^2 and a very low per capita emission of about 145 kg per annum. She has been striving to achieve development in a sustainable manner and in recent years, she has registered commendable successes in reducing poverty & hunger, arresting child mortality, spreading education, advancing primary health care, improving quality of infrastructure and communication, and addressing social inequity and injustice towards women. In three decades since its independence in 1971, despite doubling of its population the country achieved near self-sufficiency in carbohydrate-based food production, but simultaneously decreased dependence of its economy on agricultural production. A predominantly agrarian society has moved towards industry and service oriented society.

Despite the substantial progress, the country has still a long way to go as poverty and social inequity still remain high and the resource base compared to the population is rather limited. To address these issues, attempt have been made to achieve the Millennium Development Goals (MDG) for which a blueprint called the Poverty Reduction Strategy Paper (PRSP) has been developed and adopted, which also plays its role towards devising three year rolling development plan for the GOB. Unfortunately, climate change and its variability add on to the existing socio-economic vulnerabilities and threaten future path to sustainable development.

Indeed, climate change may severely affect lives and livelihoods of millions of Bangladeshi people in coming decades. No wonder, the Inter-government Panel on Climate Change (IPCC) has identified Bangladesh as one of the most vulnerable countries to climate change. It is heartening to note that, to address the issues related to climate change the Climate Change Cell (CCC) has been instituted within the Department of Environment (DOE). The CCC has been instrumental in linking climate change issues with vulnerabilities caused by natural hazards and associated disasters.

Bangladesh is a non-Annex-1 Country Party to the UNFCCC and ratified the Framework Convention in 1994. The GOB officially contributed to the pre-Convention negotiation processes, helped Kyoto Protocol (KP) to become a binding commitment to Annex-1 countries by endorsing it, and contributed to the Conference of Parties (COP) and the Meeting of the Parties (MOP). GOB representatives have been serving various official and technical bodies in various capacities, which include chairing the Least Developed Country (LDC) body on advancing adaptation, and other bodies such as the Consultative Group of Experts. A number of its nationals have contributed to the IPCC (especially in the Second, the Third and the Fourth Assessment Reports), advanced academic debates and methodologies on adaptation issues, developed a generic methodology to estimate GHG emission reduction from urban refuge management, and acted as resource persons/technical Committee Members for the relevant global institutions such as the UNFCCC Secretariat, UNEP, UNDP and the GEF. In this continuum of official as well as unofficial engagements/interactions, GOB has also reiterated the reasons for being so vulnerable to climate change in its Initial National Communication (INC), submitted in October 2002 to the UNFCCC.

By pronouncing its Energy Policy, the GOB declared that natural gas will be the primary energy for the generation of power in an effort to optimize energy efficiency in this sector. Efforts have been made to emphasize on simultaneous proliferation of renewable energy technologies, which have already culminated in providing solar energy services to over 50,000 dwellings.

In addition to the preparation of the INC with GEF/UNDP funding, the GOB carried out the National Adaptation Programme for Action (NAPA) with financial assistance from the GEF/ UNDP. The NAPA was submitted to the UNFCCC in November 2005. A new programme called the National Climate Self Assessment (NCSA) has recently been initiated to provide Bangladesh with the opportunity to identify priority capacity needs for effectively addressing the crosscutting global environmental issues. This proposal is to undertake a project, which will enable the country to prepare its SNC to the COP of the UNFCCC.

1.2 Strategy

The proposed project will assist the GOB towards preparing the SNC for Bangladesh for submission to the UNFCCC, following guidelines adopted by the CoP of the UNFCCC. Although the country does not have any time-bound commitment as she is an LDC, as a country party it is committed to meeting its reporting obligations under the Framework Convention.

It is envisaged that the project will enable the country to chalk out a functional route map to mainstream climate change related activities (both mitigation and adaptation) in every aspects of development. Such mainstreaming would encompass the integration of concerns of climate change in the general planning and development strategy formulation processes, as identified by various GOB agencies and as guided by relevant GOB sectoral policies such as Poverty Reduction Strategy Paper (PRSP), National Water Policy, National Agriculture Policy, Coastal Zone Policy, National Energy Policy, National Forestry Policy, Standing Orders on Disasters, etc. Relevance between people's livelihood vulnerability and activities undertaken to meet MDGs in the light of PRSP will also be explored and highlighted.

Recognizing that there is a need for a balance among economic growth, socio-cultural development, and environmental harmony, it is envisaged that the project will establish linkages among the three. The SNC will probe into the sector with the highest GHG emissions by completing an updated GHG emission inventory for 2000-01 as well as 2004-2005 and identify issues, in line with NAPA and other nationally available documents, which will be worst affected under climate change. The project will also highlight sectors/areas with the highest adaptation potential. The project will seek to promote the integration of climate change concerns into national sectoral/zonal development plans.

The project will be implemented by the Government of the People's Republic of Bangladesh through the UNDP Bangladesh Country Office to promote energy efficient pathways of growth and development, self-reliance, reduction of risks from climate related hazards, policy integration, cooperation, and GO-NGO collaboration. The project will be built on the foundation laid by the INC, NAPA, and the ongoing NCSA activities. Moreover, it seeks to utilize national capacity fully, which have been contributing to the field of climate change internationally. In this process, internationally famed national experts will all be involved in the process to either take lead role in

drafting and/or guide new contributors as peer reviewers. Efforts will be made to enhance capacity within GOB agencies and personnel, while stakeholders will be involved in consultations/workshops/round tables to voice their concerns on various relevant issues and other capacity building activities for professional advancements.

The involvement of DOE as well as the CCC will be ensured, while the latter will act as the key national unit to guide the processes of developing the SNC. DOE will ensure timely delivery of the products envisaged under the project.

1.3 Management Arrangements

The project will be implemented by the Ministry of Environment and Forest (MOEF) through its technical wing, the department of Environment (DOE). A National Project Director (NPD) will be appointed from the Department of Environment for the preparation of the SNC. CCC of DOE will facilitate and guide the processes of developing the SNC, while a Project Support Team will operate under the supervision of the NPD and National Steering Committee (NSC). A Core National Team (CNT) will also be formed to enable the Project Support Team to render specific services for the SNC preparation. The Core National Team will also arrange/facilitate capacity building activities under the project. For a detailed management arrangements please see Appendix C, Section 5: Institutional Framework for Project Implementation.

1.4 Monitoring and Evaluation

Monitoring responsibilities and events

A detailed schedule of project review meetings will be developed by the project management, in consultation with project implementation partners and stakeholder representatives and incorporated in the Project Inception Report. Such a schedule will include: (i) tentative time frames for Steering Committee Meetings, (or relevant advisory and/or coordination mechanisms) and (ii) project related Monitoring and Evaluation activities.

Day to day monitoring of progress of implementation will be the responsibility of the Project Coordinator, Director or CTA (depending on the established project structure) based on the project's Annual Workplan and its indicators. The Project Team will inform the UNDP-CO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion.

Periodic monitoring of implementation progress will be undertaken by the UNDP-CO through quarterly meetings with the project proponent, or more frequently as deemed necessary. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities.

Project Monitoring Reporting

The Project Coordinator in conjunction with the UNDP-GEF extended team will be responsible for the preparation and submission of the following reports that form part of the monitoring process.

(a) Inception Report (IR)

A Project Inception Report will be prepared immediately following the Inception Workshop. It will include a detailed First Year Work Plan divided in quarterly timeframes detailing the activities and progress

indicators that will guide implementation during the first year of the project. The Report will also include the detailed project budget for the first full year of implementation, prepared on the basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 months time-frame.

The Inception Report will include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project related partners. In addition, a section will be included on progress to date on project establishment and start-up activities and an update of any changed external conditions that may effect project implementation.

When finalized the report will be circulated to project counterparts who will be given a period of one calendar month in which to respond with comments or queries. Prior to this circulation of the IR, the UNDP Country Office and UNDP-GEF's Regional Coordinating Unit will review the document.

Quarterly Progress Reports

Short reports outlining main updates in project progress will be provided quarterly to the local UNDP Country Office and the UNDP-GEF regional office by the project team.

(b) ***Technical Reports***

Technical Reports are detailed documents covering specific areas of analysis or scientific specializations within the overall project. As part of the Inception Report, the project team will prepare a draft Reports List, detailing the technical reports that are expected to be prepared on key areas of activity during the course of the Project, and tentative due dates. Where necessary this Reports List will be revised and updated, and included in subsequent APRs. Technical Reports may also be prepared by external consultants and should be comprehensive, specialized analyses of clearly defined areas of research within the framework of the project. These technical reports will represent, as appropriate, the project's substantive contribution to specific areas, and will be used in efforts to disseminate relevant information and best practices at local, national and international levels.

Audit Clause

The Government will provide the Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP (including GEF) funds according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by the legally recognized auditor of the Government, or by a commercial auditor engaged by the Government.

1.5 Legal Context

This Project Document shall be the instrument referred to as such in Article I of the Standard Basic Assistance Agreement between the Government of Bangladesh and the United Nations Development Programme, signed by the parties. The host country implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government co-operating agency described in that Agreement.

The UNDP Resident Representative is authorized to effect in writing the following types of revision to this Project Document, provided that he/she has verified the agreement thereto by GEF Unit and is assured that the other signatories to the Project Document have no objection to the proposed changes:

a) Revision of, or addition to, any of the annexes to the Project Document;
b) Revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of the inputs already agreed to or by cost increases due to inflation;
c) Mandatory annual revisions which re-phase the delivery of agreed project inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility; and
d) Inclusion of additional annexes and attachments only as set out here in this Project Document.

2. Total Budget

Award ID: 00040768
Award Title: PIMS 2961 Enabling Activities for the Preparation of Bangladesh's Second National Communication to the UNFCCC
Project ID: 00046281
Project output Title: PIMS 2961 Enabling Activities for the Preparation of Bangladesh's Second National Communication to the UNFCCC
Ministry of Environment and Forest (MOEF)/ Department of Environment (DOE)

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OUTPUTS (and corresponding indicators)	RESPONSIBLE PARTY	Source of Funds	Budget Code	Budget Description	Year 1 (US$)	Year 2 (US$)	Year 3 (US$)	Total Budget (US$)
National Circumstances	MOEF/DOE	GEF	73400	Rental & Maintenance of IT equip.	100	400	0	
			72400	Communications	100	400	0	
			71300	National Consultants	2,500	7,000	0	**12,000**
			72500	Supplies	500	500	0	
			74500	Miscellaneous	100	400	0	
				Sub-total	**3,300**	**8,700**	**0**	
National Greenhouse Gas Inventories	MOEF/DOE	GEF	71605	Travel	0	3,000	0	
			73400	Rental & Maintenance of IT equip.	200	500	300	
			72400	Communications	200	500	200	
			71300	National Consultants	6,000	15,000	6,000	
			71200	International Consultants	0	5,000	0	
			74100	Professional Services	5,000	12,000	5,000	**65,000**
			74200	Audio visual & print prod costs	500	1000	500	
			72500	Supplies	300	500	300	
			74500	Miscellaneous	500	2,000	500	
				Sub-total	**12,700**	**39,500**	**12,800**	
Programmes containing measures to facilitate mitigation	MOEF/DOE	GEF	71605	Travel	0	2,000	0	
			73400	Rental & Maintenance of IT equip.	300	700	500	
			72400	Communications	250	500	250	
			71300	National Consultants	12,000	20,000	12,000	
			71200	International Consultants	5,000	5,000	0	**75,000**
			74100	Professional Services	3,000	5,000	4,000	
			72500	Supplies	500	800	200	
			74500	Miscellaneous	1,000	1,000	1,000	
				Sub-total	**22,050**	**35,000**	**17,950**	

Programmes containing measures to facilitate adequate adaptation to climate change	MOEF/DOE	GEF	71605	Travel	0	2,000	0	**113,000**
			73400	Rental & Maintenance of IT equip.	300	700	500	
			72400	Communications	250	500	250	
			71300	National Consultants	20,000	20,000	20,000	
			71200	International Consultants	10,000	12,000	4,000	
			74100	Professional Services	5,000	5,000	5,000	
			74200	Audio visual & print prod costs	0	0	0	
			72500	Supplies	500	800	200	
			74500	Miscellaneous	1,000	4,000	1000	
				Sub-total	**37,050**	**45,000**	**30,950**	
Other relevant information	MOEF/DOE	GEF	71605	Travel	0	2,000	1,000	**28,000**
			73400	Rental & Maintenance of IT equip.	200	500	200	
			72400	Communications	200	500	200	
			71300	National Consultants	3,000	8,000	3,000	
			74100	Professional Services	1,000	2,000	1,000	
			74200	Audio visual & print prod costs	0	1,200	0	
			72500	Supplies	500	800	200	
			74500	Miscellaneous	500	1,500	500	
				Sub-total	**5,400**	**16,500**	**6,100**	
Technical Assistance	MOEF/DOE	GEF	71300	National Consultants	5,000	5,000	5,000	**15,000**
				Sub-total	**5,000**	**5,000**	**5,000**	
Compilation and write draft SNC report, including Executive Summary & its translation	MOEF/DOE	GEF	71300	National Consultants	0	6,000	6,000	**12,000**
				Sub-total	**0**	**6,000**	**6,000**	
Project Management	MOEF/DOE	GEF	71605	Travel	4,000	10,000	4,000	**69,000**
			73400	Purch. & Main. of Laptop & Comp.	3,600	4,200	500	
			72400	Communications	300	600	300	
			71300	National Experts (Peer reviewers)	0	3,000	2,000	
			74100	Professional Services	3,000	6,000	3,000	
			74200	Audio visual & print (incld. SNC)	500	2,000	1000	
			72500	Supplies	500	500	500	
			74500	Miscellaneous	3,000	13,500	3,000	
				Sub-total	**14,900**	**39,800**	**14,300**	
Monitoring and reporting	MOEF/DOE	GEF	74100	Professional Services	3,000	3,000	4,000	**16,000**
			74500	Miscellaneous costs	2,000	2,000	2,000	
				Sub-total	**5,000**	**5,000**	**6,000**	
				TOTAL	**105,400**	**200,500**	**99,100**	**405,000**

3. Appendices

Appendix A: Summary Report of the self-assessment exercise

1. The processes and approach for the stocktaking exercise

The main objective of the stocktaking exercise was to review development of climate change related activities carried out since the INC. It was found that a good number of small-scale initiatives have been taken by the non-government agencies in Bangladesh, while the GOB has taken a few firm steps to address the concerns of climate change. There were a few main steps in the process of stocktaking exercise in Bangladesh, which include the following:

- Conducting a survey of relevant reports and technical studies (GHG inventory, mitigation, impacts, vulnerability and adaptation)
- Preparation of a list of projects/initiatives taken by various government/non-government agencies since the formulation of INC,
- Drafting of a brief synthesis report based on past research initiatives on impacts and vulnerability of the country to climate change,
- Preparation and sharing of an annotated bibliography on climate change related publications available in the country,
- Organization of a brainstorming workshop involving national experts on approach to SNC formulation,
- Preparation of a draft SNC Proposal and subsequent reviewing by national experts, and
- Organization of a stakeholder consultation workshop on SNC proposed and subsequent incorporation of feedbacks of stakeholders, as appropriate.

The Knowledge Network on Climate Change (KNoCC), which has been active under the aegis of the Climate Change Cell (CCC), was involved in preparation of a list of projects and/or initiatives on climate change issues in Bangladesh. Based on responses obtained from a questionnaire survey, the list of projects/initiatives was prepared.

A brief report based on nationally available literature on impacts and implications of climate change was prepared. The paper has been widely distributed among various stakeholders, including the Government Officials who have been designated by their respective Ministries /Directorates/Departments as their Focal Points. Based on literature available locally, an annotated bibliography has also been produced, which provides a basis of understanding on climate change related issues in Bangladesh.

The stocktaking brainstorming workshop was conducted involving key national stakeholders. Such an effort has been supplemented by individual interviews involving internationally known experts, who have contributed to the UNFCCC-related processes (IPCC authors and reviewers, experts on negotiations at COPs/MOPs, and contributors to the Subsidiary Bodies of UNFCCC and Kyoto Protocol, etc.). Stakeholders have been consulted on identification of relevant topics concerning the SNC, priority areas of concerns, policy and institutional issues, and advancements made in recent years.

2. Main Outcomes of the Stocktaking Exercise

2.1 National Circumstances

There is a general agreement among the stakeholders that the national circumstances have been changed since the Initial national Communication (INC). Changes have been noticed in development aspirations, development pathways and emerging thrust areas which might be either reducing or aggravating vulnerability to climate change. In one hand, poverty alleviation measures, economic growth and employment generation have been reducing the overall vulnerability of the country and its poor population, while on the other hand, water-resource related hazards and subsequent vulnerabilities have practically been increasing in a number of areas. It is also felt that the emission scene and energy use had also shown appreciable change than in the recent past. Driven by rapid economic growth objectives, the country is progressively utilizing more energy and emitting more GHGs. Simultaneously, change in technologies and policy interventions have created avenues to curb GHG emissions, while proliferation of solar home systems have also been noticeable.

Based on the responses from the stocktaking exercises, the following priority activities have been identified:

- Mobilize the core national team for developing the chapter on National Circumstances and organize a scoping workshop on various dimensions of the topic.
- Identify information needs and collect necessary data from relevant sources.
- Analyze all available national and sectoral strategies, plans, programmes and studies relevant to the formulation of the SNC, including national development blueprints and poverty reduction strategy papers and strategies;
- Collect and analyze information on specific needs and concerns arising from climate change impacts and/or the implications of the implementation of prioritized response measures;
- Update the information base on national circumstances;
- Prepare a Draft National Circumstances chapter of the SNC based on outputs of the above activities;
- Conduct consultation of stakeholders on the draft national circumstances chapter, and finalize as an input to the SNC by incorporating comments and feedbacks of stakeholders.

2.2 Greenhouse Gas Inventory

It is highlighted from the deliberations that there may be five major activity/sectors which need to be covered under the GHG emission inventory. These priority areas include

(a) energy (covering all forms and all sectors, including biomass burning),
(b) industry (paddy parboiling, cement manufacturing, pulp and paper etc.),
(c) agriculture (ruminant livestock, wet rice cultivation, grassland clearing/burning of agricultural residues, and livestock management),
(d) wastes & refuge management (fugitive methane from urban refuge, municipal wastewater treatment/management etc.), and
(e) land-use change and forestry (change in forest cover and woody biomass, change in forest land-use etc.).

Since a few gases, especially those emitted from industrial and agricultural activities and causing harm to the ozone layer, are covered under the Montreal Protocol, it is recommended not to include those gases in the Inventory.

The following have been identified as priority activities under GHG Emission Inventory Preparation.

- Mobilize a Core Inventory Team involving sector-specific experts. Develop a work programme for the GHG inventory preparation.
- Familiarize with Revised 1996 IPCC Guidelines for Emission Inventory, the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, and the Good Practice Guidance on Land Use, Land-use Change and Forestry.
- Review the 1990 and 1994 inventories, as provided in INC, taking into consideration data gaps and areas requiring improvement.
- Review and select methodologies, along with identification of tier in the revised IPCC Guidelines, for each of the sectors.
- Identify relevant national institutions from where activity data will be gathered and build their capacity to collect and share their activity data.
- Review reporting instructions for GHG inventory.
- Identify priority GHGs (e.g., CO_2, CH_4, N_2O, CO etc.) and analyze key source categories.
- Collect activity data and nationally available statistics to fill inventory data gaps.
- Review and select appropriate emission factors, and if necessary develop local emission factors.
- Prepare the GHG Inventory for the fiscal years 2000-01 and 2004-05.
- Build national capacity on inventory preparation by offering a short training for relevant institutional representatives.
- Carry out an uncertainty assessment in relation to emission coefficients (factors) and activity data, as well as the reliability of currently available data/statistics.
- Conduct a stakeholder consultation on nationally relevant key emission coefficients and devise cost-effective modalities to generate such data in near future.
- Prepare the Draft National Emission Inventory Report and share with relevant agencies and experts for their comments and reviews.
- Finalize the Inventory report.

2.3 Programmes containing measures to mitigate climate change

It was revealed in the stocktaking exercise that a number of advancements have been made since early 1990s. Following the project formulation under the ALGAS Project, the GoB has imposed a ban on highly inefficient auto-tri-wheelers (locally called ‘baby taxis’) and facilitated import of four-stroke-engine operated auto-tri-wheelers. Moreover, a fuel switching was also facilitated and the entire fleet of such four-stroke tri-wheelers has been provided with Compressed Natural Gas (CNG) kits. Not only fuel efficiency has been increased, which allowed the government to save valuable foreign currency, it also culminated into a rapid improvement in urban air quality by curbing emissions of un-burnt oxides of carbon and nitrogen. A large number of cars, vans and busses are now run on CNG fuel, which came as an autonomous development following the

ALGAS Study. Meanwhile, at least two CDM projects have been initiated: (a) reducing emissions from urban refuge management by aerobic composting of bio-degradable parts of urban refuge, and (b) reducing emissions by providing independent solar home systems to as many as 30,000 dwellings across the country. It is to be noticed that, even before the implementation of the project, over 50,000 homes are now benefiting from solar home system due to a number of projects and initiatives.

It was noticed by the stakeholders that in recent years, Bangladesh has helped UNFCCC to devise a new methodology of estimating fugitive methane gas from urban refuge management. Since efficient management is possible through aerobic composting of bio-degradable refuge in urban areas, an effort may be made to estimate potential/actual mitigation of GHGs from such activities.

It was advised by the stakeholders that all the five major sectors namely energy, industry, agriculture, waste & refuge management and LULUCF will be covered under the mitigation study. It is recommended that a detailed examination on mitigation potential from urban refuge and from rice parboiling industry will be undertaken under the mitigation stream of activities.

The following activities are thought to be of importance under the SNC.

- Review UNCCCSP, ALGAS, INC and other available documents to evaluate mitigation from various activities/ sectors.
- Assess whether and how far the current policy regime has ensured GHG mitigation as an autonomous development.
- Assess potential of the above mitigation measures against the emission inventory. Highlight potential mitigation measures with Adaptation Co-benefits.
- Identify individual mitigation options having potential for win-win scenario.
- Organize training on mitigation options involving public and private sector representatives, specialists and experts.
- Prioritize those options in a national stakeholder consultation/scoping workshop and subsequently, analyze top three win-win options in as much details as possible;
- Identify and analyze institutional/policy barriers for each of the above options and develop/propose mechanisms to remove such barriers.
- Assess whether any of these measures have actual potential to become one or more CDM-able project and share with the DNA for CDM.
- Develop a Draft National Mitigation Strategy, keeping in view the post-Kyoto challenges and opportunities.
- Share the Draft National Mitigation Strategy with relevant stakeholders in an informed roundtable.
- Incorporate the findings of the informed roundtable and finalize the Mitigation Document.

2.4 Programmes containing measures to facilitate adaptation to climate change

Recognizing that there have been a number of community based adaptation projects since the drafting of INC, key issues from all these experiences should be collated and analyzed under the programme concerning adaptation. It was also recognized that such adaptation measures cannot serve all the needs for adaptation, especially for those which require institutional involvements and

outreaching through formal mechanisms. The stakeholders highlighted the needs for examining institutional bottlenecks and limitation, removal of which could enhance effectiveness of any adaptation measures. It was recommended to analyze such limitations/bottlenecks and devise a country-specific framework for institutional mainstreaming of adaptation in the light of NAPA, UNEP Framework and new ideas generated by others.

The following activities have been regarded as important and recommended for their inclusion in the SNC.

- Provide an updated synthesis on Bangladesh's vulnerability to climate change (priority sector-specific).
- Check consistency in national climatological datasets by using globally accepted models (such as Climdex) and consider correction measures as necessary.
- Analyze national trends on climate parameters such as temperature, rainfall, degree of aridity, etc. on the basis of past observed datasets.
- Pull national experiences on adaptation in various sectors (with an in-depth focus on at least one sector) and devise new programmes/ activities to reduce vulnerability at various tiers (micro-level through to macro-level).
- Assess current institutional weaknesses including those in the policy regime, which act as barriers of mainstreaming adaptation, and devise mechanisms to overcome such identified barriers.
- Establish synergies between adaptation to climate change under UNFCCC and other multi-national Environmental Agreements such as United Nations Convention on Biological Diversity (UNCBD) and United Nations Convention on Combating Desertification (UNCCD).
- Synthesize a Draft National Adaptation Strategy, based on NAPA and other documents, and establish linkages among strategic measures and national poverty reduction strategy paper as well as MDGs.
- Conduct at least two National Consultations on the Draft National Adaptation Strategy for awareness creation among stakeholders, particularly among National Focal Points (NFP) and Knowledge Network on Climate Change (KnoCC) members, and endorsement.
- Incorporate reviews and comments of National Focal Points and National Steering Committee (NSC) as well as National Advisory Committee (NAC) members towards finalize the National Adaptation Strategy.

2.5 Other information considered relevant towards achieving the objective of the UNFCCC

To enable the country towards achieving the objectives of the UNFCCC, it is recommended that the SNC needs to consider a few steps/activities, which could not be accommodated in the above mentioned steps, however regarded as important areas of concerns. These are mostly cross cutting in nature and require special mention.

The following activities are recommended under this stream.

1. Identify needs for awareness raising, capacity building, and education programmes on climate change issues.

2. Prepare a working paper on climate resilient development with particular focus on Bangladesh.
3. Identify technology and financial resources needs to carry out studies and implementation of projects for future climate change related activities.
4. Formulate a sustainable institutional mechanism for collection of emission related activity data, institutional advancements made in view of mainstreaming/servicing adaptation, and good practices on adaptation.
5. Assess constraints and gaps towards the development of SNC.
6. Identify national needs for technology transfer and technology adoption for both mitigation and adaptation.
7. Draft a Technical Report on constraints and gaps, and on assessment of technical, capacity and financial needs for institutionalizing the periodic preparation of National Communications in Future.

Appendix C: Technical Components of the Project Proposal

1. Background/Context

Bangladesh is a South Asian country, one of the Parties among the least developed signatories to the UNFCCC, located between 20º34´ to 26º38´ North latitude and 88º01´ to 92º42´ East longitude. It is a deltaic country, bordered on the west, north and east by India, on the south-east by Myanmar and on the south by the Bay of Bengal. The country occupies an area of 146,570 square kilometers. It has a high population of about 140 million and perhaps the highest population density in the world (about 930 persons per square kilometers). The population is increasing at a rate of about 1.5 per cent per annum and it is expected to reach well over 250 million before being stabilized by the second half of the current century.

As a least developed country (LDC) it has a per capita gross domestic product (GDP) of about US$445 (ppp, in 2005). Service sector has been providing the largest contribution to the GDP in recent years, amounting to about 52%. Despite the fact that the mainstay of rural economy, the agriculture sector (including crop production, livestock & poultry, fisheries, and forestry) has been showing gradual decline in the overall economic structure relative to other sectors, it still provides for about 52% of all employment at national level and about 75% of rural employment. The relative contribution of industrial sector in GDP has been on the rise and there has been continued economic incentives for the rapid growth of industrial sector, it still is hovering around 17%. It is expected that within the next 10 years, industrial contribution to GDP will stand between 30 and 35 per cent and it will accommodate 35 per cent of the employment.

The country embraced market economy since the early 1980s and has become a WTO member state. It exports ready made garments (RMG) and knitted fabrics, seafood, unfinished leather and finished leather products, pharmaceutical products, jute, and horticulture/ floriculture products to international markers. The total export in 2003-04 has been about US$7.6 Bn, while the RMG sector alone contributed to about 74% of the export. The country imports raw materials for various industrial products, heavy machineries, transportation technologies, and various consumer items, which amount to over US$10.90 Bn (in 2003-04). One of the remarkable feature of the country's economy is the contribution of the human resources working in abroad, who remit in the range of US$3.4Bn in recent years (viz. in 2003-2004).

Bangladesh has been achieving a growth rate of over 5 per cent since early 1990s, which exceeded 6 per cent growth rate during the last fiscal year. However, the wealth is not equitably distributed: it is reported that the top 5 percentile have been enjoying over 86 per cent of the wealth. Due to such precarious distribution of wealth, there has been high incidence of poverty in both rural and urban areas. Despite utmost attempts of the government, donors and non-government voluntary agencies (including the famous micro-credit system reaching the poor people), poverty alleviation strategies in Bangladesh could dent a little to the fraction of people under poverty and the absolute number of poor people has actually been increasing over the past three decades. Currently, about 30 per cent of the population lives under 'ultra poverty' (i.e., with less than US$1 per person per day).

The high incidence of poverty is not due only to lack of resources or not having access to resources, but also to frequently occurring natural hazards which tend to create havoc in household-scale economies and causes perpetuation of poverty. Some of these natural hazards assume dimensions of human tragedies and disasters, causing wide-scale deaths and destructions, damaging infrastructure, devastating poor people's livelihoods, and nullifying potentials for improved living conditions for millions who have been trying to come out of abject poverty. To add to these naturally occurring hazards and disasters triggered by furies of nature, there are human designed elements which put people, especially the poor into disastrous conditions.

But why is the country so prone to natural hazards, especially to water-related hazards? The answer lies in the facts that the deltaic Bangladesh is situated at the fag end of the hydrological system of the combined catchment areas of three great Eastern Himalayan Rivers – the Ganges, the Brahmaputra and the Meghna (GBM) Rivers. Bangladesh, sitting on the Bengal Delta with very low elevation, occupies only about 7 per cent of the combined catchment areas of GBM systems, while it drains well over 92 per cent of all water being generated by the River systems. This mismatch in drainage area as against drainage volume has been compounded by the fact that over 80 percent of all surface flows are concentrated in four months, from June to September, when the entire Himalayan region is generally under the influence of monsoon system. These realities in regional hydrology have given rise a number of elements of vulnerability: (a) 'too much water' in monsoon months causing frequent floods, often high intensity floods, (b) 'too little water' in the dry season causing moisture deficit in top soils leading to phonological droughts, while the same causing lean flow in the river systems, which cannot push back salinity ingress along the coastal areas. Moreover, the GBM water system also carry huge quantum of sediments, which has been responsible for gradual silting up of the river beds and decrease in conveyance capacity of the rivers. This has led to accentuation of floods and water logging in parts of the country in recent decades. Furthermore, cyclones often visit Bangladeshi coastal areas and causes colossal losses of human lives and livestock and irreparable damages to properties.

It is feared that the food security of the country as a whole and that of its poor population in particular will be severely challenged under climate change. The stride for development will continue while accepting a gradual increase in per capita emission, however the investments for improvement of the country's valuable infrastructure will be under severe risks due to adverse effects of climate change. Frequently occurring natural hazards at much higher intensities would tend to damage such infrastructure, which will result in an overall decrease in quality of life of people following such hazardous events.

Natural resources will also be at high risk as a consequence of climate change. For example, low-flow induced salinity ingress along the coastal rivers will destabilize succession processes in the Sundarbans – the UNESCO designated Global Heritage Site with a number of endemic species. As a result, the vegetation mix within the natural mangrove forest will be transformed, which might have detrimental effect on its species diversity. Moreover, the large population living in the Southwestern Districts of Bangladesh who are dependent on the forest will lose their source of livelihoods.

There are numerous scientific information which suggest that the country, its people and their livelihoods will be at great risk to climate related hazards under global climate change. In a

warmer world, climate will certainly interplay with the monsoon and therefore, the water related hazards will be exacerbated. Invigorated monsoon will bring in increased volume of moisture in the GBM catchment areas resulting in increased amount and intensity of rainfall, which will increase runoff volumes in the GBM River Systems. This will be translated into increased extent and intensity of floods in Bangladesh. Simultaneously, the already scanty rainfall in the winter and pre-monsoon months will be reduced further, leading to intensification of moisture stress and drought. Lean flows in the rivers will be aggravated, causing further salinization of the coastal areas. All these will have detrimental effects on crop agriculture, on which the livelihoods of over 80 per cent of the rural households, most of which are poor, depends.

Intensification of natural hazards is likely to dampen the spirit of the investors/ entrepreneurs who have been instrumental in transformation of the predominantly agrarian society into an industrialized one. Natural conditions have already put constraints into industrialization in some parts of the country (for example, salinity ingress has forced many industries to either relocate or shut down in greater Khulna region over the past three decades). Climate change will have significant adverse impacts on the industrialization process of the country. As the current population is increasing rapidly, a future without opportunities for employment in industrial sector will end up in distorting social harmony and peace.

Reducing malnutrition and hunger have been key development goals of the country since its independence in 1971. Providing good quality of life by means of education for all, providing primary health care for all and bringing all to the coverage of safe water supply and sanitation has been the other noteworthy development goals of the country, which coincidentally match with the MDGs. The government has been trying its best to invest more and more to achieve these goals, however the benefits are often washed away due to frequently occurring high intensity hazardous events and disasters. Post-disaster rehabilitation often tend to draw scanty resources from development agenda, which has been a regular phenomenon in disaster-prone Bangladesh. The GOB has recently taken initiatives to invest more on hazard preparedness as against post-disaster relief and a Comprehensive Disaster Management Programme (CDMP) has been considered. The CCC has been instrumental in bridging the dual objectives of disaster risk reduction under CDMP and simultaneously addressing climate change.

Sustaining development is another big challenge for the country, especially in the backdrop of frequently occurring natural hazards. It is feared that the progresses made under MDG related activities might just be diminished, even eroded due to adverse impacts of climate change. Climate change will therefore have far reaching consequences on the potential of the country to become a developed country by the year 2025.

2. Project Objectives

Project Development Objective

The project will strengthen the technical and institutional capacity of both Government, non-Government and private national institutions to facilitate the Government of Bangladesh (GoB) to identify climate change concerns in sectoral and national development priorities with a particular focus on reducing vulnerability in key areas/sectors.

Project Immediate Objective

The project will enable GOB to fulfill its voluntary obligations to the UNFCCC and COP to prepare and share its Second National Communication.

3. Project Strategy

The proposed project will assist the GOB towards preparing the SNC for Bangladesh for submission to the UNFCCC, following guidelines adopted by the CoP of the UNFCCC. Although the country does not have any time-bound commitment as she is an LDC, as a country party it is committed to meeting its reporting obligations under the Framework Convention.

It is envisaged that the project will enable the country to chalk out a functional route map to mainstream climate change related activities (both mitigation and adaptation) in every aspects of development. Such mainstreaming would encompass the integration of concerns of climate change in the general planning and development strategy formulation processes, as identified by various GOB agencies and as guided by relevant GOB sectoral policies such as Poverty Reduction Strategy Paper (PRSP), National Water Policy, National Agriculture Policy, Coastal Zone Policy, National Energy Policy, National Forestry Policy, Standing Orders on Disasters, etc. Relevance between people's livelihood vulnerability and activities undertaken to meet MDGs in the light of PRSP will also be explored and highlighted.

Recognizing that there is a need for a balance among economic growth, socio-cultural development, and environmental harmony, it is envisaged that the project will establish linkages among the three. The SNC will probe into the sector with the highest GHG emissions by completing an updated GHG emission inventory for 2004-2005 and identify issues, in line with NAPA and other nationally available documents, which will be worst affected under climate change. The project will also highlight sectors/areas with the highest adaptation potential. The project will seek to promote the integration of climate change concerns into national sectoral/zonal development plans.

The project will be implemented by the Government of the People's Republic of Bangladesh through the UNDP Bangladesh Country Office to promote energy efficient pathways of growth and development, self-reliance, reduction of risks from climate related hazards, policy integration, cooperation, and GO-NGO collaboration. The project will be built on the foundation laid by the INC, NAPA, and the ongoing NCSA activities. Moreover, it seeks to utilize national capacity fully, which have been contributing to the field of climate change internationally. In this process, internationally famed national experts will all be involved in the process to either take lead role in drafting and/or guide new contributors as peer reviewers. Efforts will be made to enhance capacity within GOB agencies and personnel, while stakeholders will be involved in consultations/workshops/round tables to voice their concerns on various relevant issues and other capacity building activities for professional advancements.

The involvement of DOE as well as the CCC will be ensured, while the latter will act as the key national unit to guide the processes of developing the SNC. DOE will ensure timely delivery of the products envisaged under the project.

4. Project Activities

4.1 Output 1: National Circumstances

The National Circumstances of People's Republic of Bangladesh (here onwards referred to 'Bangladesh') has somewhat changed since its submission of the INC in a number of areas. Being in a morphologically active delta, the obvious changes in riverine morphology have added complexities to the previously flagged vulnerability to climate related hazards and risks. The second noticeable change has been in economic activities: the agrarian society has been transformed into market oriented business community with investment going into modernization of agriculture and fisheries, and in a much prominent way in industries. There has been continued growth in small to medium scale captive power generation as well as promotion of solar photovoltaic units for individual dwellings, which has changed the emission scene. Moreover, there has been a gradual shift towards efficient technologies and fuel, especially in transportation & power generation. However, it is also observed that biomass still features as the most important source of energy on national scale. All such characteristics and changes there in need to be highlighted in the SNC.

The SNC will therefore revise National Circumstances, based on current realities. It will carry out review of the statistical information (as available), national policies and development strategies for the following sectors:

- Sectors which either emit GHG the most or has potential to reduce emission burden (energy & power, land use change & forestry, agriculture, industrial processes, transportation/road communication, and wastes/urban refuge, etc.)
- Sectors most impacted upon by climate change (water resources, agriculture, coastal zone, human health, etc.).

In order to synthesize and highlight national circumstances, available secondary sources will be sought and utilized. Updated national and regional scale statistical tables (primary source: BBS Yearbooks) will be collated and used extensively to provide statistical information. Geographic, climatological, physiological, and agro-ecological information will collated from national institutions such as Survey of Bangladesh, Geological Survey of Bangladesh (GSB), Bangladesh Meteorological Department (BMD), Bangladesh Agricultural Research Council (BARC). These information will be cross-checked with BBS supplied data. Infrastructural information will be collected from Roads and Highways Department (DRH), Bangladesh Road Transport Authority (BRTA), Bangladesh Railways (BR), and Bangladesh Inland Water Transport Authority (BIWTA), etc. Energy-related data will be collected from Power Cell, Bangladesh Petroleum Corporation (BPC) and Bangladesh Natural Gas Distribution and Transmission Company. Water-related information will be gathered from the databanks (such as the National Water Resources Database and the Integrated Coastal Resources Database) created under the Water Resources Planning Organization (WARPO).

Apart from these information sources, various other published sources will also be consulted. The INC, NAPA, and NCSA documents will be utilized as much as possible to ensure compatibility among various relevant national documents. Policy-related information will be found in various sectoral policies such as Poverty Reduction Strategy Paper (PRSP), National Water Policy, National Agriculture Policy, Coastal Zone Policy, National Energy Policy, National Forestry Policy, Standing Orders on Disasters, etc. The most recent three year rolling plan, as a planning outcome of PRSP completed by the Planning Commission (PC), will be utilized for understanding GOB's investment portfolio. A recently completed survey report on rural electrification will provide information on Rural Electrification Programme. Forestry related database will be used to identify potential carbon sinks. In addition to these sources, Annual Reports from relevant government agencies will be collated and utilized.

Finally, the process of preparing country circumstances chapter of the SNC will utilize all relevant documents prepared by the Climate Change Cell (CCC), namely (a) An annotated bibliography (of published literature), (b) A synthesis on climate change impacts and vulnerability, and (c) A Road map for carrying out Climate Modelling in Bangladesh. Moreover, the outcome of stakeholder consultation on research needs and priorities, as compiled by the CCC, will be made useful to highlight stakeholders' views. The advancements made under Clean Development Mechanisms (CDM) and the initial institutional mainstreaming efforts of the CCC will be considered as necessary activities towards achieving the national objectives in relation to climate change.

Activities envisaged:

1. Mobilize the core national team for developing the chapter on National Circumstances and organize a scoping workshop on various dimensions of the topic.
2. Identify information needs and collect necessary data from relevant sources.
3. Analyze all available national and sectoral strategies, plans, programmes and studies relevant to the formulation of the SNC, including national development blueprints and poverty reduction strategy papers and strategies;
4. Collect and analyze information on specific needs and concerns arising from climate change impacts and/or the implications of the implementation of prioritized response measures;
5. Update the information base on national circumstances;
6. Prepare a Draft National Circumstances chapter of the SNC based on outputs of the above activities;
7. Conduct consultation of stakeholders on the draft national circumstances chapter, and finalize as an input to the SNC by incorporating comments and feedbacks of stakeholders.

Outputs:

1. Identifying information needs, collection and collation of information of data towards developing the chapter on National Circumstances.
2. Description of the country setting (geological, climatological, physiological, morphological, hydrological, demographical, social, institutional, and economic) and the detailed explanation on why the country ranks high among the most vulnerable to climate change around the world;

3. A description each on specific vulnerability in major sectors such as water resources, agriculture (both crop and non-crop), coastal zones, human health, physical infrastructure, etc.
4. A description explaining how people's livelihoods will be at higher risk than it is today and what policy interventions would be necessary to respond to such challenges.
5. Information regarding sector-specific concerns and measures which might be necessary to respond to various needs arising from climate-related adverse impacts and opportunities.
6. National Circumstances chapter for the SNC is prepared.

4.2 Output 2: Greenhouse Gas Inventory

The Bangladesh INC reported an inventory of GHG emissions for 1994 against the base year 1990. It covered both sources and sinks, including emissions from biomass burning which are excluded from net emission estimations. The GHG covered in the inventory were carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and carbon monoxide (CO). The inventory covered various activity sectors such as (i) energy, (ii) land use, land-use change and forestry, (iii) agriculture (both wet rice production, livestock management), and (iv) industrial processes. The IPCC 1996 Methodology has been used for these estimations. In most cases, data from secondary sources have been used, while IPCC default emission coefficients have been considered for estimating GHG emissions from various sectors/activities. Non-availability of country-specific data has been identified as a major limitation, which was why such default coefficients were used in the calculations. Lack of capacity to carry out research with a focus on ascertaining country-specific emission coefficients was also responsible for not having Bangladesh-specific coefficients, which unfortunately is still prevailing. Subject to availability of additional resources, a few country-specific emission coefficients may be developed.

It is envisaged that the Emission Inventory under the SNC will be conducted following the revised IPCC 1996 Guidelines. It will also draw on the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, and the Good Practice Guidance on Land Use, Land-use Change and Forestry.

All the major stages of inventory preparation, as outlined in the revised 1996 IPCC guidelines, will be followed. These include the following:

(A) Planning the inventory (review of reporting instructions, identification of priority sources/sinks and priority GHGs, with in depth focus on fertilizer production and brick kiln sectors and/or in rice parboiling industries sector);
(B) Using national emission coefficients wherever possible and also IPCC default methods and data (i.e., emission coefficients & factors) where national coefficients cannot be determined;
(C) Develop national capacity, through organizing training, for preparation of sector-specific emission inventory;
(D) Using the IPCC workbook and worksheets;
(E) Providing documentation; and
(F) Reporting finer level of details when available.

The Inventory will be prepared by using Tier-1 Methodology, as specified in the revised IPCC Guidelines. As both Tier-2 and Tier-3 methodologies are highly data intensive and the Bangladesh national data are generally scanty to support these methodologies, analyses will be restricted to Tier-1 Methodology. However, efforts might be made to incorporate Tier-2 and 3 in specific cases where more detailed data and statistics are made available. As in the case of INC, in absence of country-specific emission coefficients/factors, default emission coefficients/factors will be used where applicable. If national values cited in literature could be gathered, efforts will be made to use those values. Efforts will be made to organize a national awareness workshop by involving potential research institutions and personnel where national emission/sink coefficients could be developed/generated for future inventory preparation. In addition, specially designed field studies will be arranged to physically check sink potentials (locally available growth rates for specific dominant tree species) and possibilities of emission reduction in at least one rural industrial activity (such as paddy parboiling). These will provide opportunities to blend bottom-up approach with top-down approach for inventory preparation.

Five major activity/sectors will be covered under the inventory, which include (a) energy (including biomass burning, transport sector, etc.), (b) industry (cement manufacturing, brick making industries, fertilizer, pulp and paper, rice parboiling, etc.), (c) agriculture (ruminant livestock, wet rice cultivation, grassland clearing/burning of agricultural residues, and livestock management), (d) wastes & refuge management (fugitive methane from urban refuge, municipal wastewater treatment/management etc.), and (e) land-use change and forestry (change in forest cover and woody biomass, change in forest land-use etc.). All the major GHGs, excepting those are not included and reported under Montreal Protocol, will be covered in the inventory.

Activities envisaged:

1. Mobilize a Core Inventory Team involving sector-specific experts. Develop a work programme for the GHG inventory preparation.
2. Familiarize with Revised 1996 IPCC Guidelines for Emission Inventory, the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, and the Good Practice Guidance on Land Use, Land-use Change and Forestry.
3. Review the 1990 and 1994 inventories, as provided in INC, taking into consideration data gaps and areas requiring improvement.
4. Review and select methodologies, along with identification of tier in the revised IPCC Guidelines, for each of the sectors.
5. Identify relevant national institutions from where activity data will be gathered and build their capacity to collect and share their activity data.
6. Review reporting instructions for GHG inventory.
7. Identify priority GHGs (e.g., CO_2, CH_4, N_2O, CO etc.) and analyze key source categories.
8. Collect activity data and nationally available statistics to fill inventory data gaps.
9. Review and select appropriate emission factors, and if necessary develop local emission factors.
10. Prepare the GHG Inventory for the fiscal years 2000-01 and 2004-05.
11. Build national capacity on inventory preparation by offering a short training for relevant institutional representatives.
12. Carry out an uncertainty assessment in relation to emission coefficients (factors) and activity data, as well as the reliability of currently available data/statistics.

13. Conduct a stakeholder consultation on nationally relevant key emission coefficients and devise cost-effective modalities to generate such data in near future.
14. Prepare the Draft National Emission Inventory Report and share with relevant agencies and experts for their comments and reviews.
15. Finalize the Inventory report.

Outputs

1. National Capacity to prepare GHG Emission Inventory, management of data and finding out/documentation of data gaps including emission coefficients/factors.
2. A National GHG Emission Inventory, highlighting emission sources and sinks.
3. Technical appendices to the inventory, discussing inventory procedures, methodologies and levels of uncertainty.
4. Increased awareness among national institutions on methods of inventory preparation and needs for emission coefficients.
5. A database created at the CCC/DOE which has been utilized for developing the Emission Inventory.
6. A set of recommendations on the improvement and strengthening of national data collection and management for future GHG inventories.

4.3 Output 3: Programmes containing measures to mitigate climate change

Although mitigation of GHGs is not a major priority for Bangladesh, which is a low-emitting country, however there are scopes where win-win mitigation options are available and the country should try to optimize its carbon intensity without compromising to its economic objectives and goals. Under the US Climate Change Country Studies Programme (USCCCSP) and the GEF-UNDP assisted Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS) initiative, a number of win-win mitigation options have been tossed, which were subsequently highlighted in the INC. A number of mitigation options have been elucidated in the more recent study which has adaptation co-benefit potential, which needs to be flagged. Moreover, there is a consensus that emphasis in the future should be on cleaner production and transfer of cleaner technologies as well as capacity building for energy efficient development.

Since late 1990s, a number of advancements have been made. Following the project formulation under the ALGAS Project, the GOB has imposed a ban on highly inefficient auto-tri-wheelers (locally called ‘baby taxis’) and facilitated import of four-stroke-engine operated auto-tri-wheelers. Moreover, a fuel switching was also facilitated and the entire fleet of such four-stroke tri-wheelers has been provided with Compressed Natural Gas (CNG) kits. Not only fuel efficiency has been increased significantly, which allowed the government to save valuable foreign currency, it also culminated into a rapid improvement in urban air quality by curbing emissions of un-burnt oxides of carbon and nitrogen. A large number of cars, vans and busses are now run on CNG fuel, which came as an autonomous development following the ALGAS Study. Meanwhile, at least two CDM projects have been initiated: (a) reducing emissions from urban refuge management by aerobic composting of bio-degradable parts of urban refuge, and (b) reducing emissions by providing independent solar home systems to as many as 30,000 dwellings across the country. It is

to be noticed that, even before the implementation of the project, over 50,000 homes are now benefiting from solar home system due to a number of projects and initiatives.

It is envisaged that the SNC will identify GHG emission mitigation measures which deal with the following potential aspects in energy sector: (i) energy conservation (human behavioural aspects, demand side management, measures directly saving energy use, etc.), (ii) energy efficiency (choice of efficient technologies, choice of efficient fuel for similar energy services, etc.), and (iii) renewable energy sources and services (solar homes, solar village, etc.). It is to be of special interest to assess comparative advantage/disadvantage of using diesel operated captive power generators for short-time users as compared to grid electric system.

In addition to energy sector, transport sector mitigation measures will concentrate on the following: (i) move towards fuel-efficient technologies for similar transportation service (passenger kilometers), (ii) efficient fuel, and (iii) change in mode of transportation (e.g., shift in freight transportation from road to rail, promotion of mass transit system in urban transport mix, CNG buses instead of individual cars in common and high density routes, etc.).

Mitigation is also possible in agricultural sector, which may deal with (i) manure management, and (ii) biomass burning. Irrigated areas has increased significantly in recent years compared to that in 1990 and 1994. Therefore, it will be interesting to check whether wet rice production is producing more methane gas than ever before. Permanent conversion of agricultural land into urban areas will have to be evaluated in terms of emission sources. In the LULUCF sector, one may consider of the following mitigation opportunities: (i) afforestation programme, (ii) replantation of already denuded designated forest areas, (iii) roadside/embankment (line) forestry, and (iv) community afforestation (village/homestead, char lands, newly emerged coastal islands, coastal greenbelt, etc.).

In recent years, Bangladesh has helped UNFCCC to devise a new methodology of estimating fugitive methane gas from urban refuge management. Since efficient management is possible through aerobic composting of bio-degradable refuge in urban areas, an effort may be made to estimate potential/actual mitigation of GHGs from such activities.

Activities envisaged

1. Review UNCCCSP, ALGAS, INC and other available documents to evaluate mitigation from various activities/ sectors.
2. Assess whether and how far the current policy regime has ensured GHG mitigation as an autonomous development.
3. Assess potential of the above mitigation measures against the emission inventory. Highlight potential mitigation measures with Adaptation Co-benefits.
4. Identify individual mitigation options having potential for win-win scenario.
5. Organize training on mitigation options involving public and private sector representatives, specialists and experts.
6. Prioritize those options in a national stakeholder consultation/scoping workshop and subsequently, analyze top three win-win options in as much details as possible;
7. Identify and analyze institutional/policy barriers for each of the above options and develop/propose mechanisms to remove such barriers.

8. Assess whether any of these measures have actual potential to become one or more CDM-able project and share with the DNA for CDM.
9. Develop a Draft National Mitigation Strategy, keeping in view the post-Kyoto challenges and opportunities.
10. Share the Draft National Mitigation Strategy with relevant stakeholders in an informed roundtable.
11. Incorporate the findings of the informed roundtable and finalize the Mitigation Document.

Outputs

1. Identification of and detailed analysis on at least three prioritized win-win mitigation options in different sectors/fields.
2. Identification of potential barriers of implementation and barrier removal mechanisms.
3. Awareness on beneficial mitigation options.
4. Identification of a few potential CDM-able projects/concerns.
5. Development and sharing of a National Mitigation Strategy.

4.4 Output 4: Programmes containing measures to facilitate adequate adaptation to climate change

Considering that adaptation to climate change will have co-benefit on sustainable development, GOB attached due emphasis (in-country) on adaptation to climate change in comparison to mitigation efforts. It is now known internationally that anticipated and planned adaptation can indeed reduce vulnerability of a country's key sectors and its population to a great extent. During the formulation of its INC, there has been limited understanding regarding adaptation measures, their relative strengths and weaknesses (in relation to their technical feasibility, economical viability, social acceptability, and overall sustainability), scales of adaptation, good practices, and most importantly, information on who suppose to adapt and at which scale. In absence of any noteworthy understanding on adaptation, the INC focused on awareness building, capacity development etc. and recommended for increased investment in a number of priority sectors. As cross cutting issues, adaptation needs for gender equity, poverty, and disaster management were highlighted, however without any profound analysis.

Meanwhile, the country embarked on developing its National Adaptation Plan of Action (NAPA) with a view to identify/develop priority adaptation projects in order to enable the country to seek LDC Fund for their implementation. Although five stakeholder consultations have been conducted in a bid to develop the NAPA, which culminated into prioritizing as many as fifteen projects, the projects have not yet been implemented/ initiated due to various institutional constraints. Nonetheless, it serves the purpose of identifying a number of adaptation projects, which already provides a starting point from where the SNC can build its adaptation programme.

In a bid to develop new and reestablish adaptation measures as mentioned in the NAPA, the process will accommodate the findings of the research activities currently being carried out by the CCC. Moreover, lessons learned from the recently implemented project (one of the pathfinder adaptation project across the globe) titled "Reducing Vulnerability to Climate Change (RVCC)" should be consulted on a priority basis. Its multi-dimensional approach and multi-faceted

outcomes offer a high number of good practices, which have been incorporated by UNDP in a global compendium of 'Adaptation Good Practices'. These need to be understood and as applicable, considered under the SNC. Furthermore, the new adaptation initiative by BCAS under 'South-South-North (SSN)' project as well as the studies carried out by BUP on 'Community-based Flood Management (CBFM)' and by FAO on 'Drought Management' may be consulted for identifying community-based adaptation. The National Water Management Plan (NWMP) and the Coastal Development Strategy (CDS) under the WARPO may also be taken into consideration for identification of adaptation options at micro-, meso-, regional- and national scales. However, it might require adequate budgetary provisions which are likely to be much larger than what is currently sought under the SNC.

One of the ongoing research activities (conducted under CCC) involves identification of adaptation needs of the women and disadvantaged/marginalized people (old, children with particular disability, minority groups etc.). Reflection on the outcomes of such a study would be of extreme importance while working on SNC. The perceptional baseline, again conducted under CCC, should be useful towards designing micro-level adaptation. However, there exist gaps in terms of defining institutional adaptations, their strengths and weaknesses. Efforts will be made to analyze institutional adaptation needs through a detailed institutional stakeholders' consultation. The CCC initiated 'National Institutional Focal Points on Climate Change' will be involved in this consultation process.

Activities envisaged

1. Provide an updated synthesis on Bangladesh's vulnerability to climate change (priority sector-specific).
2. Check consistency in national climatological datasets by using globally accepted models (such as Climdex) and consider correction measures as necessary.
3. Analyze national trends on climate parameters such as temperature, rainfall, degree of aridity, etc. on the basis of past observed datasets.
4. Pull national experiences on adaptation in various sectors (with an in-depth focus on at least one sector) and devise new programmes/ activities to reduce vulnerability at various tiers (micro-level through to macro-level).
5. Assess current institutional weaknesses including those in the policy regime, which act as barriers of mainstreaming adaptation, and devise mechanisms to overcome such identified barriers.
6. Establish synergies between adaptation to climate change under UNFCCC and other multi-national Environmental Agreements such as United Nations Convention on Biological Diversity (UNCBD) and United Nations Convention on Combating Desertification (UNCCD).
7. Synthesize a Draft National Adaptation Strategy, based on NAPA and other documents, and establish linkages among strategic measures and national poverty reduction strategy paper as well as MDGs.
8. Conduct at least two National Consultations on the Draft National Adaptation Strategy for awareness creation among stakeholders, particularly among National Focal Points (NFP) and Knowledge Network on Climate Change (KnoCC) members, and endorsement.

9. Incorporate reviews and comments of National Focal Points and National Steering Committee (NSC) as well as National Advisory Committee (NAC) members towards finalize the National Adaptation Strategy.

Outputs

1. An updated synthesis on vulnerability to climate change for wider circulation.
2. A climate trend analysis report for various regions in Bangladesh (based on nationally available and corrected datasets).
3. Establishment of modeling based national climate scenario(s) for 2030 and 2050.
4. Documentation on national experience(s) on vulnerability reduction through adaptation measures and practices (including one or two in-depth case studies).
5. A fully-developed strategy paper on institutional concerns on mainstreaming adaptation to climate change in Bangladesh.
6. Awareness of national stakeholders built/raised on adaptation issues and concerns.
7. Preparation of a National Adaptation Strategy paper.

Output 5: Other information considered relevant to the achievement of the objective of the Framework Convention

To enable the country towards achieving the objectives of the UNFCCC, the SNC will consider a few steps/activities, which could not be accommodated in the above mentioned output streams, however regarded as important areas of concerns. These are mostly cross cutting and require special mention.

Activities envisaged

1. Identify needs for awareness raising, capacity building, and education programmes on climate change issues.
2. Preparation of a working paper on climate resilient development with particular focus on Bangladesh.
3. Identify technology and financial resources needs to carry out studies and implementation of projects for future climate change related activities.
4. Formulate a sustainable institutional mechanism for collection of emission related activity data, institutional advancements made in view of mainstreaming/servicing adaptation, and good practices on adaptation.
5. Assess constraints and gaps towards the development of SNC.
6. Identify national needs for technology transfer and technology adoption for both mitigation and adaptation.
7. Drafting of a Technical Report on constraints and gaps, and on assessment of technical, capacity and financial needs for institutionalizing the periodic preparation of National Communications in Future.

Outputs

1. A Needs Assessment report on awareness raising, capacity building, and education programme on climate change issues.

2. A working paper developed on climate resilient development with particular focus on Bangladesh.
3. An institutional mechanism developed for collection of emission related activity data, institutional advancements made in view of mainstreaming/servicing adaptation, and good practices on adaptation.
4. Constraints and gaps towards the development of SNC assessed.
5. A Technical Report is drafted on constraints and gaps, needs for technology transfer/adoption, and on assessment of technical, capacity and financial needs for institutionalizing the periodic preparation of National Communications in Future.

5. Institutional Framework for Project Implementation

Since the proposed SNC will be a GoB document, its preparation/formulation will primarily be directed and guided by relevant government officials and institutions, with active support from technically sound national experts and professionals.

On behalf of the GoB, the Focal Point on Climate Change issues, the Ministry of Environment and Forest (MOEF) will have full authority and ownership on the overall document. MOEF will also retain the authority to submit and/or reject the SNC following its completion. As the Technical Wing of MOEF, the Department of Environment (DOE) will be responsible to prepare the SNC with the support of national experts and professionals. As the UNFCCC and GEF Focal Point in Bangladesh and the implementation partner for Bangladesh is UNDP Mission, the MOEF will also be accountable for the delivery of the project outputs and the achievements of the project activities as outlined in the above section.

National Project Director (NPD) will plan the project activities and outcomes, carry out the overall management responsibilities, ensure the day-to-day progress of various activities of the project. The day-to-day planning, implementation and management of the project will be administered by the Project Support Team under the guidance of the NPD and in close coordination of the Climate Change Cell, which is a designated body on relevant issues formed within the Department of Environment. The NPD will report time to time to a number of bodies: (a) a National Steering Committee (NSC) headed by the Secretary, MOEF, which is proposed for overseeing the correctness of the analyses, usefulness of inferences drawn, and implementation modalities of various recommendations about to be generated, and (b) a National Technical Advisory Committee (NTAC), which is proposed for verifying robustness of technical inputs and inferences drawn from the analyses and making sure that the findings are technically acceptable to international as well as national experts. The Terms of References (TOR) for the NSC and NTAC are provided in Annex D.

The national core team will be chosen from national institutions having adequate experience in contributing to the tasks already outlined in earlier section. The NPD in consultation with the NSC will allocate tasks according to prior experience in delivering the tasks and comparative advantage of individual expertise available nationally. A Project Coordinator (or Chief Technical Advisor) may be appointed on a full/part time basis, according to the workload. On behalf of the Core Team, s/he will liaise with responsible institutions who are given specific responsibilities to carry

out. Moreover, s/he will finalize the reports from each stream, in cooperation with the NPD and the responsible partner institutions/individual members of the core team.

It is envisaged that a *Project Support Team* will be formed under the NPD, comprising of two mid-level and two junior level experts on adaptation and mitigation issues, who will assume responsibility to internalize the capacity of SNC development within the DOE, especially with the Climate Change Cell. These professionals and the Project Coordinator will assist the core team to deliver outputs on time and provide technical guidance as necessary. They will assist the NPD to ensure timely quality delivery of outputs. They will also organize, in close cooperation with the DOE and CCC, to organize national and sub-national/regional workshops/stakeholder consultations and discussions/informed roundtables with institutional Focal Points of sectoral agencies.

UNDP Bangladesh Country Office will facilitate the implementation of the project, provide support services to the project in accordance with the UNDP procedures as requested by the NPD and/or his representative or may follow national rules and regulations, as applied. These services may include sub-contract arrangements with individual experts/professionals (project Support Team members) and national institutions and procurement of goods and services as necessary.

6. Assessing project impacts

It has been several years since the activities under the INC have taken place. Unfortunately, the institutional memory of the project activities has faded with time and very little internalized capacity remained within the GOB system. A fresh initiative under the SNC formulation will provide a new mechanism to create awareness about technical aspects of climate change and allow relevant national stakeholder agencies to refresh their memories and redesign their responsibilities under the UNFCCC and COP/MOP.

The project will contribute in a major way towards the achievement of national sustainable development objectives by a number of different pathways:

- First, the new GHG emission inventory will allow key stakeholders to assess current position of the country in the wake of entering into post-Kyoto climate regime.
- Second, the SNC processes will generate new wave of nationally available information on specific vulnerability and vulnerable sectors, will help identify relevant adaptation measures by each vulnerable sectors, and define a National Strategy for Adaptation to Climate Change. The latter will be a milestone towards ensuring a climate resilient development regime in the country.
- Third, the institutional barriers towards implementation of adaptation programmes/ agenda currently hindering national strive for achieving sustainable development will be identified and remedial measures will be devised/recommended, which in turn will allow a smoother institutional set up to deal with affairs relating to climate resilient development in the country.
- Fourth, the emission reduction stream of activities will generate enough ideas and programmes with win-win options for mitigation of GHG emissions. This will not only help the nation to meet the voluntary obligation to the UNFCCC and COP/MOP, it will also help the country's economy to grow in a carbon-efficient manner.

- Fifth, it is expected that the processes and activities will create enough room to build national capacities to prepare future national communications for national institutions, with minimal or no support from external expertise. Creating and maintaining a national pool of experts within national institutions is certainly a measure of sustainability and an indicator of development in a Developing Country, especially in a LDC.

The project will be facilitated by the guidance provided by two high level committees (i.e., NSC and the NTAC), while individual members of the NTAC will be given specific responsibility to ensure quality of outputs. Such measures are expected to ensure overall quality of the products being drafted. The quarterly progress reports (QPR), as prepared by the Project Support Team under the leadership of the NPD & NPC/CTA, will provide a summary of project status, including outputs delivery, and explain variances from the work plan. A project terminal report will be finalized by the completion of the project activities and submission of the final product to the ministry (i.e., the MOEF).

The project will be jointly reviewed by a Tripartite Project Review Committee involving representatives (one each) from the MOEF, the DOE, and the UNDP Bangladesh Country Office. This review committee may conduct two meetings, the first one at the end of Year-1 and the second meeting following the completion of the project.

Financial Reports (FR) will be prepared by the DOE and submitted to UNDP on a quarterly basis in accordance with the Guidelines for National Execution. The Project is subject to an annual financial audit as per international standards within the framework of the UNDP Harmonized Approach to Cash Transfer (HACT) and UNDP/GEF requirements. The audit will be conducted by an external auditor hired directly by UNDP Bangladesh Country Office. The audit report will be an integral part of the monitoring and evaluation process and its comments shall be taken into account in the year-end progress review and evaluation of the project.

7. Budget

The total cost of the project proposed for GEF funding is US$405,000. Details of the proposed budget are provided below (in US$1,000).

Activity	Total
I. **National Circumstances**	12
Development Priorities, objectives, policies, and circumstances	
II. **National GHG Inventories**	60
National GHG Inventories for 2000-01 and 2004-05	
Cost-effective modalities to develop country-specific emission coefficients	
III. **Emission Mitigation Stream**	75
Identification, prioritization, and analysis of a few selected win-win mitigation options (by sector/ activity), Analysis of barriers of implementation, and barrier removal mechanisms	
Analysis of potential CDM-able mitigation options	
Development of National Mitigation Strategy	
IV. **Impacts, Vulnerability, and Adaptation Stream**	75
Updated synthesis on impacts and vulnerability, by sector	
Assessment of Adaptation Needs and prioritization (by sector)	
Synergy paper: UNFCCC, UNCCD, and UNCBD	
Preparation of National Adaptation Strategy	
Institutional (incld. policy) issues and concerns for mainstreaming adaptation	
V. **Cross-cutting stream**	30
Needs Assessment for awareness raising, capacity building, and educational programmes	
Working Paper on Climate Resilient Development	
Institutional Mechanism for collection of emission related activity data etc.	
Preparation of a report on constraints and gaps, etc.	
VI. **Project Support Team** (salaries, office equipments, professional services, quality assurance fees for products developed, communication, documentation, reproduction, etc.)	78
VII. **Project Management** (Based on 15~18 month duration) (include communication, conducting stakeholder consultations, workshops, informed roundtables, reproduction of final reports, dissemination, monitoring and reporting, NTAC/NSC meetings, etc.)	75
TOTAL	405

8. Detailed Workplan (Gantt chart)

Activities/Outputs	Timeline							
	Yr-1		Yr-2				Yr-3	
	Q1	Q2	Q1	Q2	Q3	Q4	Q1	Q2
Preparatory Activities								
Formation of Project Support Team (personnel)	***							
NSC Meeting	*							
Mobilization of Core Institutions & their Teams	***							
Preparation of TORs for Core Institutions	***							
Preparation of TORs for targeted studies/papers		*						
NTAC Meeting		**						
Drafting the Inception Report		***						
Organizing the Inception Workshop		*						
Output 1: National Circumstances								
Analyze all available national and sectoral strategies, plans, programmes and studies relevant to the formulation of the SNC, including national development blueprints and poverty reduction strategy papers and strategies.	**	******						
Collect and analyze information on specific needs and concerns arising from climate change impacts and/or the implications of the implementation of prioritized response measures.		*******						
Update the information base on national circumstances.		**	*****					
Prepare a Draft National Circumstances chapter of the SNC based on outputs of the above activities.			*******	**				
Conduct consultation of stakeholders on the draft national circumstances chapter, and finalize as an input to the SNC by incorporating comments and feedbacks of stakeholders.				**				
Workshops/consultations on National Circumstances					*			
Peer review of Output-1 Documents					*			
Incorporation of workshop comments & reviewers' comments					**	**		

Output 2: GHG Inventory								
Mobilize a core Inventory Team involving sector-specific experts.	*							
Develop a work programme for the GHG Inventory preparation.		**						
Familiarization with revised 1996 IPCC Guidelines etc.		****						
Technical Review of 1990 & 1994 inventories, identification of data gaps and areas requiring improvement.		**						
Review and select methodologies, identify level of analysis for each sector		*	***					
Identify relevant national institutions from where activity data will be gathered and build their capacity to collect/share activity data.			********					
Review of reporting instructions for GHG inventory.				****				
Identification of priority GHGs, analyze key source categories (organizing a national workshop).				**				
Collection of activity data and develop inventory datasets.				******				
Review and select appropriate emission factors, and if necessary develop local emission factors.				****				
Prepare GHG Inventory for 2000-01 and 2004-05.					********			
Build national capacity on inventory preparation by offering a training course for relevant institutional representatives.					*	*		
Carry out uncertainty assessment wrt emission coefficients.						****		
Conduct stakeholder consultation on relevant key emission coefficients & devise cost-effective modalities to collect/generate such data.						**		
Organize capacity building exercises for CCC/DOE and other government personnel						**		
Prepare draft National Emission Inventory Report							***	
Organize peer reviewing of GHG Emission Inventory							**	
Finalize Inventory by incorporation of review comments							*	
Output 3: Measures to Mitigate Climate Change								
Review USCCCSP, ALGAS, INC and other documents to evaluate mitigation from various activities/ sectors.	**							
Assess whether and how far the current policy regime has ensured GHG mitigation as an autonomous development.		****						
Assess potential of the above mitigation measures against the emission inventory.		****						
Identify individual mitigation options having potential for win-win scenario.		**						
Organize training on mitigation options involving public and private sector			**					

representatives, specialists and experts.								
Organize national stakeholder consultation and prioritize win-win mitigation options mentioned above.			**					
Analyze top three win-win mitigation options.			**	***				
Identify institutional/policy barriers for each of these options and develop/propose mechanisms to remove such barriers.				***				
Assess whether any of these measures have actual potential to become one or more CDM-able project and share with the DNA for CDM project formulation.					***			
Develop a Draft National Mitigation Strategy, keeping in view the post-Kyoto deliberations.					***	*		
Organize awareness workshop on mitigation options						**		
Organize a NTAC Meeting for discussing mitigation issues/outcomes.						**		
Arrange Peer reviewing of the Draft National Mitigation Strategy.						**		
Incorporate the findings of the informed roundtable and finalize the National Mitigation Strategy.							***	
Output 4: Measures to facilitate Adaptation to CC								
Provide an updated synthesis on vulnerability to climate change.	*	***						
Check consistency in national climatological datasets by using globally accepted models (such as Climdex) and consider correction measures as necessary.		*******	**					
Analyze national trends on climate parameters such as temperature, rainfall, degree of aridity, etc. on the basis of past observed datasets.			*****					
Pull national experiences on adaptation in various sectors and devise new programmes/ activities to reduce vulnerability at various tiers.			*******	****				
Assess current institutional weaknesses including those in the policy regime, which act barriers of mainstreaming adaptation, and devise mechanisms to overcome such identified barriers.				*******	**			
Establish synergies between adaptation to climate change and UNCBD as well as UNCCD					*******			
Synthesize a Draft National Adaptation Strategy, based on NAPA and other documents, and establish linkages among strategic measures and national poverty reduction strategy paper as well as MDGs.						*******		
Conduct at least two National Consultations on the Draft National Adaptation Strategy for awareness creation among stakeholders, particularly among National Focal Points (NFP) and KnoCC members, and endorsement.						*	**	

Organize a NTAC Meeting for discussing adaptation modalities.							*	
Arrange Peer reviewing the Draft National Adaptation Strategy.							**	
Incorporate reviews and comments of NFPs and National Steering Committee (NSC) as well as National Technical Advisory Committee (NTAC) members towards finalize the National Adaptation Strategy.								**
Output 5: Other information considered relevant								
Identify needs for awareness raising, capacity building, and education programmes on climate change issues.		******						
Preparation of a working paper on climate resilient development with particular focus on Bangladesh.			*******					
Identify technology and financial resources needs				*******				
Formulate a sustainable institutional mechanism for collection of emission related activity data, institutional advancements made in view of mainstreaming/servicing adaptation, and good practices on adaptation.					*******			
Assess constraints and gaps towards the development of SNC.					*******			
Identify national needs for technology transfer and technology adoption for both mitigation and adaptation						****		
Drafting of a Technical Report on constraints and gaps, and on assessment of technical, capacity and financial needs for institutionalizing the periodic preparation of National Communications in Future.						**	***	
Arrange Peer Reviewing of the products developed.							**	
Organize a stakeholder consultation. Invite/involve NTAC members.							*	
Finalize the products.								**
Concluding Phase								
Compile all the reports and draft the National Communication based on reports/documents being generated.							*******	**
Organize a National Workshop on information/results dissemination.								*
Arrange peer reviewing of the Draft Final Report.								**
Finalize the National Communication (report).								***
Place the National Communication Report to the NSC for endorsement								*
Publish the National Communication and disseminate.								*
Management Related Activities								
Inception Report submission	*	*						

Quarterly progress report submission	*	*	*	*	*	*	*	
Financial report submission	*	*	*	*	*	*	*	
Tripartite Evaluation Meeting								*
Project Completion Meeting								*

Annex I: Terms of Reference

1. National Steering Committee

The major responsibilities of the National Steering Committee (NSC) are to:

1. Lay down policies defining the functions, responsibilities and delegation of powers for the Core Study (Project) Team and the Working Groups.
2. Facilitate coordination of project activities across institutions, data sharing and dissemination of information.
3. Facilitate inputs from relevant GOB agencies to the Core Study Team.
4. Ensure that comments received from the Peer Reviewers are accommodated towards the improvement of the project outcomes.
5. Review and approve the project outcomes in accordance with specific TORs and Annual Work Plan.
6. Provide guidance on the issues brought to its notice by the National Project Director, UNDP Project Assurance and other cooperating institutions.
7. Provide general advices regarding efficient and timely execution of the project.

A composition of the NSC would be:

1.	Secretary, Ministry of Environment and Forests	Convener
2.	Director General, Department of Environment	Member
3.	Joint Secretary (Dev.), Ministry of Environment and Forests	Member
4.	Representative, Ministry of Energy and Mineral Resources	Member
5.	Representative, Ministry of Industries	Member
6.	Representative, Ministry of Transport	Member
7.	Representative, Ministry of Land	Member
8.	Ministry of Science and Communication Technology	Member
9.	Deputy Secretary (Env.), Ministry of Environment and Forests	Member
10.	Representative, Planning Commission	Member
11.	Representative, IMED	Member
12.	Director (Technical - 1), Department of Environment	Member
13.	Representative, Water Resources Planning Org.	Member
14.	Representative, Department of Forests	Member
15.	Representative, Department of Livestock	Member
16.	Anwar Iqbal, Director, Bangladesh Agriculture Research Council	Member
17.	Representative, Bangladesh Meteorological Department	Member
18.	Representative, Bangladesh Bureau of Statistics	Member
19.	Dr. M. Asaduzzaman, Research Director, BIDS	Member

20. Dr. Aminul Islam, Sustainable Development Adviser, UNDP Member

21. Mr. Mirza Shawkat Ali, Deputy Director, DoE Member
and National Project Director, SNC Enabling Activity

22. NPD Member-Secretary

2. National Project Director

The National Project Director will be appointed according to the implementation Guidelines for the UNDP-supported projects in Bangladesh and will be accountable to the National Steering Committee, headed by Secretary, MOEF for day to day activities. The NPD is responsible for the day-to-day management of the project.

Main responsibilities of the National Project Director include the following:

- Manage day-to-day issues and make decisions for the project.
- Overseeing project implementation with systems and indicators put in place for smooth management of all project related activities and subcontracts and financial disbursements.
- Overseeing project implementation to ensure that the project achieves its objectives and deliver outputs as designed.
- Preparing detailed work plans for each sectoral core groups and identifying resource requirements, collaborating agencies/personnel, responsibilities, task outlines, and performance evaluation criteria.
- Preparing Quarterly Progress Reports and Annual Progress Reports.
- Resolve Impasses and conflicts among stakeholders at the project level.
- Initiate remedial measures to remove impediments in the progress of project activities that were not envisaged earlier.
- Ensuring project outputs in accordance with the timeline/workplan.

Scope of the assignment

The NPD will be responsible in managing the project on a day-to-day basis and is accountable to the executing agency for the planning, management, quality, timeliness and effectiveness of the activities carried out, as well as for the use of funds. The NPC will ensure the regular monitoring and feedback from activities already under implementation. The NPC will work closely with the National Executing Agency, the Project Steering Committee, UNFCCC focal point, UNDP Programme Officer for Environment and the National Climate Change Committee.

Duties and Responsibilities

The National Project Coordinator (NPC) will have the following duties:

- Prepare a detailed work plan and budget;

- Prepare and submit to UNDP and the Executing Agency, regular progress and financial reports;
- Coordinate and oversee the preparation of the outputs of the SNC;
- Ensure effective communication and adequate information flow with the relevant authorities, institutions and ministries;
- Ensure appropriate stakeholder participation in the project implementation and coordinate the work of all stakeholders and in consultation with the UNDP office;
- Maintain and establish additional links with other related national and international programs and National Projects;
- Prepare the Terms of Reference for consultants and experts and ensure their timely hiring;
- Guide the work of consultants and experts and oversee compliance with agreed work plan;
- Identify training needs at contracted national institutions and for other project stakeholders;
- Organize and coordinate the procurement of services and goods under the project;
- Coordinate, manage and monitor the implementation of the Project assignments undertaken by the working groups, local experts; consultants, sub-contractors and co-operating partners;
- Coordinate the experts and consultants in preparing and finalizing the SNC document
- Assume overall responsibility for the proper handling of logistics related to all project workshops and events;
- Manage the Project finance, oversee overall resource allocation and where relevant submit proposals for budget revisions with the help of the UNDP officer;
- Undertake any other actions related to the Project as requested by the Executing Agency or by UNDP.

IV. Qualifications and Skills

- Advanced university degree in the fields related to climate change and environmental management
- Minimum of 10 years of working experience in the area relevant to the project;
- Substantial involvement in the preparation of the national GHG inventory and the initial National
- Good command in English
- Demonstrated ability in managing projects, and in liaising and cooperating with all project stakeholders including government officials, scientific institutions, NGOs and private sector;
- Substantial experience in Government and in inter-ministerial procedures

- Familiarity with international negotiations and processes under the UNFCCC
- Strong communications and interpersonal skills
- Excellent computer knowledge (MS Office, Internet)

3. SNC Core Sectoral Work Groups (CSWG)

The Core Sectoral Working Groups (CSWG) will be responsible for providing guidance to the technical personnel/agencies those having specific responsibilities for carrying out activities as outlines under each stream. These CSWG will be multi-disciplinary, represented by national level experts and institutions (including government and non-government institutions and academics) having specific relevance for each of the activity stream as outlined in the proposal. They will sit at least once in each quarter and oversee the progress of the activities. In each of these CSWGs, one Convener will be elected and S/he will draw attention of the National Project Director in case an impasse/irregularity is noticed. They will also help the NPD to identify relevant Peer Reviewers, who will be given responsibility to ensure quality of outputs in written form.

A list (non-exhaustive) of Agencies, which will have representatives in various CSWGs is provided below:

- Bangladesh Agriculture Research Council
- Bangladesh Bureau of Statistics
- Bangladesh Center for Advanced Studies
- Bangladesh Forest Research Institute
- Bangladesh Inland Water Transport Authority
- Bangladesh Institute for development Studies
- Bangladesh Livestock Research Institute
- Bangladesh Petroleum Corporation
- Bangladesh Power Development Board
- Bangladesh Rice Research Institute
- Bangladesh Road Transport Authority
- Bangladesh Rural Development Board
- Bangladesh University of Engineering and Technology
- Bangladesh Unnayan Parishad
- Bangladesh Water Development Board
- Centre for Environmental Geographic Information Services
- Centre for Global Change
- Conservation of Natural Resources
- Department of Environment
- Department of Forest
- Department of Livestock
- Department of Meteorology
- Department of Public Health Engineering

- Dhaka University
- Disaster Management Bureau
- Institute for Water Modelling
- Institute of Water and Flood Management
- Jahangirnagar University
- Khulna University
- Local Government Engineering Department
- Ministry of Science and Technology
- Planning Commission
- Sylhet Shahjalal University of Science and Technology
- The Power Cell
- Water Resources Planning Organization

4. Project Support Team

The Project Support Team (PST) will facilitate the implementation of project activities, especially those sub-contracted to various institutions/agencies for each stream-based activities. The PST members will be appointed by the National Project Director following Government Rules and Regulations and will be accountable to the NPD. The Project Support Team will operate within the Department of Environment (DOE) in close cooperation with the Climate Change Cell. It will be headed by a Chief Technical Advisor/National Project Coordinator, who will ensure smooth functioning of the activities, liaise with relevant institutional heads responsible for Stream-based activities on behalf of the NPD and help to resolve conflicts and overcome impasse. The PST will develop the sub-contracting TORs with specific tasks and detailed indicator-based outputs. The PST will also liaise with the Peer Reviewers, on behalf of the NPD, to ensure quality of the products. They will also contribute technically on undertaking research in relation to the cross-cutting stream.

On behalf of the National Project Director, it will facilitate organization of various national/regional Stakeholder consultations, workshops, training programmes and meetings of various CSWGs/ Committees. The PST will help organize the inception workshop and the concluding National Workshop. The PST will ensure quality of reporting, bring out dissemination/communication materials, represent the project in other national level activities/efforts etc. In brief, the PST will facilitate to institutionalize the SNC activities within the DOE system.

Generic Broad TOR for PST Members

- Provide assistance and support to the National Project Director as well as to the Chief Technical Advisor for smooth implementation of the project activities;
- Liaise with CSWGs and NTAC Members to ensure time-bound delivery of project outputs;
- Assist the National Project Director in planning, organizing and conducting of workshops/stakeholder consultations and training sessions;

- Prepare work-plan for each stream;
- Finalize technical reports with support from the responsible CSWGs;
- Undertake research/studies on various topics under the cross-cutting stream; and
- Help the National Project Director towards preparing Quarterly and Annual Reports.

Qualifications

- Ph.D with at least 15 years experience or Post-graduate degree with at least 20 years experience, having basic degree in relevant natural/environmental science or engineering fields;
- A minimum of 5 years of experience on climate change field;
- Familiarity with the UNFCCC Policies and processes;
- Experience in conducting workshops/seminars and symposiums
- Experience in technical writing;
- Excellence in communicating in English;
- Excellence in verbal communication and interpersonal skills;
- Proven track record in dealing with large projects.

5. Institutions Responsible for Carrying Out Stream-based Activities

Stream-1: National Circumstances

The institution will undertake the following activities:

- Mobilize the core national team for developing the chapter on National Circumstances and organize a scoping workshop on various dimensions of the topic.
- Identify information needs and collect necessary data from relevant sources.
- Analyze all available national and sectoral strategies, plans, programmes and studies relevant to the formulation of the SNC, including national development blueprints and poverty reduction strategy papers and strategies;
- Collect and analyze information on specific needs and concerns arising from climate change impacts and/or the implications of the implementation of prioritized response measures;
- Update the information base on national circumstances;
- Prepare a Draft National Circumstances chapter of the SNC based on outputs of the above activities;
- Conduct consultation of stakeholders on the draft national circumstances chapter, and finalize as an input to the SNC by incorporating comments and feedbacks of stakeholders.

Stream-2: Emission Inventory Stream

The institution will undertake the following activities:

- Mobilize a Core Inventory Team involving sector-specific experts. Develop a work programme for the GHG inventory preparation.

- Familiarize with Revised 1996 IPCC Guidelines for Emission Inventory, the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, and the Good Practice Guidance on Land Use, Land-use Change and Forestry.
- Review the 1990 and 1994 inventories, as provided in INC, taking into consideration data gaps and areas requiring improvement.
- Review and select methodologies, along with identification of tier in the revised IPCC Guidelines, for each of the sectors.
- Identify relevant national institutions from where activity data will be gathered and build their capacity to collect and share their activity data.
- Review reporting instructions for GHG inventory.
- Identify priority GHGs (e.g., CO_2, CH_4, N_2O, CO etc.) and analyze key source categories.
- Collect activity data and nationally available statistics to fill inventory data gaps.
- Review and select appropriate emission factors, and if necessary develop local emission factors.
- Prepare the GHG Inventory for the fiscal years 2000-01 and 2004-05.
- Build national capacity on inventory preparation by offering a short training for relevant institutional representatives.
- Carry out an uncertainty assessment in relation to emission coefficients (factors) and activity data, as well as the reliability of currently available data/statistics.
- Conduct a stakeholder consultation on nationally relevant key emission coefficients and devise cost-effective modalities to generate such data in near future.
- Prepare the Draft National Emission Inventory Report and share with relevant agencies and experts for their comments and reviews.
- Finalize the Inventory report.

Stream-3: Emission Mitigation Stream

The institution will undertake the following activities:

- Review UNCCCSP, ALGAS, INC and other available documents to evaluate mitigation from various activities/ sectors.
- Assess whether and how far the current policy regime has ensured GHG mitigation as an autonomous development.
- Assess potential of the above mitigation measures against the emission inventory. Highlight potential mitigation measures with Adaptation Co-benefits.
- Identify individual mitigation options having potential for win-win scenario.
- Organize training on mitigation options involving public and private sector representatives, specialists and experts.
- Prioritize those options in a national stakeholder consultation/scoping workshop and subsequently, analyze top three win-win options in as much details as possible;
- Identify and analyze institutional/policy barriers for each of the above options and develop/propose mechanisms to remove such barriers.
- Assess whether any of these measures have actual potential to become one or more CDM-able project and share with the DNA for CDM.

- Develop a Draft National Mitigation Strategy, keeping in view the post-Kyoto challenges and opportunities.
- Share the Draft National Mitigation Strategy with relevant stakeholders in an informed roundtable.
- Incorporate the findings of the informed roundtable and finalize the Mitigation Document.

Stream-4: Impacts, Vulnerability, and Adaptation Stream

The institution will undertake the following activities:

- Provide an updated synthesis on Bangladesh's vulnerability to climate change (priority sector-specific).
- Check consistency in national climatological datasets by using globally accepted models (such as Climdex) and consider correction measures as necessary.
- Analyze national trends on climate parameters such as temperature, rainfall, degree of aridity, etc. on the basis of past observed datasets.
- Pull national experiences on adaptation in various sectors (with an in-depth focus on at least one sector) and devise new programmes/ activities to reduce vulnerability at various tiers (micro-level through to macro-level).
- Assess current institutional weaknesses including those in the policy regime, which act as barriers of mainstreaming adaptation, and devise mechanisms to overcome such identified barriers.
- Establish synergies between adaptation to climate change under UNFCCC and other multi-national Environmental Agreements such as United Nations Convention on Biological Diversity (UNCBD) and United Nations Convention on Combating Desertification (UNCCD).
- Synthesize a Draft National Adaptation Strategy, based on NAPA and other documents, and establish linkages among strategic measures and national poverty reduction strategy paper as well as MDGs.
- Conduct at least two National Consultations on the Draft National Adaptation Strategy for awareness creation among stakeholders, particularly among National Focal Points (NFP) and Knowledge Network on Climate Change (KnoCC) members, and endorsement.
- Incorporate reviews and comments of National Focal Points and National Steering Committee (NSC) as well as National Advisory Committee (NAC) members towards finalize the National Adaptation Strategy.

Stream-5: Cross-cutting Stream

The institution will undertake the following activities:

- Identify needs for awareness raising, capacity building, and education programmes on climate change issues.
- Prepare a working paper on climate resilient development with particular focus on Bangladesh.
- Identify technology and financial resources needs to carry out studies and implementation of projects for future climate change related activities.

- Formulate a sustainable institutional mechanism for collection of emission related activity data, institutional advancements made in view of mainstreaming/servicing adaptation, and good practices on adaptation.
- Assess constraints and gaps towards the development of SNC.
- Identify national needs for technology transfer and technology adoption for both mitigation and adaptation.
- Draft a Technical Report on constraints and gaps, and on assessment of technical, capacity and financial needs for institutionalizing the periodic preparation of National Communications in Future.

6. Terms of reference for scoping and implementing the V&A component of the National Communication

These generic terms of reference for the preparation of the V&A studies identify the basic set of activities that the V&A expert/consultant will be responsible for under the supervision of the National Communication's Coordinator. It is important to note that these generic terms of reference do not intend to limit the work of the expert but to guide countries on the general profile of the V&A expert and on the activities generally expected to be carried out.

Profile of the V&A expert/consultant

The V&A expert should be very knowledgeable and with hands-on experiences on V&A issues, have a solid understanding of the gaps and needs for developing/improving vulnerability assessments, and have technical expertise in the formulation of adaptation options. The V&A expert should be able to scope technical studies in the V&A area and design an implementation strategy to carry out the different V&A activities within the framework of the NC. He/She should also have a solid understanding of the institutional arrangements and resources required to carry out the V&A work.

Although the NC project document already provides the framework for the V&A studies, the expert should be able to advise on any adjustments if needed, both at the organizational and technical levels, for a successful implementation of the V&A studies.

Activities

In general, the V&A expert/consultant should be responsible for ensuring that the following set of activities is carried out. Emphasis on different activities will depend on the scope of the work already described in the NC project document and/or on the specific activities the V&A expert would be assigned to.

<u>Policy and institutional issues</u>

1. Identify the key policy issues the V&A study of the SNC project aims to address, e.g.,
    a. to scope the scale of risks associated with projected climate change;
    b. to aid in the identification of priorities for adaptation;
    c. to support the development of a national adaptation strategy.

2. Identify the expected output of the V&A study of the SNC project on the basis of the project document, e.g.,
    a. impacts assessment at the sectoral level for the given priorities identified in the project document;
    b. a national adaptation strategy, including policies, programs and projects.

3. Develop a clear strategy to link the V&A outputs to national development planning. This would include, among others:
    a. assessment of institutional arrangements/stakeholders engagement required to facilitate linking the outcome of the V&A studies to sectoral or national planning;
    b. framework for assessing how the above linkage can be monitored and measured in the short and long terms, for instance through the development of practical indicators.

Technical issues

Scope of the V&A study

4. Elaborate on the scope (geographic, thematic, sectoral coverage, time horizon) of the V&A study, e.g.,
    a. designing a strategy to build on but advance what was done within INC, and while applicable, NAPA project;
    b. elaborating on the scope of studies to address sectors/regions not covered by INC, sectors/regions identified as sensitive/vulnerable to climate change, as per the NC project proposal;
    c. preparing a detailed work plan for each of the study to be carried out, including a strategy to involve the relevant stakeholders, timeline, etc.;
    d. designing a strategy, as applicable, to link the V&A studies with previous and ongoing related projects/activities (e.g., land degradation, biodiversity, international waters.)

Methodological framework

5. Elaborate on the overall methodological framework for the V&A study as per the project document and in consultation with the project coordinator. In doing so, the V&A expert should ensure that:
    a. The proposed methodological framework is the most appropriate given the policy questions to be addressed, the characteristics of the study (e.g., sectoral focus, spatial and temporal scales, stakeholders involved, and data requirement, etc.), and data availability;
    b. In-country expertise required for such a methodological framework is available. If needed, the V&A expert should develop a strategy to address technical capacity gaps. For instance, by exploring the possibility of applying another framework in which more in-country expertise exists, or by designing a training/technical backstopping strategy, etc.

Scenarios development

6. Identify the types of scenarios required to conduct the V&A assessment, e.g., climate, socio-economic, sea level, adaptive capacity, technology, land-use land-cover.

7. Identify the temporal and spatial resolution needed for these scenarios (e.g., national, sub-national, watershed, community, farm level, multi-decadal average, annual, monthly, daily, mean conditions, extreme events, etc.). In doing so, the expert should justify the choices.

8. Develop the strategies for developing such scenarios, e.g., model-based, expert judgment, etc.

In the preparation of the scenarios development strategy, the expert should assess the feasibility of the scenario needs and the methods for developing these scenarios, given the characteristics of the studies, and data availability. For instance, the expert would be expected to advice on alternative options to running regional climate models or other resource intensive and time consuming exercises. The V&A expert would also assess whether there is enough in-country expertise to develop such scenarios and/or identify options to address the needs for additional expertise.

Sectoral assessment (to be considered by each of the sectors to be covered in the V&A study)

9. Elaborate on the methods and tools, as per the project document, chosen to undertake sectoral assessments, e.g., numerical models, elicitation of expert views, stakeholder consultations, focus groups, etc. In doing so, the expert will advise on any adjustments needed to the options identified in the project document.

10. Provide justifications for the selection of the methods/tools considering the research questions, characteristics of the study, and requirements of data and technical expertise of these methods/tools.

11. Assess in-country expertise required to apply the selected methods/tools and prepare training/technical backstopping strategy as required.

12. Develop a strategy to integrate findings from sectoral assessment, as needed. For instance, by applying an integrated model, synthesizing sectoral information, etc.

Technical assistance needs

13. Develop a technical backstopping/training strategy to strengthen the national capacity needed to carry out the different V&A studies, This would include details on the type of support needed (training courses on particular methodological frameworks/tools, guidance material, technical documents and good practice) and the, timeline for such support.

Annex II: Stock taking of relevant works carried out in Bangladesh

The Following books/articles have been found on **Adaptation**

Rationale for integrating adaptation measures in the current policy regime in relation to water resources and associated sectors of Bangladesh has been flagged in the article **Toward integrating adaptation to climate change in current policy regime: perspectives on Bangladesh's water resources and associated sectors**.

Adaptation Options for Managing Water –Related Extreme Events under Climate Change Regime: Bangladesh Perspectives is an article about people-centric anticipatory and planned adaptation measures through institutional facilitation by revising policy to reduce vulnerability to climate change in the water resource sector for Bangladesh.

A Review of the Current Policy Regime in Bangladesh in Relation to Climate Change Adaptation has attempted and suggested issues of each sector must be brought under a holistic policy regime, conducive to address adaptation to climate change in Bangladesh. In order to devise a policy a horizontal integration involving all the relevant policies and their custodian institutions is a prerequisite.

Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans suggested a three – tiered framework. First, key sectoral impacts are identified for adaptation. Second, donor portfolios in Bangladesh are analyzed to climate change concerns. Third, an in-depth analysis is conducted for coastal zones, particularly the coastal mangroves –the Sundarbans-which have been identified as particularly vulnerable to climate change.

Climate Variability and Flood: Observed Coping Mechanisms in Bangladesh recorded coping good examples during 1998 flood.

Climate Variability and Flood: Observed Coping Mechanisms in Bangladesh detailed the lesson learned during the 1998 flood and offer many good examples of coping which will be of great help when flood intensity is likely to increase in Bangladesh as a consequence of climate change.

Managing Climate Change highlighted necessities of adaptation and recommendations have been made for mainstreaming adaptation of Bangladesh.

Adaptability of Bangladesh's Crop Agriculture to Climate Change: Possibilities and Limitations has identified possible actors such as research, training, crop insurance, early warning system, etc for implementing adaptation in agriculture of Bangladesh.

Adaptation to Climate Change in Bangladesh: Future Outlook examined the possibilities, opportunities and challenges of adaptation to climate change for the people of Bangladesh.

Climate Change and Water Resources Management in Bangladesh is a report about the basic strategies identified for accommodating the effects of climate change, which are; Physical measures to reduce drainage congestion (or at least avoid worsening the present situation); Pumped or other natural energy based (wind or tidal current) drainage may be required; Land filling using natural or artificial methods to prevent, or at least reduce, inundation and promote drainage; Increased tree and mangrove planting on accreted lands and in coastal belts; Measures for the improvement of livelihood condition of the coastal people; Encourage more efficient use of water resources.

Lessons Learned from Adapting to Climate Change in Bangladesh is a study report, involved two distinct sets of activities namely (i) analysis of existing information on climate change scenarios and their impacts in a manner that would make them intelligible to policy makers and planners, and (ii) identification of possible adaptation measures and engagement with key stakeholders in each of the vulnerable sectors to determine the feasibility of adopting the potential adaptation measures identified for those sectors.

National Adaptation Programme of Action (NAPA) suggested measures for Bangladesh to address adverse effects of climate change including variability and extreme events based on existing coping mechanisms and practices, and suggested future strategies and coping mechanism.

Mainstreaming adaptation to climate change in coastal Bangladesh by building civil society alliances documented the major contributions of Civil society organizations towards poverty alleviation and disaster reduction in Bangladesh.

The following books/articles have been found on **Adaptation** & **Vulnerability**

Vulnerability and Adaptation Assessments for Bangladesh explored vulnerabilities with regard to climate change, economic development, sea level rise, and watershed development for Bangladesh. Analysis indicates that for Bangladesh the most affected sector in terms of climate change impacts is the water resources.

Climate change, vulnerability and adaptation in Bangladesh set the context including geographical position, geophysical characteristics, population, social development, literacy, natural resources (land, water regime, forests, biodiversity), climate, governance, economy, agriculture, industrial production, foreign trade, export, remittance, inflation rate, foreign development aid and debt, poverty, contribution to climate change, energy sector, emission of greenhouse gases and protection, vulnerability to cc, impact of crop sector & forests, soil salinity & erosion, effects on SLR and finally international negotiation & what needs to be done.

The following books/articles have been found on **Vulnerability**

Vulnerability of Forest Ecosystems of Bangladesh to Climate Change was an attempt to qualitatively analyze the impact of climate change on forest ecosystems including

inland Sal forest, savanna, bamboo bushes in the hilly regions and freshwater swamp forests of Bangladesh.

Water Resources Vulnerability to Climate Change with Special Reference to Inundation focused on Vulnerability assessment of water resources by using MIKEII (a fixed bed hydrodynamic model) considered changes in flooding conditions due to a combination of increased discharge of river water during monsoon period and sea level rise for the two projection years, 2030 and 2075. This model runs along the rivers all over the country except Chittagong and Chittagong Hill Tracts area.

Fish Resources Vulnerability and Adaptation to Climate Change in Bangladesh presented the effects of climate change on fish habitats.

Vulnerability of Bangladesh to Climate Change and Sea Level Rise. Concepts and Tools for Calculating Risk in Integrated Coastal Zone Management. Volume I: Technical Report, Volume II : Institutional Report, Volume III : Summary Report is part of a set of three documents, containing – A technical report provides a systematic framework for developments; An Institutional report with implementing response strategies and A summary report for policy makers, planners and scientists regarding climate change and SLR of Bangladesh.

Assessment of the Vulnerability of Coastal Areas to Climate Change and Sea Level Rise. A Pilot Study of Bangladesh presented the integrated planning for the development of coastal zone, which properly accounts for long range impacts of climate change and SLR, would substantially reduce the vulnerability of these zones to such impacts.

Beach Erosion in the Eastern Coastline of Bangladesh. Vulnerability and Adaptation to Climate Change for Bangladesh showed the land loss due to beach erosion caused by sea level rise in the eastern coastline of Bangladesh was calculated by using Brunn's formula. Estimation was done for three distinct areas: a) Bakkhali river valley b) Southern beach plain c) Nilla-Teknaf plain. In addition Moheskhali channel area was also studied. Bathymetric information was drawn from admiralty charts from which height (depth of water) and width of the continental shelf were determined. Brunn's formula gave the values for shoreline recession for 30 and 75 cm sea level rise for the year 2030 and 75, respectively.
It was found that about 5,800 ha area along the shoreline would be lost in 2030, while 11.200 ha would be recessed in 2075. It was also found that about 13,750 and 252,000 tons of food grain production would be lost in 2030 and 2075, respectively, due to shoreline erosion.

Climate Change Vulnerability of Crop Agriculture is a report based on simulation study conducted to assess the vulnerability of food grain production due to climate change in Bangladesh.

The GFDL model predicted about 17 per cent decline in overall rice production and as high as 61 per cent decline in wheat production compared to the baseline situation. The highest impact would be on wheat followed by Aus variety. CCCM model predicted a significant, but much reduced shortfall in food grain production.

It was found that increase in 4°C temperature would have severe impact on food grain production, especially for wheat production. On the other hand, carbon-di-oxide fertilization would facilitate food grain production. A rise in temperature cause significant decrease in production, some 28 and 68 per cent for rice and wheat, respectively. On the other hand, doubling of atmospheric concentration of CO_2 in combination with a similar rise in temperature would result into an overall 20 per cent rise in rice production and 31 per cent decline in wheat production. It was found that Boro rice would enjoy good harvest under a severe climate change scenario. However, the report also highlighted that the apparent increase in yield of Boro and other crops might be constrained by moisture stress. A 60 per cent moisture stress on top of other climatic cause as high as 32 per cent decline in Boro yield, instead of having an overall 20 per cent net increase. It is feared that moisture stress would be more intense during the dry season, which might force the Bangladeshi farmers to reduce the area for Boro cultivation. Shortfall in food grain production would severely threaten food security of the poverty ridden country.

Assessment of Vulnerability to Sea Level Rise: A Case Study of Bangladesh. Global Climate Change And the Rising Challenge of the Sea. Case Studies of Deltas attempted to briefly highlight some of the likely impacts of a 0.3-meter and a 1.0 meter sea level rise on a number of physical, environmental, and socioeconomic parameters and focuses mainly on the possible response strategies and needs for developing suitable responses.

Project Implementation Plan, Reducing Vulnerability to Climate Change (RVCC) Project identified a large group of extremely vulnerable households in the southwest that has moved from reasonably stable livelihoods to high levels of vulnerability and food insecurity. One problem area that is not currently being addressed by anyone is the disruption of farming systems that may occur as sea levels rise. While sea levels have not yet risen significantly as a result of global warming, the southwest part of Bangladesh is already exhibiting symptoms that may indicate what could appear from rising sea levels. These include water logging, poor drainage through river systems, siltation and saline intrusion.

The following books/articles have been found on **Vulnerability & Impact**

Global Climate Change. Bangladesh Episode launched to address the major issues were inventory of GHGs, vulnerability with respect to climate change and mitigation options for reducing GHG emission. in Bangladesh. The report also deals with users for future research and investigation.

The following books/articles have been found on **Impact**

Impacts of Climate Change on Tropical Cyclones and Storm Surges in Bangladesh analyzed different scenarios of storm surges under two different levels of SLR (0.3m and 1.0m) and temperature increase (2^0C and 4^0C), developed by using a hydrodynamic model of storm surges for the Bay of Bengal to the south of Bangladesh.

Development of Climate Change Scenarios with General Circulation Models has been done for two projection years 2030 and 2075.

The Implications of Climate Change for Bangladesh: A Synthesis is a synthesis of what is known, and needs to be known, about the possible effects of climate and sea-level change on Bangladesh. Global warming and scientific assessment also included.

International Sea level Rise: National Assessment of Effects and Possible Responses for Bangladesh discussed possible consequences of SLR on Bangladesh and its consequences.

Effects of Climate and Sea-Level Changes on the Natural Resources of Bangladesh showed possible impacts of global warming and sea – level rise on Bangladesh's water, agriculture, forestry, fisheries and livestock resources.

Monitoring the Evidence of the Greenhouse effect and its Impact on Bangladesh covered the monitoring of hydrological, geomorphological, infrastructural and land use changes would be expected to occur, in the next 50 years, irrespective of any change in sea –level.

Rising Sea Level and Damming of Rivers: Possible Effects in Egypt and Bangladesh concentrated on two areas that especially vulnerable due to Sea Level Rise: the Nile River delta in Egypt, which has already been dammed, and the delta of the complex Ganges –Brahmaputtra- Meghna River system in Bangladesh, in which river damming has begun.

Climate Change and its Impacts on Water Resources of Bangladesh assess the impacts of climate change variability associated extreme hydrological events on the shared water resources of the South Asian Countries (India, Nepal, Pakistan and Bangladesh).

Intra-Annual and Inter-Annual Variations of Rainfall over Different Regions of Bangladesh analyzed of coherent rainfall pattern for the variations and trends over the four regions (Northwest, Northeast, Southwest and Southeast) of Bangladesh and over the whole country.

Socio-Economic Implications of Climate Change for Bangladesh focused on the main relationships between society & climate and flagged socio-economic vulnerability & resiliency of the country and research needs & a framework for prioritizing options.

Assessment of Food grain production loss due to climate induced enhanced soil salinity estimated the loss of food grain production due to soil salinity intrusion in the coastal districts was estimated under climate change scenarios. The impacts of soil salinity as manifold under the climate change scenarios. It was also found that the estimated crop loss under the severe climate change scenario would be the maximum. Furthermore, more areas would become severely affected by soil salinity and thereby the affected lands would become unsuitable for a number of crops. As a result, the food security of the country would be threatened under climate change.

The modeling was extended to examine crop loss considering adaptation in conjunction with the climate change scenarios. The results show that substantial improvement might be achieved by adapting to increased soil salinity, yet the projected loss would be significant.

The Greenhouse effect and the Coastal Area of Bangladesh: Its People and Economy concentrated more on 'what' is at stake rather than refining estimates of 'how much' of it, and includes the coastal area of Bangladesh: its resources, infrastructure, people and economy; the alternate scenarios under GE; consequences and options are discussed within a policy framework and recommendations.

Impact Assessment of Climate Changes on the Coastal Zone of Bangladesh presented an assessment of impacts of sea level rise on inundation, drainage congestion, salinity intrusion and change of surge height in the coastal zone of Bangladesh. Sea level rise scenarios are based on the recommendations of the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC) and National Adaptation Program of Action (NAPA).

Food Security in the Face of Climate Change, Population Growth, and Resource Constraints: Implications for Bangladesh has examined the nature and magnitude of these (rapid population growth, declining land, etc) threats for the benchmark years of 2030 and 2050. It has been shown that the overall impact of climate change on the production of food grains in Bangladesh would probably be small in 2030. This is due to the strong positive impact of CO_2 fertilization that would compensate for the negative impacts of higher temperature and sea level rise. In 2050, the negative impacts of climate change might become noticeable: production of rice and wheat might drop by 8% and 32%, respectively. However, rice would be less affected by climate change compared to wheat, which is more sensitive to a change in temperature.

Recent Climatic Changes in Bangladesh. SMRC No. 4 is an attempt to study the recent climatic changes in Bangladesh by using the surface climatologically data on monthly and annual mean maximum temperature, minimum temperature and monthly and annual rainfall for the period 1961-90.

The analysis has been performed considering the actual values of maximum temperature, minimum temperature and rainfall. Based on this analysis the rise of 0.40° C and 0.73°C is expected in the annual mean maximum temperature by 2050 and 2100 years respectively whereas the annual mean minimum temperature is likely to rise by 0.04°C and 0.08°C by the year 2050 and 2100 respectively. But the overall annual mean temperature over Bangladesh is likely to increase by 0.22°C and 0.41°C by 2050 and 2100 years respectively. The annual total rainfall over Bangladesh is likely to increase by 295.94 mm and 542.55 mm by 2050 and 2100 years respectively.

Assessing Impacts of Climate Variations on Foodgrain Production in Bangladesh is a report on A simulation study conducted to access the vulnerability of food grain production in Bangladesh to potential climate change. Three GCM scenarios namely baseline, CCCM and GFD3, and sensitivity analyses for 2°C and 4°C temperature rise at three levels of CO_2 (330, 580 and 660 ppmv) was used.

Under CCCM and GFD3 scenarios reductions in aggregated production for the country were 27% and 27%for HYV Aus rice, 7% and 13%for HYV Aman rice, 3% and 7%for HYV Boro rice, and 20% and 61 % for wheat. Maximum reductions in aggregated production for all the crops were noted at 330 ppmv CO_2 with 4°C temperature rise. Maximum increases in aggregated productions for the country of Aus, Aman , Boro rice, and wheat were observed at 660 ppmv level of CO_2 with no temperature rise followed by 580 ppmv CO_2 level. The impact of various water stress scenarios superimposed on different climate change scenarios revealed that under CCCM and GFD3 scenarios the yields of Boro rice declined with the increase in water stress. The percent yield reductions varied from 16% and 64%.

Climate Change and Sea-Level Rise: The Case of the Coast examined the relevant aspects of the human, physical and biological systems of the coastal zone of Bangladesh as they pertain to the climate change issue. Each system was considered in terms of its vulnerability and resilience to present and future stresses. Elements of each coastal zone system that require urgent management attention were identified, as were important areas of uncertainty and future research directions.

Impact of climate change on the production of modern rice in Bangladesh showed climate models combined with crop simulation models to determine the possible effects of climate change on rice production in major agricultural regions of the country.
Sensitivity simulations showed that rice yields decreased significantly with temperature increases in the two sites considered. The rice yields under the GCM climate scenarios alone decreased at both sites. When the physiological CO_2 effects were considered, the yield decreases under the climate change scenarios were offset. If the physiological CO_2 effects are not as positive as simulated in this study, rice production in Bangladesh could be damaged under climate change conditions. A decrease in rice production, combined with the rapidly increasing population would threaten the country's food security.

The Implications of Climate Change on River Discharge in Bangladesh illustrated that Bangladesh has an abundance of water in the monsoon while the country still faces surface water scarcity in the dry season. Irrigated agriculture is highly dependent on dry season surface water availability. On average, annually floods engulf roughly 20% of the area of the country, or about 3.03 mha (Mirza, 2003). In extreme cases, floods may inundate about 70% of Bangladesh, as it occurred during the floods of 1988 and 1998 (Ahmed and Mirza, 2000). Hydrological droughts are very common in the rivers of Bangladesh.

Variations of temperature in Bangladesh documented the thirty years (within 1971-2001) record of monthly average minimum temperature during the months of December and January in winter and monthly average maximum temperature during the months of April and May (Premonsoon) at Dinajpur, Rangpur, Rajshahi, Jessore, Ishurdi, Chuadanga and Srimangal stations are examined by statistical method. These stations were selected because lowest minimum and highest maximum temperature are generally recorded at these stations. It has been found from the study that the temperature trend has increased by 0.012° C/yr in winter except for Rajshahi where the temperature trend is cooling. The temperature trend has increased by 0.013° C/yr in summer except for Chuadanga where the temperature trend is also found cooling in the summer. The average temperature has increased by 0.0125° C/yr within the period of 1971-2001 which is nearer to the global temperature increasing rate.

Modeling the Effects of Climate Change on Flooding in Bangladesh study showed that with climate-change induced increases in peak discharges, Bangladesh may well experience a larger flooded area and a longer flooding period. The simulated results further indicate that more land could be deeply flooded under future climate change. This suggests that substantial changes in the land categories suitable for high-yielding rice varieties could occur and that an enhanced high risk of flooding could reduce cropping intensity, with negative effects on agricultural production in Bangladesh.

Global warming and changes in the probability of occurrence of floods in Bangladesh and implications describe how Global warming caused by the enhanced greenhouse effect is likely to have significant effects on the hydrology and water resources of the GBM basins and might ultimately lead to more serious floods in Bangladesh. The use or climate change scenarios from four general circulation models as input into hydrological models demonstrates substantial increases in mean peak discharges in the GBM rivers. These changes may lead to changes in the occurrence or flooding with certain magnitude. Extreme flooding events will create a number of implications for agriculture flood control and infrastructure in Bangladesh.

Detection of changes due to greenhouse effect: Application of Space and Remote Sensing Technology was an attempt has been made to review the state-of-the-art and knowledge of the phenomenon and its possible impacts on Bangladesh. A brief on the methodology for measurement both by conventional and remote sensing techniques has been given. A few recommendations are put forward to study and combat the greenhouse effect, particularly in the context of Bangladesh.

Climate Change and its Impacts on Bangladesh Floods Over the Past Decades showed the recent climatic variability over Bangladesh and the adjacent areas of India and Nepal and its impact on Bangladesh floods have been studied. The data of precipitation and surface air temperature for the period 1961-1999 for Bangladesh, 1961-1990 for India and 1965-1996 (or as available) for Nepal have been used. The meteorological stations selected for the study covered the major portion of the basin area of the Ganges, Brahmaputra and Meghna (GBM) river system. The time series plots and regression analysis were applied to investigate the long term variability and trends of the pre-monsoon and monsoon period. The analysis showed that the precipitation over the study area has strong inter-annual variability. In the years of strong monsoon activity over the GBM basins inside and outside Bangladesh, severe floods occur in the basin areas. The analysis also shows that the monsoon precipitation has the increasing trends over most parts of Bangladesh and in the upper basin of GBM system adjacent to Bangladesh. The temperature over the Himalayan region has been increasing at a high rate during monsoon season, which is supposed to enhance the melting of snow and glaciers over the Himalayas during this time.

Country Report on the Study on Greenhouse Effect and its impact on the SAARC Region emphasized on summarise findings on climate change in Bangladesh. These were, rising trend in minimum temperatures but no definite trend in maximum temperature; no definite trend in mean seasonal temperature, fluctuation of annual rainfall, and mean monthly frequency and magnitude of heavy rainfalls.

Following books/articles have found on **Mitigation**

Application of Solar Energy for Mitigation of Greenhouse Gases in Bangladesh is an article about potential mitigation options concerning solar-powered technologies. Given the high initial investments for solar photo-voltaic technologies and poor socio-economic conditions of the majority of the population the feasibility of large-scale GHG mitigation by use of solar photo-voltaic systems has found low in Bangladesh. However, recently BRAC is working with Photo-voltaic System under a project.

Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS). Bangladesh suggested to develop a National Climate Change Strategy as required under UNFCCC using the ALGAS outputs as inputs. The study has also suggested time line for implementation.

Bangladesh Least Cost Greenhouse Gas Abatement Strategy is a report on the workshop, aimed at raising awareness among the different stakeholders who are engaged in GHG releasing activities.

The following books/articles have found on **Mitigation & Response**

Bangladesh. In Biagini, B., (ed). Confronting Climate Change: Economic Priorities and Climate Protection in Developing Nations showed an increasing awareness of the

issues involving mitigation and adaptation, as well as the roles of government, NGOs, and the private sectors.

The following books/articles have been found on **Response**

Climate Change in Asia: Bangladesh Country Report covers the impact of climate change in Bangladesh, the available options for adaptation and mitigation measures and response strategies at the national and the regional levels.

Legal Implications of Global Climate Change for Bangladesh examined both the national and international legal contexts that impinge upon decisions relating to climate and sea-level change. This review suggested that there needs to be greater attention paid to ways of implementing international rules within the Bangladesh context in order to ensure coordination of internal policies with international norms.

The following books/articles have been found on **Inventory**

Bangladesh Emissions of Greenhouse Gases –Preliminary Findings presents the inventory of greenhouse gas emission and sinks for Bangladesh, with 1990 as the base year. Hence, the total methane emissions in 1990 were estimated to be 974 Gg CH_4.

Annex III: Endorsement letters

- GEF Operational Focal Point
- UNFCCC Focal Point

SIGNATURE PAGE

Country: Bangladesh

UNDAF Outcome(s)/Indicator(s):
(Link to UNDAF outcome. If no UNDAF, leave blank) *N/A*

Expected Outcome(s)/Indicator (s): Enhanced Government capacity and commitment to meet its obligations under global conventions

(CP outcomes linked to the SRF/MYFF goal and service line)

Expected Output(s)/Indicator(s): Climate change considerations integrated into national development policies, strategies, programmes and projects

(CP outcomes linked to the SRF/MYFF goal and service line)

Implementing partner: Ministry of Environment and Forest (MOEF)
(designated institution/Executing agency)

Other Partners: _____
(formerly implementing agencies)

_____

Programme Period: 2007-2010
Programme Component: Goal 3. Energy /environment for sustainable development; Service Line 3.1.
Project Title: PIMS 2961 Enabling Activities for the Preparation of Bangladesh's Second National Communication to the UNFCCC
Project Code: 00046281
Project Duration: June 2007 - December 2010
Management Arrangement: National Execution

Budget: US$ 405,000 (GEF)
Total budget: US$ 405,000
Allocated resources:

- Government: US$ 20,000 (in kind)
- Regular _____
- Other:*(including in-kind contributions)*
  - Donor _____
  - Donor _____
  - Donor _____

Unfunded budget: _____

Agreed by (Government):

_____

Agreed by (Implementing partner/Executing agency):_____

Agreed by (UNDP):_____