



ECONOMIC
DIALOGUE
ON GREEN
GROWTH



Background Paper on the Determinants of a Green Growth Strategy for Bangladesh

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Abbreviations

| | | | |
|-----------------|--|---------|--|
| ADB | Asian Development Bank | EDDG | Economic Dialogue on Green Growth |
| ADP | Annual Development Programme | EEC | Energy Efficiency and Conservation |
| AZE | Alliance for Zero Extinction | EIA | Environmental Impact Assessment |
| BARC | Bangladesh Agricultural Research Council | EPI | Environment Performance Index |
| BAU | Business as Usual | ERD | Economic Relations Division |
| BBS | Bangladesh Bureau of Statistics | ETP | Effluent Treatment Plant |
| BB | Bangladesh Bank | FAO | Food and Agricultural Organization |
| BCCSAP | Bangladesh Climate Change Strategy and Action Plan | FD | Forest Department |
| BCCRF | Bangladesh Climate Change Resilience Fund | GDP | Gross Domestic Product |
| BCCTF | Bangladesh Climate Change Trust Fund | GCF | Green Climate Fund |
| BDP2100 | Bangladesh Delta Plan 2100 | GED | General Economic Division |
| BEH | Bündnis Entwicklung Hilft | GHG | Greenhouse Gases |
| BERC | Bangladesh Energy Regulatory Commission | GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| BFIDC | Bangladesh Forest Industries Development Corporation | GNI | Gross National Income |
| BFRI | Bangladesh Forest Research Institute | GOB | Government of Bangladesh |
| BIDS | Bangladesh Institute of Development Studies | GTF | Green Transformation Fund |
| BNH | Bangladesh National Herbarium | Ha | Hectare |
| BOD | Biochemical Oxygen Demand | IARC | International Agency for Research on Cancer |
| BPC | Bangladesh Petroleum Corporation | IBFCR | Inclusive Budgeting and Financing for Climate Resilience |
| BSMRAU | Bangabandhu Sheikh Mujibur Rahman Agricultural University | IDCOL | Infrastructure Development Company Limited |
| CCA | Climate Change Adaptation | IEA | International Energy Agency |
| CCKN | Climate Change Knowledge Network | INDC | Intended Nationally Determined Contributions |
| CDMP | Comprehensive Disaster Management Programme | IPCC | Intergovernmental Panel on Climate Change |
| CEGIS | Center for Environmental and Geographic Information Services | IUCN | International Union for the Conservation of Nature |
| CHT | Chittagong Hill Tract Areas | LDCs | Least Developed Countries |
| CIESIN | Center for International Earth Science Information Network | LGD | Local Government Division |
| CO ₂ | Carbon Dioxide | LGI | Local Government Institutions |
| COD | Chemical Oxygen Demand | LGRD | Ministry of Local Government and Rural Development |
| DO | Dissolved Oxygen | MFI | Micro Finance Institutions |
| DDM | Department of Disaster Management | MIE | Multilateral Implementation Entity |
| DoE | Department of Environment | MoDMR | Ministry of Disaster Management and Relief |
| ECA | Ecologically Critical Area | MoEF | Ministry of Environment and Forestry |
| ECA | Environment Conservation Act | MoFL | Ministry of Fisheries and Livestock. |
| ECR | Environmental Conservation Rule | MINLAND | Ministry of Land |
| | | MPEMR | Ministry of Power, Energy & Mineral Resources |
| | | MoWR | Ministry of Water Resources |

| | | | |
|--------|---|---------|--|
| MW | Mega Watt | 7thFYP | Seventh Five Year Plan |
| NAPA | National Adaptation Programmes of Action | SC | South Central |
| NDA | National Designated Authority | SDG | Sustainable Development Goals |
| NEMAP | National Environmental Management Action Plan | SE | South East |
| NEMC | National Environment Management Council | SIDS | Small Island Developing States |
| NEP | National Environment Policy | SLR | Sea Level Rise |
| NFP | National Forest Policy | SMEs | Small and Medium Enterprises |
| NGO | Non-Governmental Organization | SRF | Sundarbans Reserve Forest |
| NIE | National Implementation Entity | SST | Sea Surface Temperature |
| NPDM | National Plan for Disaster Management 2010-15 | UMIC | Upper Middle Income Country |
| NSDS | National Strategy for Sustainable Development | UNDP | United Nations Development Programme |
| NWMP | National Water Management Plan | UNEP | United Nations Environmental Programme |
| O&M- | Operations and Maintenance | UNFCCC | United Nations Framework Convention on Climate Change |
| OECD- | Organization for Economic Cooperation and Development | UNU-EHS | United Nations University-Institute for Environment and Human Security |
| PFM | Public Financial Management | WARPO | Water Resources Planning Organization |
| PKSF | Palli Karma-Sahayak Foundation | WASA | Water and Sewerage Authority |
| PM | Particulate Matter | WUA | Water User Association |
| PPP | Public-Private Partnerships | WHO | World Health Organization |
| Ppt | Parts Per Thousand | YCELP | Yale Center for Environmental Law and Policy |
| PRI | Policy Research Institute | | |
| 6thFYP | Sixth Five Year Plan | | |

Executive Summary

Bangladesh has made important progress in a number of areas relating to environmental management but this has not matched the progress with the growth and poverty reduction agenda. Importantly Bangladesh is yet to adopt formally a “green growth strategy” that fully reconciles the development agenda with the protection of the environment. In the absence of the green growth strategy and associated regulations, policies and institutions, the costs of environmental degradation have grown over time. Additionally, the adverse effects of climate change are mounting and creating substantial downside risks and vulnerabilities. Against the backdrop of this, the government’s preparation of Vision 2041 under which Bangladesh is envisaged to reach World Bank-defined high income threshold by FY2041 and eliminate absolute poverty provides an important opportunity to take a fresh look at the environmental degradation and climate change risks. Unless required regulations, policies and institutional reforms are undertaken to fully reconcile the growth and poverty-reduction agenda with the environmental protection needs, there is a substantial risk that the income and poverty targets of Vision 2041 will not be achieved.

Evidence suggests that environmental degradation and climate change related risks and vulnerabilities have intensified in Bangladesh. According to FAO data, the area under forest cover has fallen significantly owing to rising population and competing demand for land. A global ranking of per capita forest cover prepared by NationaMaster.com for 2005 puts Bangladesh at the near bottom of the list of countries compared (186 out of 192).

Loss of forest land, the degradation of land, sea and river water pollution, indiscriminate filling of water bodies for land acquisition, unsustainable use of ground water and fishery resources in ponds, lakes and rivers, and unsustainable ways of shrimp farming have collectively taken a huge toll on the degradation of the eco-system and consequent loss of bio-diversity. Global ranking of country performance in protecting the natural habitat and biodiversity done by the Yale Center for Environmental Law and Policy (YCELP) and the Center for International Earth Science Information Network (CIESIN) at Columbia University for 2014 puts Bangladesh at 123 out of 176 countries.

Land degradation presents a special challenge for Bangladesh owing to the low per capita availability of land that has been gradually shrinking owing to population growth. According to a 1999 Study by Bangladesh Agricultural Research Council, an estimated 23.6 million hectares of land suffers from various extents of degradation. A 1999 study by the Bangladesh Agricultural Research Council (BARC) estimated the cost of land degradation from water erosion, fertility decline, salinization and acidification at about \$2.3 billion for 1997, which was about 5.2% of 1997 GDP.

Owing to unregulated use of air pollutants, the urban air environment in Bangladesh is amongst the most polluted in the world. The air quality monitored by the World Health Organization

(WHO) ranks Bangladesh as the 4th most air- polluted country out of 202 countries in 2014 when urban pollution is measured in terms of annual mean concentration of fine particulate matter (PM 2.5). Dhaka is the third most air polluted city when compared with top 15 mega cities; only Delhi and Karachi have worse air pollution than Dhaka.

Growing water demand from rapid urbanization and industrialization; rapid depletion of groundwater owing to over-exploitation in many areas; arsenic poisoning of ground water; and a range of water quality issues emerging from industrialization and urbanization all combine to make water management a massive development challenge. Evidence suggests that all water bodies in urban areas including rivers, ponds and lakes are heavily polluted. The ground water of Bangladesh is heavily contaminated with Arsenic. According to a survey report, out of 64 districts 60 are exposed to the arsenic contamination in drinking water.

The urban centers of Bangladesh are highly vulnerable to economic losses emerging from a host of natural disasters and climate change factors. Many urban centers are highly vulnerable to flooding owing to poor drainage, but the most damage in terms of economic losses happen to the Dhaka Metropolitan Area owing to the high population density and huge concentration of physical assets in Dhaka.

Unhindered use of fossil fuel subsidies have contributed to carbon emission and discouraged adoption of clean energy. For example, the penetration of solar power generation is a mere 15 MW as compared with total generation of 13,000 MW. Fossil-fuel based emissions from transport and industrial units as a major contributor to poor air quality.

Climate change exacerbates the environmental damage through several channels of its impact on natural disasters: flooding; cyclones and storm surges; sea- level rise and salinity; river-bank erosion; temperature rise; and waterlogging. Evidence suggests that the adverse effects of climate change are going to intensify without proper global and local measures.

The YCELP-CIESIN composite index, known as the Environmental Performance Index (EPI) is developed on the basis of two core objectives, 9 environmental issues and 20 indicators. The 2014 EPI ranks Bangladesh at 169 among 178 countries. It is obvious that an EPI ranking at the bottom 5% of the 178 countries compared puts Bangladesh at a serious risk of coming in conflict with the challenge of sustainable development.

At the macro-level, indicative projections show that the combined effects of moderate climate change could cause an average GDP growth loss of about 1.3 % per year between FY2017 and FY2041. Environmental degradation lowers growth by reducing the capital stock as well as by lowering the productivity of capital. Unless adequate measures are taken to offset these environmental losses, Bangladesh will not be able to achieve its target to secure upper middle income status by FY2031 and higher income status by FY2041. Growth slowdown also has negative consequences for the growth of employment in productive activities and the progress with

absolute poverty reduction in both forms: extreme and moderate. Accordingly, Bangladesh will also fail to achieve its target to eliminate extreme poverty by FY2031.

Over the years the government's sensitivity to protecting the natural environment has increased. In 2009 the government adopted the Bangladesh Climate Change Strategy and Action Plan (BCCSAP). A draft National Strategy for Sustainable Development (NSDS) was prepared in 2008 that was subsequently updated and broadened to make it consistent with the Sixth Five Year Plan and the Perspective Plan 2010-2020. The NSDS 2010-2021 was adopted in May 2013. An impressive list of environmental laws, regulations and plans covers a wide range of environmental issues including forestry control, air pollution, water pollution, bio-diversity preservation and wetland management. Additional laws, regulations and programmes related to agriculture, land, water management, fisheries and disaster management seek to safeguard environmental concerns in these areas including land degradation, sustainable management of fisheries resources, management of water resources, waste management and disaster risk mitigation.

Despite this array of policies and programmes, the overall environmental management performance in Bangladesh is weak owing to a number of binding constraints.

First, the national sustainable development framework lacks strategic focus. The various laws, regulations and programmes did not emerge as a part of a coordinated and integrated sustainable development strategy. How these laws and regulations interact with each other and how they connect to the overarching goal of ensuring the sustainability of growth and poverty reduction efforts are mostly missing. A major missing link in sustainable development policy making is the use of incentive policies for environmental management. Neither fiscal policy nor pricing policies seek to achieve environmental sustainability. On the contrary, pricing policies of energy heavily subsidize carbon-emitting fossil fuel that have not only created tremendous budgetary burden but also contributed to air pollution.

Second the governance and institutional arrangements for environmental management are weak. The focal environmental management ministry, the Ministry of Environment and Forest (MoEF), and its main agency for environmental management, the Department of Environment, have weak capacities, technical knowledge and staffing owing to very limited resources. Technical data on environment performance is scarce and not regularly monitored to check progress. There is the lack of proper coordination between the MoEF and other ministries that have major input in determining the quality of the state of the environment. Another major institutional weakness is the absence of role of local government institutions (LGIs) in environmental management.

Thirdly, at the heart of the weak performance of environmental protection is the shortage of financial resources. Direct spending by the coordinating ministry responsible for managing the national environmental programmes (MoEF) has been almost negligible (0.05% of GDP in FY2000) and even as late as FY2016, it barely increased (0.06% of GDP). Total public spending

of the core ministries dealing with water and environment-related services and the water and sanitation component of the local government division and local government institutions (LGIs) constitute about 1% of GDP.

The agenda for green growth for Bangladesh is undoubtedly daunting, but not impossible. The 2041 Perspective Plan provides a major opportunity to jump start the green growth agenda and step up the policies, programs, institutional reforms and financing that will allow Bangladesh its growth and poverty agenda with environmental protection.

Macroeconomic Framework: At the macroeconomic level, the growth strategy should recognize environmental protection as an integral part of the macroeconomic framework. The costs of environmental degradation should be explicitly recognised in the Base Scenario of the 2041 Macroeconomic Framework and offsetting measures incorporated in the Policy Scenario.

Adoption of the Delta Plan: One of the highest priorities is to reduce the vulnerability of the population to natural hazards and climate change by implementing the Delta plan 2100 (BDP2100). The BDP2100 includes major policies, investment programmes and institutional reforms that if adopted and implemented properly will address the sources of long-term climate change vulnerability at source thereby reducing the adverse effects of climate change on the population.

Managing Air and Water Pollution: Bangladesh needs to adopt two major principles in the conduct of fiscal policy for better environmental management: (1) beneficiary pays principle; and (2) polluter pays principle. Clean air and clean water are increasingly becoming scarce environmental services in Bangladesh partly because of limited supply but also because of continued degradation by users. Adoption of the polluter pays principle in addition to regulations is absolutely essential to reduce air and water pollution

Removal of Fuel Subsidies: Fossil fuel subsidy reform can support climate change policy and goals. It can be recognized as part of a package of measures to implement ‘Intended Nationally Determined Contributions’ (INDCs), because reform can both reduce emissions and free up resources to invest in sustainable energy systems.

Adoption of Green Tax on Fossil Fuel Consumption: The green tax on fossil fuel can be a tremendously useful policy for integrating environmental considerations in the growth strategy because it not only discourages the consumption of CO₂ emitting fossil fuel but also provides a very attractive resource of revenue generation that can be used for investing in clean energy and other environmental programs. A green tax on fossil fuel is also a very good example of the application of the polluter pays principle.

Taxation of Emission from Industrial Units: Bangladesh has introduced policies for the control of air pollution from brick manufacturing kilns. Policies are also needed to control emission from

other polluting industries. Bangladesh has set air quality standards but monitoring by industrial units is difficult because of the absence of proper testing equipment and database. Once data and monitoring equipment are in place, a system of air pollution taxes could be levied to create incentives for industrialists to adopt clean technology.

Prevention of Surface Water Pollution: Arguably, water pollution owing to inappropriate human and industrial waste disposal is amongst the most pressing environmental challenge in Bangladesh. In addition to laws and regulations that set preventive measures, the polluter pays principle must be applied to create a strong disincentive against illegal disposal of industrial, commercial and household wastes in surface water bodies. At the same time, urgent actions are needed to launch surface water clean-up drive including arrangements to treat drainage / sewerage water before it reaches public water bodies. This effort should continue until the target for 100% compliance is reached.

Policies for Sustainable Management of Forestry Resources: The adoption of the Delta Plan will have major positive implications for sustainable forestry management. A particularly important step is the restoration of the Gorai River that will restore the supply of fresh water to the Sunderban mangroves and clean out the intrusion of saline water. Another important step will be to manage oil spillovers from shipping and dumping of shipping scraps in the Bay of Bengal area. On the policy front, however, the biggest challenge is to control the illegal poaching of forest resources and to prevent the jhum cultivation. This is partly a challenge for ensuring alternative livelihood for the poor settlers in the forest areas, especially in the Sunderban locality and the Chittagong Hill Tracts. But it is also a major challenge for preventing corruption and ensuring good governance.

Strengthening Environmental Coordination: Given the need for a coordinating agency for environmental management across ministries, the government may want to implement the recommendation in the NSDS 2010-2031 to establish the Sustainable Development Monitoring Council (SDMC) and the Sustainable Development Board (SDB).

Strengthening MoEF: In order for MoEF to play its role as the central body for environmental management, its capabilities must be sharply strengthened. Progressive increases in its budget must be provided to reach the target of 0.5% of GDP by FY2041 in order to build up capacity through better staffing, including technical professional staff, establishing a strong digital management information system based on a data bank that gets regularly updated, and regular monitoring and evaluation of environmental compliance. MoEF needs to build strong partnerships with the private sector, the NGOs and the research community in the areas of compliance monitoring and knowledge management, including data gathering and policy research. Regular dialogue with stake-holders including public hearing and participatory policy development will be essential to improve policy implementation and compliance. MoEF needs to regularly come up with Environmental Outlook Report on Bangladesh with updated information on the state of

environment and action plan for achieving milestones to be widely disseminated with different stakeholders.

Decentralization of Environmental Management: Bangladesh can learn from the good- practice international examples of what might be the appropriate division of responsibilities between national and local level environmental agencies. To ensure seamless implementation and avoid conflicting signals, a formal coordinating mechanism between national and local government environmental agencies must be established. The LGIs will need to be participatory in their approach and adopt proper mechanisms for allowing citizen's participation in all local issues including environmental management. A policy initiative needs to be taken to formally engage local government authorities down the Upazila level to involve in the oversight of environmental management linking to development activities.

Strengthening Environmental Concerns in Planning and Budgeting: Integration of environmental concerns in budgetary management requires progress on green public financial management (PFM) in terms of green accounting, procurement and auditing. Project selection must also require full accounting of environmental degradation issues for all investment projects. The full incorporation of the green PFM agenda is a long-term endeavour and will require long-term commitment, resources and efforts. Institutional capacities in Ministries of Finance, Planning and concerned line ministries will have to be substantially strengthened.

Financing Options: Investments needs to ensure the full integration of environmental protection with the growth strategy is estimated at around 3.5% of GDP as compared with only 1% presently. Although environment typically is a public good, the public sector alone cannot finance it. Innovative solutions must be found to ensure a good division of financing options between public and private sectors.

Private Financing Options: There are three main instruments for boosting private financing for environment. First, in a number of areas, such forestry for timber, fisheries, eco-tourism, water supply and waste management, private supply can be encouraged with proper regulatory and pricing policies. Second legal and regulatory policies can be used to encourage proper adoption of measures that include private investment in the protection of the environment. Important examples include adoption of clean air technology in industries, installation of ETPs in industries and private hospitals, and prevention of land degradation through proper farming practices including the banning of jhum cultivation while providing alternative livelihoods to the affected population. Third, the public sector can enter into co-financing arrangements of a range of environmental services through public-private partnerships including partnerships with communities. For example, programs for clean rural water supply and sanitation, cleanup of rural ponds used for bathing and household cleaning, public toilet and public bathing facilities can all be implemented through public subsidy to private suppliers as well as through cost-sharing arrangements with the community.

Public Financing Policies: As noted earlier, presently the budget provides about 1% of GDP for water resource and environmental management. Some 2% of GDP of additional financing will need to come from tax resource mobilization. Bangladesh has one of the lowest tax to GDP ratio in the world and the FY2041 Perspective Plan's Macroeconomic Framework allows for an additional tax/GDP ratio increase of 5% that can accommodate this additional financing. The remaining 0.5% of GDP domestic financing can be mobilized through the application of the beneficiary pays principle (cost recovery) and the polluter pays principle (green taxes). Prospects for cost recovery from the supply of water, sanitation and solid waste management are large. Presently, there is minimal cost recovery from water and sewerage services provided by WASAs and Municipalities. Cost recovery is based on partial recovery of operation cost only. This pricing policy must change, both to mobilize funding for new investments as well as to ensure efficient use of water. The water and sewerage pricing policy must move to full operating cost recovery by FY2020 and 100% capital cost recovery by FY2031.

Regarding green taxes, the combination of fossil fuel tax and pollution tax on industries polluting air and water and households polluting water should generate adequate revenues to finance environmental protection and mass transit programmes such as, BRT, LRT and Metro Rail, for the urban areas. .

Harnessing The Green Climate Fund (GCF): Bangladesh played a leading role in helping set up the GCF with an ambitious agenda to mobilise \$100 billion per year from rich countries by 2020 to finance climate change initiatives in developing countries. As of November 2017, the GCF had raised \$10.3 billion equivalent in pledges from 43 governments. So far the GCF has authorized some \$2.6 billion in projects globally. Bangladesh got only one project approved so far, the Climate Resilient Infrastructure Mainstreaming (CRIM) project, worth \$40 million.

Efforts should also be made to mobilize resources for climate funding from other global programs such as Adaptation Fund, LDCF, CIF, FIP, GEF, REDD, NAMA etc. The government should set up a dedicated wing in the Economic Relations Division (ERD) to effectively coordinate and access funding from these other international climate funds as well.

Determinants of a Green Growth Strategy for Bangladesh

A. Development Context

Rising from the ruins of a war-devastated economy in 1972, Bangladesh has come a long way on the development path with enviable progress on several fronts (Table 1). Buoyed by this positive record, Bangladesh now aspires to secure upper middle income status as measured by the World Bank's Atlas Method by FY2031 and high-income status by FY2041. To this end, the government has embarked upon the formulation of "Vision 2041" that seeks to build on the successes of "Vision 2021" (Government of Bangladesh 2009). The two core development targets of Vision 2041 are: first, to achieve high-income status by FY2041; and second to eliminate the incidence of absolute poverty by the same date. These are highly ambitious targets. But the government believes that Bangladesh has the capacity to do so. Independent assessment by a leading group of Bangladeshi researchers suggest the feasibility of these targets provided rapid progress is made in addressing the major development constraints including institutional reforms and good governance (Ahmed, et. al. 2015).

Table 1: Development Performance Since Independence

| Development Indicator | Base Year | Present |
|-----------------------------------|-----------------------|-----------------------|
| GDP Growth rate (% per year) | 4.0 (1974-80 average) | 6.7 (2013-17 average) |
| Per Capita GNP (\$) | 90 (1975) | 1602 (2017) |
| Poverty (% headcount) | 77-80 (1977) | 24 (2016) |
| Life Expectancy (no. of years) | 46 (1974) | 70 (2013) |
| Infant mortality (per 1000) | 130 (1975) | 31 (2013) |
| Total fertility rate (%) | 5.8 (1970-75) | 2.3 (2011-16) |
| Adult literacy rate (%) | 22 (1974) | 61 (2013) |
| Primary school enrollment (Net %) | 67.5 (1973) | 97.7 (2014) |

Source: Bangladesh Bureau of Statistics

Detailed reviews of the development performance suggest that the progress so far is indeed laudable (Ahmed 2012; 2015; 2017). While advancements have been made on many fronts, there is one important area where progress has stalled. This relates to reconciling the growth and social development strategies with the protection of the natural environment. Over the years the government's sensitivity to protecting the natural environment has increased. The awareness on climate change has grown much more rapidly. Bangladesh is acutely aware of the downside risks of climate change and participates actively in all related international fora. A 2012 report documents the progress made in integrating climate change issues in the development strategy. But it also candidly highlights the main remaining challenges (Government of Bangladesh 2012). As a result, the downside risks to sustained progress with growth and poverty reduction is large. Most of the burden of climate change tends to fall on the poor. There is strong evidence that

poverty and the vulnerability of the population from climate change and associated natural disasters are positively correlated (Ahmed 2017). At the macroeconomic level, indicative projections show that unless the climate change induced environmental degradation and natural disaster risks are fully taken into account and corrective actions are taken, there is a real risk that the long-term growth will slow down to levels that will make it impossible to secure the government's targets of achieving upper middle income status by FY2031 and higher-income status by FY2041. The associated poverty reduction targets of eliminating extreme poverty by FY2031 and absolute poverty by FY2041 will similarly be jeopardized.

International experience suggests that there is no necessary conflict or trade-off between long-term growth, poverty reduction and environmental protection. Indeed, with the adoption of proper strategies and policies they can be positively correlated and made to strengthen each other in a virtuous cycle. In the context of an analytical framework, the long-term sustainability of rapid growth and poverty reduction requires the adoption of a "green growth strategy" (World Bank 2012). As the name implies, this green growth strategy seeks to reconcile growth and poverty reduction targets with the protection of the environment. Bangladesh has made progress integrating environmental concerns in several policy documents including in the national medium-term development plans. In 2009 it adopted the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) (Government of Bangladesh 2009). A draft National Strategy for Sustainable Development (NSDS) was prepared in 2008 that was subsequently updated and broadened to make it consistent with the Sixth Five Year Plan and the Perspective Plan 2010-2020. The NSDS 2010-2021 was adopted in May 2013 (Government of Bangladesh 2013). But a fuller effort to mainstream environmental protection through the adoption of a formal green growth strategy has not yet happened (EDDG 2016). In particular, assessing the full impact of the growth and social development strategies on the natural environment and implementing corrective policy, institutional and governance reforms to offset the adverse effects on the natural environment and thereby ensure the sustainability of development has not happened in a systematic and satisfactory manner.

The ongoing finalization of the draft report of the Delta Plan 2021 will be a major step forward in developing a holistic national plan that integrates environment and climate change vulnerabilities in national development strategy with focus on strategies, policies, programs and institutions (Government of Bangladesh 2017). The formulation of Vision 2041 also provides a major opportunity to address the gap between the growth strategy and the environmental protection strategy with a clear strategic signal from the highest level of policy making that inclusive and sustainable growth requires the mainstreaming of environmental concerns in the national growth strategy for 2041. The document should accordingly identify the policy, institutional and governance implications of the green growth strategy embedded in the Vision 2041.

The main objective of this paper is to identify the main determinants of a green growth strategy for Bangladesh as background input to the formulation of Vision 2041. The paper comprises of

the following: briefly assesses the progress with elements that might contribute to a green growth strategy in Bangladesh along with the economic and social cost of the inadequacy of progress; highlights the main determinants of an adequate green growth strategy and their sectoral implications; identifies the policy and public investment programme implications of the green growth strategy; reviews the financing options for Bangladesh to implement the green growth path; and draws the implications for institutional reforms including planning and budgeting.

B. Sustainable Development Challenges Facing Bangladesh

The positive picture of development performance over the past 45 years painted in Table 1 begs the question what are the sustainability issues facing Bangladesh on the growth and poverty fronts? To answer this question we need to look at several aspects of the evolution of the natural environment and the threats and degradation it has suffered and continues to face as development proceeds in Bangladesh.

Climate Change

The evidence from global experience as well as the experience from Bangladesh suggests that climate change is a real threat to global and national level prosperity (IPCC, 2014, 2013, 2001; Government of Bangladesh 2005, 2009, 2013, 2017). With a population of 160 million crammed into a total space of 144 thousand square kilometers including rivers, Bangladesh at around 1200 people per square kilometer is the most densely populated country in the world, excluding some small island economies with less than 2 million people and the city states of Hong Kong and Singapore (World Development Indicators 2016). Owing to the deltaic formation of the country, the configuration of the rivers and climate change, Bangladesh has been ranked as the 5th most vulnerable country among 171 countries in terms of risks from natural hazards during 2016 (Bündnis Entwicklung Hilft (BEH) and UNU-EHS 2016). Ignoring the 2 small island economies of the Pacific Ocean (Tonga and Vanuatu), the risk rating surges to the 3rd most natural disaster risk prone country in the world, just behind Philippines and Guatemala.

Tidal surge, salinity, flooding, river erosion and cyclones are regular features of Bangladesh. These features pose a continuous challenge to food security for the country and livelihood for a large part of the rural population. Growing risk of sea level rise threatens to engulf a considerable area of the coastal belt that could displace millions of people living in the coastal districts. Sea level rise along with drying up of upstream fresh water flows in rivers in the Southwest are causing problems for agriculture and fresh water supply. Increasing temperature threatens to increase monsoon rains causing river overflow and higher incidence of flooding; temperature rise also threatens to damage crops and contribute to health problems. In parts of the country over-exploitation of ground water with low rain owing to climate change threatens to weaken the surface aquifers that could create water-shortage for irrigation-led agriculture in the Northwest dry zone of Bangladesh. In the urban areas the water tables in many parts have already fallen very low owing to over-exploitation of

ground water and inadequate re-charging. Arsenic contamination threatens many water supply sources. Assuring adequate water supply to a growing urban population and expanding industrial and commercial activities will be a major challenge. Unless these vulnerabilities are managed and addressed comprehensively, Bangladesh faces serious downside risks to food security, the growth momentum and poverty reduction efforts.

Climate Change, Environment and Natural Disaster: Interactions

Being one of the world's most densely populated countries coupled with its deltaic geographical configuration, there is immense risk of environmental degradation. Deforestation and damage to ecosystems in pursuit of livelihood are serious threats. The forest resources in the Sundarbans and the Chittagong Hill Tract Areas (CHT) face risk of over-exploitation. The eco-system is under threat in these areas as well as in the Haor areas of the Sylhet Division. Growing water demand from rapid urbanization and industrialization; rapid depletion of groundwater owing to over-exploitation in many areas; arsenic poisoning of ground water; and a range of water quality issues emerging from industrialization and urbanization all combine to make water management a massive development challenge.

Climate change exacerbates the environmental damage through several channels of its impact on natural disasters:

Flooding: Flood is a recurrent phenomenon of Bangladesh and occurs in almost every year. Three mighty rivers the Ganges, the Brahmaputra and the Meghna meet together in central Bangladesh forming the largest delta of the world. As a consequence, most of the country consists of huge flood plain and delta, of which around 70% of the total area is less than 1 meter above sea level and 10% of the land area is made up of Lakes and Rivers. Bangladesh experiences heavy monsoon rains, especially over the highlands along with frequent tropical storms in coastal region. These events trigger frequent flood occurrence in Bangladesh. On average, an estimated 20-25% of the country becomes inundated due to river spilling and drainage congestion. Extreme situation arises when the three major rivers (Ganges, Brahmaputra, and Meghna) reach their flood peak at the same time. In general, 55-60% of the country is inundated during extreme flood events. Recent evidence shows that the magnitude and frequency of mega floods is increasing as a consequence of climate change. Research suggests that the flood extent will be increased for all areas of the country by mid-century (2050) based on the extreme scenario (Government of Bangladesh 2017).

Cyclones and Storm Surges: Low lying areas of coastal region are highly vulnerable to cyclones, which pose serious threat to lives and properties of the region. Nearly every year, cyclones hit the country's coastal region and a severe cyclone strikes the country every three years, on average. Intensity of cyclonic storm surges as well as the depth and extent of storm surge induced coastal inundation are likely to increase in changing climate through rising sea surface temperature (SST) and sea level (SLR). The IPCC further indicates that future cyclonic storm surges and related

coastal floods in Bangladesh will likely become more severe as future tropical cyclones increase in intensity. In the extreme scenario, the areas vulnerable to inundation depths of more than 1 meter and 3 meters, respectively, would be 14 and 69 percent higher than the baseline scenario. A 10-year-return period cyclone in extreme scenario will be more intense by 2050 and cover 43 percent of the vulnerable area, 17 percent more than the current coverage.

Sea-level Rise (SLR) and Salinity: SLR and associated salinity intrusion are the two most prominent issues in the coastal areas of Bangladesh. The IPCC (2013) predicts SLRs from 0.2 meter to 1 meter for low to high emission scenarios in 2100 for the Bay of Bengal. Analysis indicates that under the extreme scenario flooding extent will increase up to 6% and 8% from the base level (2005) in the central part of the Coastal region by 2050 and 2100 respectively. The west portion of coastal region will face 5% and 6% more coastal flooding than base by 2050 and 2100 respectively (Government of Bangladesh 2017).

The rising sea level impedes fresh water availability in coastal area, expediting intrusion of salinity. Both surface water and soil salinity along the coast may be increased with the rising sea level. Presently, in base (2005) condition, about 10% area is under 1 ppt salinity and 16% under 5 ppt salinity; these areas will increase up to 17.5% (1 ppt) and 24% (5 ppt) by 2050 in the extreme scenario (Government of Bangladesh 2017).

River Bank Erosion: The morphology of the Bangladeshi rivers is highly dynamic and river bank erosion is a regular phenomenon, particularly along the banks of the Jamuna, the Padma and the lower Meghna. The present rate of the Jamuna bank erosion is about 1770 ha per year while bank erosion by Padma River is about 1298 ha per year. Lower Meghna erodes at a rate of 2900 ha per year (Government of Bangladesh 2017).

Temperature Rise: In line with rising global temperatures. Bangladesh has also experienced considerable rise in temperature. While there is debate about the magnitude of the future increase, there is consensus that global warming will increase and so will be the case for Bangladesh. Projections show that temperature will rise in all regions in Bangladesh in the future in a similar trend with the global pattern. The magnitude ranges from 1.4 to 1.9°C for BAU and around 2°C for EXT by 2050. Further rise in temperature is expected in the latter half of the century (Government of Bangladesh 2017).

Droughts: In the drought prone agro-ecological regions of Bangladesh, period of dry days range between 32-48 days, starting from 24 March to 21 May. During this period the temperature also rises to more than 40°C for 5 to 15 days within the same agro-ecological regions. Surface water reduction from diversion of river water upstream in India, inadequate rainfall in the dry season and falling water table from groundwater over-exploitation combined with rising temperature lowers rainfall further in the dry season. This would hurt agriculture in the Barind tract.

Waterlogging: Waterlogging in urban and rural areas pose a serious development challenge. These are caused by a number of factors, including unplanned and ineffective drainage infrastructure, encroachment on wetlands in urban and rural areas and the hampering of tidal flows in the coastal area, especially in the southwest (Satkhira, Jessore, Khulna and Bagerhat) and south east coastal zones (Feni and Noakhali) and in Chandpur.

Impact of Climate Change and Environmental Damage on Social and Economic Vulnerability

The climate change effects can create severe social and economic vulnerability to Bangladesh. A particular challenge is food security. Related risks concern loss of livelihood, poverty and health hazards. Additionally, the displacement of population owing to sea-level rise and river bank erosion and the loss of life and property from storm surges and cyclones could all combine to create major socio-economic vulnerabilities. The climate vulnerabilities are created through adverse effects on a number of sectors.

Climate Risks to Agriculture: The most vulnerable sector is agriculture. The main channels through which climate change hurts agriculture include:

- Climate change, especially through rising temperature, humidity and solar radiation, increases the incidence of insect pests, diseases, and microorganisms.
- Rising temperature reduces yields of high-yielding varieties of rice.
- Farm productivity will fall from increase in soil salinity caused by SLR.
- Agriculture will suffer from the higher incidence of flooding caused by climate change, including from inundation caused by SLR.

Climate Risks to Forest Resources & Ecosystems: The other very vulnerable sectoral effect is on forestry and ecosystems. Many of the anticipated adverse effects of climate change, such as SLR, higher temperatures and an increase in cyclone intensity, will damage the forest resources of the country, put pressure on many climate-sensitive species, and cause increased erosion and deterioration of soil quality in many upland forested areas. The world's largest mangrove forest, the Sundarbans, is extremely vulnerable to climate change. Sea level rise will increase saltwater intrusion and negatively affect the forest.

Forestry cover is threatened by cyclones and human extraction for income. Degradation of wetlands owing to human interference has caused several problems, including extinction and reduction of wildlife, extinction of many indigenous wild and domesticated rice varieties, loss of many indigenous aquatic plants, herbs, shrubs and weeds, loss of natural soil nutrients, loss of natural water reservoirs and of their resultant benefits, increase in the occurrence of flooding and degeneration of wetland based ecosystems, occupations, socio-economic institutions, and cultures.

Land degradation from salinity and water-logging creates problems for agricultural sustainability. In general, sustainable uses of land, water and forest cover are major issues for Bangladesh.

Loss of land, Physical Assets and Health Risks: The main vulnerabilities are:

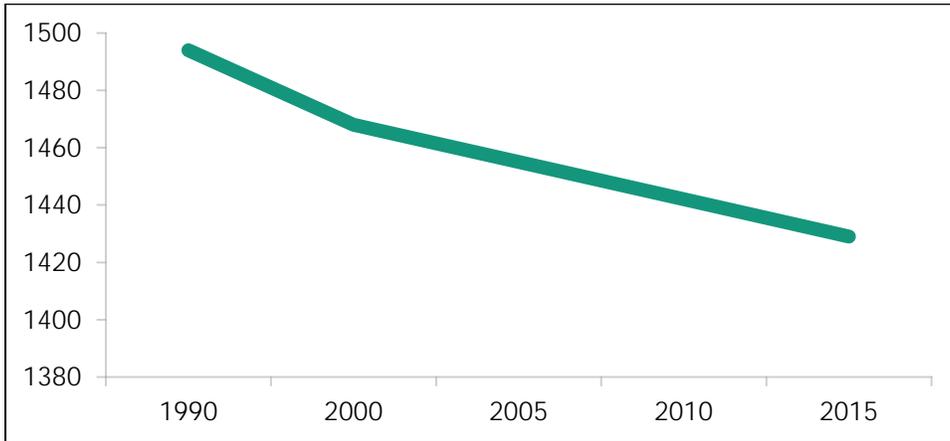
- At a 1 meter SLR a significant part of dryland in Bangladesh will be permanently submerged; the fall in production in all sectors in the economy due to the land quantity shock would lead to a substantial fall in real GDP.
- Climate change and the resultant floods and cyclones will negatively impact on capital stock in construction and infrastructure in Bangladesh.
- Health hazards will also intensify. Water-borne diseases, such as diarrhea and dysentery, and vector-borne diseases, such as malaria and dengue, are climate sensitive. Research suggests that growing morbidity could occur from dengue and malaria.
- Additional health risks emerge from exposure to contaminated water, especially arsenic poisoning. In urban areas poor waste management and polluted water bodies create serious environment-related health concerns.

Degradation of Forest Resources

Based on topography, Bangladesh forestry can broadly be classified into three categories: hill forests; Sal forests; and Mangrove forests. According to FAO (FAO 2000), some 45% of total forestry are hill forests; 44% are Mangrove forests; and the remaining 11% are Sal forests. Roughly 89% is publicly owned and 11% is private forests (village forests/ homesteads). Forests are a valuable natural resource. They provide timber, fuel, ecosystem service as well as carbon storage and delivery of oxygen to the atmosphere. For Bangladesh that is highly vulnerable to natural disasters, forestry provides a valuable natural cover that protects human lives and wealth. Given the importance of forestry resource, it is imperative to preserve its value as a part of sustainable growth strategy.

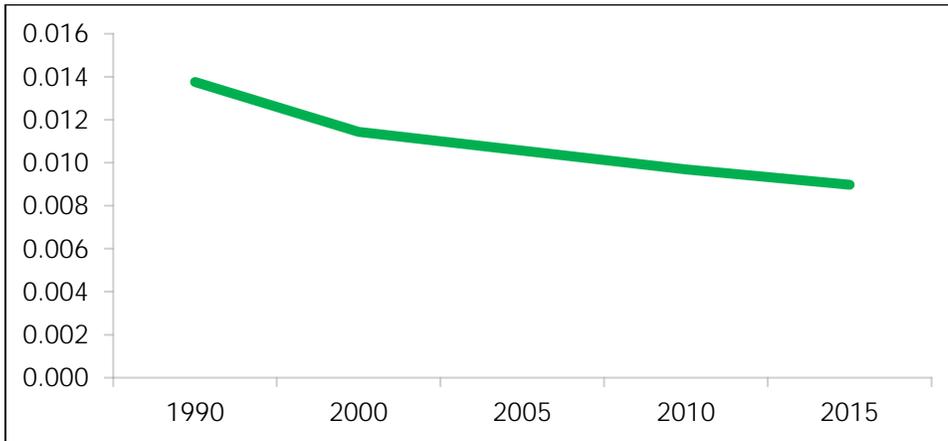
Rapid population growth along with large incidence of rural poverty has taken a huge toll on forestry resources of Bangladesh. Not only the share of forest cover has fallen, the productivity and quality of forest cover in remaining forests has degraded substantially over time. According to FAO data, the area under forest cover has fallen significantly (Figure 1) owing to rising population and competing demand for land. In per capita terms, Bangladesh has merely 0.009 ha forest cover per person that is among the lowest in the world. Per capita forest cover fell by an annual average rate of 2.3% between 1990 and 2015 (Figure 2). A global ranking of per capita forest cover prepared by NationaMaster.com for 2005 puts Bangladesh at the near bottom of the list of countries compared (Figure 3). Thus, Bangladesh is ranked at 186 out of 192 countries. All other South Asian countries perform better than Bangladesh.

Figure 1: Area Under Forest (000 ha)



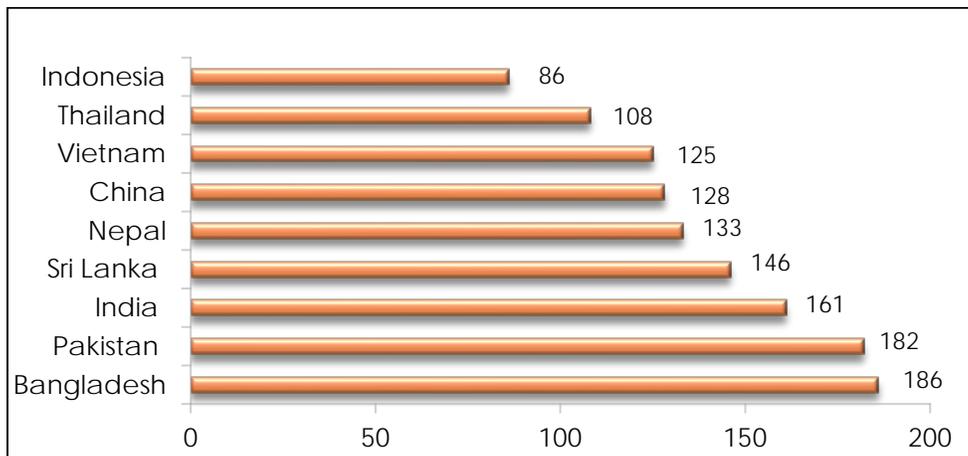
Source: FAO

Figure 2: Per Capita Forest Cover (Ha)



Source: Estimated based on FAO data

Figure 3: Per Capita Forest Cover Rankings (192 countries; 2005)



Source: NationMaster.com

Even more concerning is the loss of forest quality and productivity. Many of the remaining forests have been degraded to poor density forests (FAO 2000; ADB 2004). The toll has been particularly hard on the forests of the Chittagong Hill Tracts. The Reinkhyong reserve forest, the Kassalong reserve forest and the Sangu and Matamuhuri reserves have all faced serious losses. In the world famous Sunderban mangrove forest, in addition to depletion from illegal encroachment, a serious problem is the top-dying of several species of trees. Already 40% of the Sunderban forest is affected by top dying, which is killing the famous Sundri tree from the top down wards (ADB 2004).

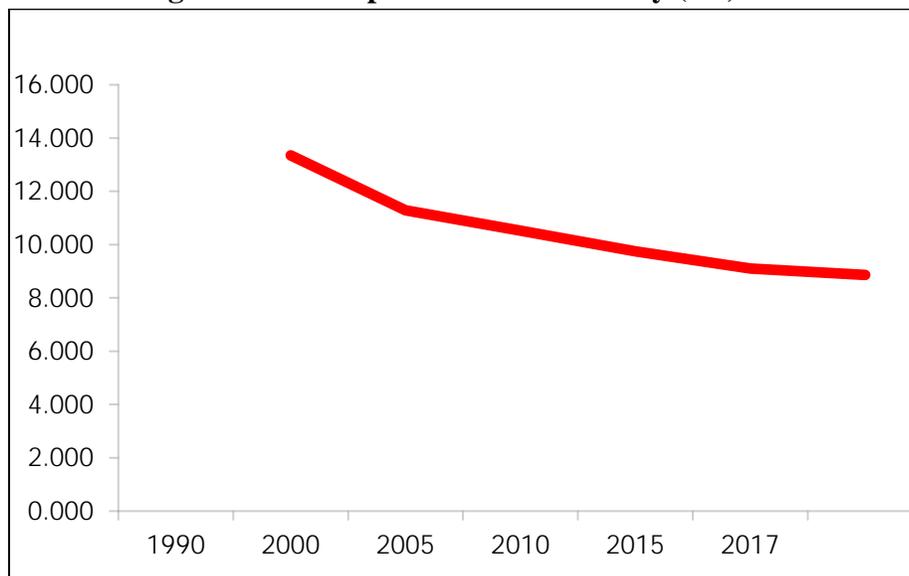
There are several factors that have caused this alarming situation. The most important factor is poverty. A large number of the rural poor are dependent upon forestry resources for livelihood as well as for fuel. A second factor is greed. Illegal poaching through connivance of local forest officers for the production of timber is a major contributor to deforestation. A third factor is land scarcity. Population density in Bangladesh has been increasing in almost geometrical progression. The per capita availability of land is getting scarce by the day. Prices of land are rising progressively all over Bangladesh. Competing demand for land for habitation, cropping, fisheries, animal husbandry, road infrastructure, schooling, hospitals and industrialization have made both forest and agricultural lands increasingly difficult to protect. The degradation of the Sunderban is caused partly by deforestation and illegal poaching but also by the pollution of the mangrove water through seepage of sea water salinity and the oil spillage from ships.

The government has responded to the growing incidence of forest degradation by declaring protected forest areas and by adopting afforestation programmes. But these efforts have not been as effective as necessary to reconcile the competing demands for land. Additionally, the absence of an effective monitoring and evaluation of forestry sector developments using a quantitative framework is a serious limitation. Accurate data on forest cover, types of forest resources, annual losses and regeneration, loss of bio-diversity and preservation are not available that is a major constraint on sound forestry management. A serious rethinking is needed to arrest the further degradation of forest resources in Bangladesh that is essential to ensure the sustainability of long-term development.

Land Degradation

Land degradation is a global phenomenon but it presents a special challenge for Bangladesh owing to the low per capita availability of land that has been gradually shrinking owing to population growth (Figure 4). Degradation of available land adds to the challenge of achieving and sustaining food security for a country where land availability for all economic activities including agriculture is a serious challenge.

Figure 4: Per Capita Land Availability (Ha)

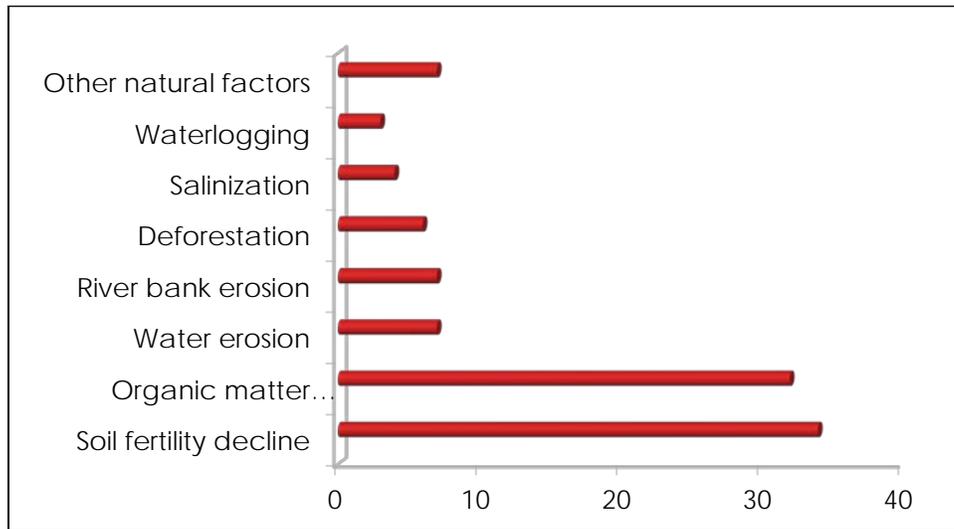


Source: Bangladesh Bureau of Statistics

Soil degradation can happen either from natural processes or due to the land use pattern. The natural factors that lower the productivity of soil include: flooding; salinity encroachment; soil erosion; landslides and water logging. Land use processes that degrade the soil include: cropping pattern; infrastructure construction; industrialization; and solid waste disposal. The major types of land degradation that Bangladesh faces are (i) soil erosion, (ii) water erosion, (iii) river bank erosion, (iv) salinization, (v) sedimentation, (vi) acid sulphate soil, (vii) acidification, (viii) water logging and (ix) depletion of soil fertility.

According to a 1999 Study by Bangladesh Agricultural Research Council, an estimated 23.6 million hectares of land suffers from various extents of degradation. The major determinants of land degradation are illustrated in (Figure 5). As is obvious, human factors are the overwhelmingly large contributors to land degradation in Bangladesh. These include organic matter depletion, soil fertility decline and deforestation. The former two results from various development-related land use including poor farming practices and failure to replenish the nutrient value of the soil. For example, Hossain (2002) reports that as compared with the required organic matter content of more than 3.5% for good soil, in Bangladesh most soils have less than 1.7% and some soils have even less than 1% organic matter. Among the natural factors soil salinity owing to sea water encroachment and water logging are major headaches for land management. The incidence of soil salinity is growing and the projected adverse climate change developments including sea-level rise would seriously increase the spread of soli salinity.

Figure 5: Major Determinants of Land Degradation (%)



Source: BARC 1999 as reported in Rahman (2002) and Solaiman (2014)

Land degradation poses some serious food production and food security sustainability threats. They also pose challenges for livelihood of the poorest of poor farmers many of whom are facing the growing threat of loss of soil productivity from the combination of human and natural factors. Although no recent estimates are available, a 1999 study by the Bangladesh Agricultural Research Council (BARC) estimated the cost of land degradation from water erosion, fertility decline, salinization and acidification at about \$2.3 billion for 1997, which was about 5.2% of 1997 GDP (Hasan and Alam 2006; Soliaman 2014). The cost of land degradation can be severe.

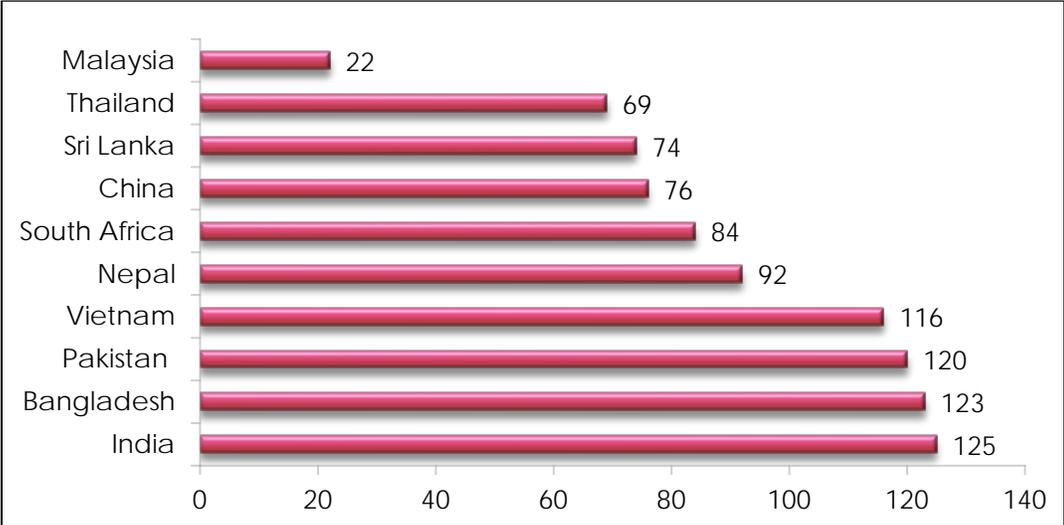
Loss of Bio-Diversity

Biodiversity provides people with basic ecosystem goods and services that include food, fibre, medicine, water and air purification, climate control, cycling of nutrient and control of erosion. So the entire population gets affected by the changes in biodiversity. Directly it impacts on the livelihood of people engaged in agriculture, fisheries and forestry. The growing importance of eco-tourism also makes biodiversity a direct determinant of tourism. Even today some 41% of the Bangladeshi population is engaged in farming, fishery and forestry activities. More than 50% of this population is poor. It is obvious that changes in bio-diversity affect the poor disproportionately.

Bangladesh has a rich heritage of a diverse eco-system that has come under severe threat from development. Loss of forest land, the degradation of land, sea and river water pollution, indiscriminate filling of water bodies for land acquisition, unsustainable use of ground water and fishery resources in ponds, lakes and rivers, and unsustainable ways of shrimp farming have collectively taken a huge toll on the degradation of the eco-system and consequent loss of bio-diversity (UNEP 2001; ADB 2004; Rahman 2015).

Global ranking of country performance in protecting the natural habitat and biodiversity is done by the Yale Center for Environmental Law and Policy (YCELP) and the Center for International Earth Science Information Network (CIESIN) at Columbia University. The biodiversity-Habitat category includes four indicators: Critical Habitat Protection, Terrestrial Protected Areas, Natural Biome Protection, Global Biome Protection and Marine Protected Areas. The Critical Habitat Protection indicator measures the percent of sites identified by the Alliance for Zero Extinction (AZE) that have partial or complete protection. The latest available country ranking is for 2014 done on the basis of 176 countries. There are 9 countries including Germany, Switzerland and Luxembourg that score 100% and are ranked as 1. Iraq is at the bottom of the list with a ranking of 176. The results for a selected number of countries as compared with Bangladesh are shown in Figure 6. Bangladesh performance is ranked at 123, at around 30% higher than the bottom performers. Interestingly it does better than India but poorer than Pakistan, Nepal and Sri Lanka.

Figure 6: Protection of Habitat and Biodiversity Rankings (2014; 176 countries)



Source: (YCELP- CIESIN 2014)

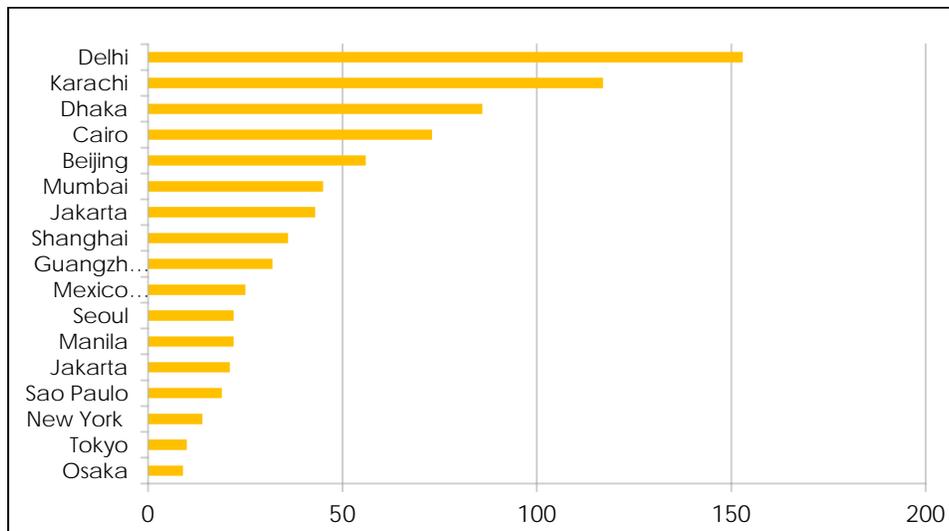
Urban Air Pollution

The availability of clean air is an essential part of the quality of life. Air pollution can have severe negative effects on public health over the longer term including chronic respiratory disease, lung cancer, heart disease, and even damage to the brain, nerves, liver, or kidneys. Children and the elderly are particularly at risk. The World Health Organization (WHO) website-based media sheet (last updated September 2016) notes that outdoor air pollution may have contributed to some 3 million pre-mature death globally in 2012. The WHO also notes research done by The International Agency for Research on Cancer (IARC) indicates that outdoor air pollution contributes to cancer. Additional non-fatal health risks and associated health-care costs can be substantial.

Several factors contribute to outdoor air pollution in Bangladesh. These mainly include: use of fossil fuel for energy; emissions from industrial plants, especially brick kilns; emissions from transport vehicles without adequate emission control mechanisms, and gaseous releases from improper treatment and disposal of solid and liquid wastes.

Available evidence suggests that the urban air environment in Bangladesh is amongst the most polluted in the world. The air quality monitored by the World Health Organization (WHO) ranks Bangladesh as the 4th most air- polluted country out of 202 countries in 2014 when urban pollution is measured in terms of annual mean concentration of fine particulate matter (PM 2.5)¹. The three countries that have higher urban air pollution are Saudi Arabia, Qatar and Egypt. The WHO has also compiled data for 1624 cities from 91 countries for the periods 2008 to 2014. Urban air pollution found in Dhaka puts it at the bottom 2% of the cities compared. The comparison of air quality for world’s top 15 megacities is shown in Figure 7. Dhaka is the third most polluted city in terms of air pollution when compared with top 15 mega cities; only Delhi and Karachi have worse air pollution than Dhaka.

Figure 7: Air Quality, annual average, $\mu\text{g}/\text{m}^3$ PM 2.5



Source: World Health Organization database 2010-2014

Water Quality

The major causes of surface water pollution are related to land based activities, including industrial effluents, agrochemical, faecal pollution, and oil and lube spillage. Since the rivers are frequently

¹ The WHO sets a standard of annual average of 10 for airborne particulate matter (PM) for particles smaller than 2.5 microns (PM 2.5). The PM 2.5 is considered fine particulate matter as opposed to PM 10 that is labeled as gross particulate matter. The presence of annual mean concentration higher than 10 microns per cubic meter ($\mu\text{g}/\text{m}^3$) of fine particulate matter (PM 2.5) is considered unsafe. Values of 88 $\mu\text{g}/\text{m}^3$ found in Bangladesh urban areas for 2014 is an indication of very high air pollution.

used as dumps, overall inland surface water quality drops below the permissible limit of Department of Environment (DoE) standards in the dry season although it improves in the wet/monsoon season.

Industrialization has developed near the major rivers due to the availability of water and easy dumping of effluent owing to the absence of proper regulations. Industrialization got a boost in the early 1980s with the beginning of investment in garments sector. However, most of the industries did not consider the danger created by dumping effluent into rivers without any treatment. This has led to a serious degradation of river water quality over the years and it continues to do so.

Urban area is heavily industrialized with most of the industries located in Dhaka, Narayanganj, Gazipur, Narsingdi, Chittagong, Comilla and Khulna. Buriganga and Turag River are the two major rivers of Dhaka. They are most susceptible to water pollution from industries relating tannery, fabric dyeing and chemical processing, fabric washing, garments, plastic products etc. located on the banks of these two rivers (CEGIS, 2015). Dumping of untreated effluent has caused major degradation of water quality of these rivers. In many places sewerage lines also end up in these rivers carrying sewage and municipal solid waste.

The parameters that are considered to measure water pollution are: the acidic level of water (pH), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). The typical reference values for unpolluted water are: pH: ≤ 7 ; DO: > 3.5 ; BOD₅: < 1 ; and COD: > 200

The pH of Buriganga river is around 7 (Saifullah et al, 2011) and Turag river is between 6.18 and 7.46 (Mobin et al., 2013). The DO varies along the stream of Buriganga. In wet season DO is around 4.9 mg/L and in dry season around 3.7 mg/L. The BOD₅ of Buriganga River is over 25mg/l in most places and it can go up to 38mg/l (Saifullah et al., 2011). Also, the COD level is very low. For Turag river the values are: DO: < 1 ; BOD₅: 5-38; and COD: 9-290. Overall, these data suggest that the waters of the two rivers are severely contaminated.

The city of Narayanganj is located along the Sitalakhya River. It is a major industrial belt and a part of Metropolitan Dhaka. The river Sitalakhya is heavily polluted owing to the dumping of industrial and human wastes. The pollution indicators are: pH: 6.3-8.8; DO: 0-6.2; BOD₅: 2-16; and COD: < 200 .

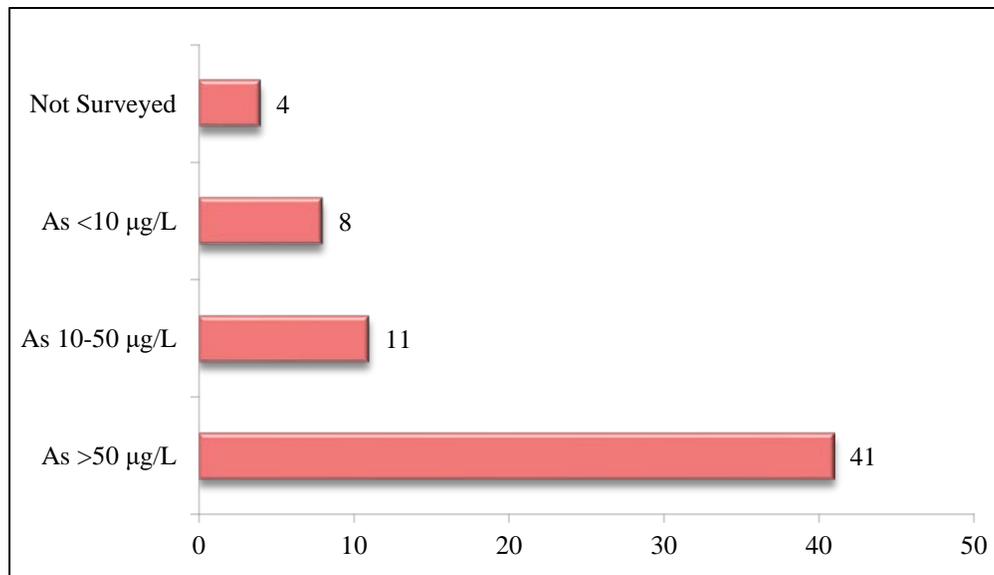
Sylhet is one of the rapidly developing urban areas and is in the hilly portion of the country. Gas based industries have boomed in Sylhet region. Surma and Khushiara are the two main rivers of this region. The urbanization of Sylhet city is a threat for the environmental quality and economic gains of the city dwellers. The pH of river water in this region varies between 6.5 and 8.5, DO value varies between 5.28 mg/L to 6.88 mg/L and BOD ranges from 27.33 mg/L to 44.33 mg/L (Rahman et al., 2013). The water of Surma River is not suitable for drinking purpose.

The main cities of west part of Coastal areas are Kushtia, Jessore, and Khulna. The major rivers of this region are Padma, Madhumati, Chitra, Rupsha, Kaliganga etc. Shrimp culture is the common practice in this area. Usually the water has higher salinity in the areas where shrimp farms are located. The pH of surface water varies from 7.29-7.46 in summer season which is higher than the ground water pH (6.46-6.71). The salinity of the ground water was higher than the surface water both in the summer and in the rainy seasons. The average ground water quality of the area is not good (Haque et al., 2010). Most of the shallow aquifers in this region are found to be saline. Salinity is also a problem for cities located in the central part of Coastal (Barisal, Patuakhali and Bhola). Shrimp culture has intensified salinity at some of the southern districts.

The eastern part of Coastal area is comprised of some of the biggest industrial cities of the country. The major industrialized cities in this region are Chittagong and Comilla. Meghna is one of the major rivers of this region. The other rivers of this region are Gumti, Titas, Haora, Dakatia etc. Ship breaking industry plays a significant role in this region’s environmental quality. Ship dismantling is a reason of concern due to its economic values and environmental hazards. Up to 2.2-2.5 M tons of national steel production comes from the ship breaking industry (Talukder et al., 2015). The ship breaking yard has profound effect in its vicinity area. In the perimeter of the ship breaking yard area, DO level is low (1-5 mg/l) at some points.

The ground water of Bangladesh is heavily contaminated with Arsenic. About 25% of the national population is exposed to arsenic level above 0.05 mg/L (NWMP 2001). According to a survey report (Hossain 2006), out of 64 districts some 60 districts comprising 126,134 km² of Bangladesh are exposed to the arsenic contamination in drinking water (Figure 8).

Figure 8: District-wise Incidence of Arsenic Poisoning



Source: Hossain, 2006

Among the hydrologic regions, the south east (SE) and south central (SC) regions are worst affected by arsenic. The ground water of Comilla (0.17 mg/L), Chandpur (0.13 mg/L), Feni (0.1 mg/L) are well above the standard for Bangladesh which is 0.05 mg/L. Among the districts of central part of Coastal area Faridpur (0.16 mg/L), Madaripur (0.12 mg/L), Barisal (0.18 mg/L) are heavily contaminated with arsenic. Though the south west region is in a relatively better state than the other two regions, Khulna has the arsenic contamination of 0.31 mg/L which is the highest in the country. The arsenic contamination in Haor area is in the range between 0.022 mg/L to 0.09 mg/L. Dhaka's ground water has arsenic contamination of around 0.035 mg/L whereas Narayanganj has an overwhelming amount to 0.176 mg/L of arsenic in water. The eastern portion of Coastal area has overall good quality of ground water in terms of arsenic within ranges between 0.013 mg/L to 0.02 mg/L.

As evident, arsenic poisoning presents a serious threat to health for a large segment of the population. A recent study (Flanagan et al. 2012) reports that over the next 20 years arsenic-related mortality in Bangladesh (1 of every 18 deaths) could lead to a loss of US \$12.5 billion assuming a steady economic growth and an unchanged population exposure to arsenic contamination.

Urban Flooding, Water Logging and Drainage Problem

The urban centers of Bangladesh are highly vulnerable to economic losses emerging from a host of natural disasters and climate change factors (World Bank 2016). Many urban centers are highly vulnerable to flooding, but the most damage in terms of economic losses happen to the Dhaka Metropolitan Area. This is not surprising in view of the high population density and huge concentration of physical assets in Dhaka. The challenge posed to urban flood management in Dhaka, and by implication to other urban centers, is illustrated in Box 1. The most serious threat is flooding due to poor drainage. Apart from the loss of economic wealth from flooding, the traffic mess that happens from frequent flash floods is severe causing huge hardship to the population. Traffic congestion is already a night mare in Dhaka. When flash flooding occurs owing to poor drainage, the chaos it creates is simply alarming.

As illustrated by the summary analysis contained in Box 1, investing in urban flood control and drainage is both a financially and economically viable options with high rates of return on investment. This ought to be one of the highest priority investments for Bangladesh with special focus on Dhaka where the financial loss from flooding is the highest.

Box 1: Coping with Urban Flooding in Metropolitan Dhaka

Flooding from intense rainfall is a recurring phenomenon in Metropolitan Dhaka that contributes to substantial loss of assets and productivity and causes immense miseries to the residents. Unplanned and rapid urbanization has intensified the problem by filling up of low-lying flood plains, rivers, canals, and other water bodies, thereby preventing drainage opportunities. The Bangladesh Delta Plan (Government of Bangladesh 2017) notes that the effects of climate change will further aggravate the flooding problem in Bangladesh including Dhaka owing to a more erratic pattern of monsoon. Consequently, urgent actions are needed to cope with this challenge.

A recent study by Dasgupta et. al. (2015) provides estimates of incremental costs of infrastructure adaptation upto the year 2050. It also identifies the vulnerable populations and infrastructure, quantifies outstanding deficits in addressing current climate-related risks, and estimates the adaptation cost of avoiding further damage due to climate change. The main findings of the study are:

- “The cost of meeting Dhaka’s current adaptation deficit, even without climate change, would total Tk. 2.7 billion, equivalent to just 0.35 percent of the government’s annual development budget expenditure for 2014–15. Of this amount, Central Dhaka would comprise the largest investment, at about Tk. 1.4 billion.
- The added cost of closing the climate change gap would require the other Tk. 1.3 billion.
- Implementing the recommended additional investments can result in significant damage savings for Dhaka, given that the expected damage from flooding would be quite significant for the city overall. For example, if an extreme rainfall event like that of 2004 were to occur in 2050, then, without investment to address the current adaptation deficit, the increased damage caused by climate change would amount to Tk. 2.0 billion; however, it would be reduced significantly (to Tk. 0.9 billion) by investing to close the current adaptation gap.
- Such savings in damage of Tk. 1.1 billion in just one year reveal how quickly the investment of Tk. 2.7 billion in current adaptation deficit can be paid back.”

It is important to note that the above values are all in 2014-15 prices. The study correctly observes that these are conservative estimates because first the intensity of future flooding events could be much more damaging and secondly, the assumption that the existing drainage pipes and connections and khals work as per expected design is too optimistic. The study also assessed the total cumulative damage between 2014 and 2050, using random assignments of 1-year to 100-year storms for each year. The cumulative damage savings would amount to Taka 96.8 billion. The potential rate of return to timely investments in urban flood control and proper drainage is indeed very high. The important points of the study are: first, the need to do a full assessment of the flooding risks in major city centers and; second, the need to take timely actions to prevent much bigger longer-term damages.

Source: Dasgupta, et. al. 2015

Environmental Impact of Oil Subsidies

Bangladesh is an oil importing country. Oil is considered a strategic and politically sensitive commodity in Bangladesh and as such the oil market is heavily controlled. Importation, domestic refining and distribution are managed by a government entity called the Bangladesh Petroleum Corporation (BPC). The BPC is a statutory organization of the Government under the Ministry of Power, Energy & Mineral Resources (MPEMR). It is tasked to supervise, co-ordinate and control all the activities relating to import, storage, marketing and distribution of petroleum products in the country, and to develop/ establish infrastructure facilities to deal in petroleum products. Oil prices are controlled by the government. Faced with resource constraints and growing energy

demand, Bangladesh has selectively deregulated the entry of private enterprises in the energy markets. In 2003 an autonomous regulatory agency, the Bangladesh Energy Regulatory Commission (BERC), was created to regulate private supply and establish proper energy prices including electricity, oil and gas. Better progress has been achieved in streamlining electricity prices compared with oil and gas. The government's control on these two energy sources has remained tight with BERC basically towing the government's directives.

The main political consideration in price setting is the sensitivity of the concerned oil product in terms of the perceived impact on consumer budget. Diesel and kerosene, which are mostly used in transportation, irrigation and rural household lighting, are considered highly sensitive products because of the direct impact on consumer incomes and the fear of feedback on inflationary pressure. The pricing policy therefore provides a subsidy for these products on average. Octane and petrol are used for motor cars mainly by the rich. As such, these are not considered sensitive and are taxed. Furnace oil is primarily used for power generation by the private producers and in manufacturing sector. These are also regarded as sensitive and therefore subsidized.

In addition to adverse macroeconomic effects, fossil fuel subsidies in Bangladesh have a significant negative impact on the environment and climate change, though Bangladesh's carbon footprint is rather low by global standards. Subsidies, through underpricing, create incentives to use fossil fuels, and disincentives to use resources efficiently and to invest in renewable energy (Whitley, S. 2013). While fossil fuel subsidies create profits for industry and keep consumer costs low, they are unequivocally bad for the natural environment. While governments have pledged to avoid dangerous climate change, the approach to fossil fuel support is taking many economies in the other direction. Instead of raising the price of carbon emissions, many are subsidizing firms to over-produce carbons and for consumers to over-use carbon-intensive fuels.

Subsidies to fossil fuels can be considered a barrier to trade and investment in clean-energy technologies. These subsidies have significant implications for private investors and clean-energy project developers, who must compete with artificially low energy prices based on fossil fuels. A number of countries provide subsidies to fossil fuels alongside parallel incentives for clean energy. As a result, a closer examination of the 'policy bundle' or 'package' associated with energy taxation is necessary. It is quite possible that some subsidies could be negating the impact of climate finance and other clean-energy incentives.

Looking forward, as Bangladesh seeks to increase its growth rate to 8-10% per year, its demand for energy, especially electricity, will increase substantially. So, the composition of fuel use in power generation could have significant impacts on CO₂ emissions and the environment. The fuel subsidies could affect the composition of fuel use in power generation, creating disincentives for adoption of clean or renewable power generation options. Recent trends in fuel-use for power generation in Bangladesh point in this direction. At the turn of the century, 90% of power generation in Bangladesh was gas-based. Now, the share has fallen to 63% while the role of furnace

oil based power plants is on the rise (33%). Notwithstanding its high air pollution potential continued subsidization of furnace oil will push further this tendency. Though solar power, a renewable energy source, has earned enormous popularity in recent times with over 4 million households in rural areas adopting this means by April 2016, the overall penetration of solar power generation is miniscule at 15 MW compared to the total 13,000 MW of power generation capacity in the country.

Clearly, the subsidy on furnace oil affects incentives for renewable electricity generation in that they “reduce the costs of fossil fuel-powered electricity generation, impair the cost competitiveness of renewable energy, reinforce the incumbent advantage of fossil fuels within the electricity system and favour investment in fossil fuel-based technologies over renewable alternatives” (Merrill, L. et al, 2015). Removal of subsidies to fossil fuels would then be a first step to ensure that fuel prices reflect the true financial costs of fuels and balance incentives in the use of alternative fuels for power generation.

Overall Environmental Management Performance

The YCELP-CIESIN initiative develops a quantitative measure to assess the overall country performance on environmental management. The composite index, known as the Environmental Performance Index (EPI) is developed on the basis of two core objectives, 9 environmental issues and 20 indicators. These are summarized in Table 2. The composite index is a fairly solid representation of the overall environmental picture of a country. The global comparison puts country performance on a common globally standardized scale. Policy makers may want to pay attention to the various indicators and sub-components included in the index to monitor and strengthen environmental performance.

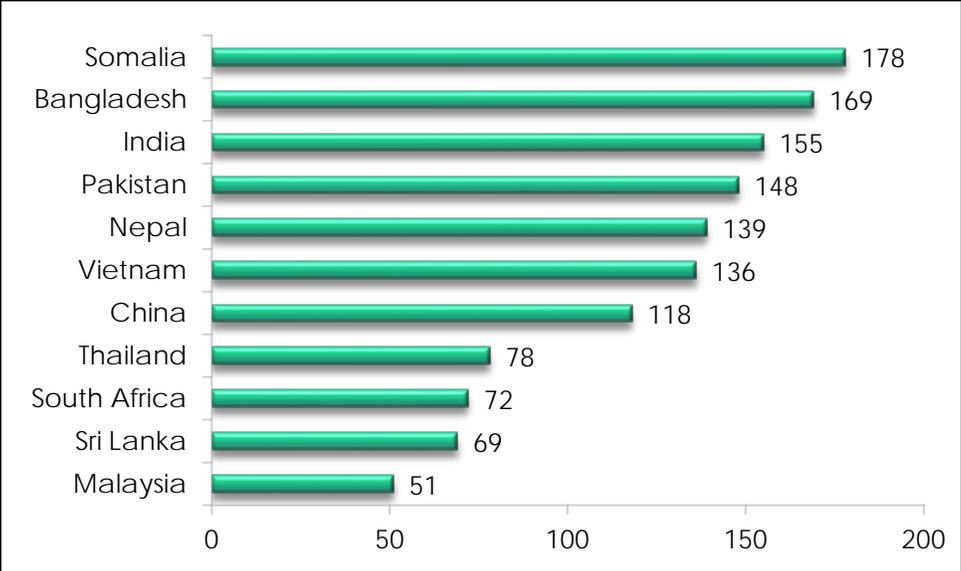
Table 2: YCELP-CIESIN Construction of Environmental Performance Index

| Core objectives (2) | Issues (9) | Indicators (20) |
|-----------------------------|--------------------------|--|
| Environmental Health | | |
| | Health Impacts | Child mortality |
| | Air Quality | Household air quality; air pollution average exposure to PM2.5; air pollution > PM2.5. |
| | Water and Sanitation | access to drinking water; access to sanitation. |
| Ecosystem Vitality | | |
| | Water Resources | Waste water treatment. |
| | Agriculture | Agriculture subsidies; pesticide regulations |
| | Forest | Change in forest cover; Coastal shelf |
| | Fisheries | Fish stock; coastal shelf fishing pressure; |
| | Biodiversity and Habitat | Critical habitat protection; marine protected areas; global biome protection; national biome protection. |
| | Climate and Energy | Trend in CO2 emission per kwh; carbon intensity trend; change in carbon intensity trend. |

Source: YCELP-CIESIN website

The results of the 2014 YCELP-CIESIN EPI are shown in Figure 9. The EPI ranks Bangladesh at 169 among 178 countries. Bangladesh gets a very low score of 25.61 out of 100 as compared with a score of 86.67 for the best performer Switzerland. It is obvious that an EPI ranking at the bottom 5% of the 178 countries compared puts Bangladesh at a serious risk of coming in conflict with the challenge of sustainable development. Although past performance with GDP growth and reduction in poverty is to be celebrated, the evidence suggests that this has come at a serious cost in terms of environmental degradation. Swift actions must be taken to address the main environmental concerns to ensure the sustainability of long-term development.

Figure 9: Environment Performance Index (EPI) 2014



Source: (YCELP- CIESIN 2014)

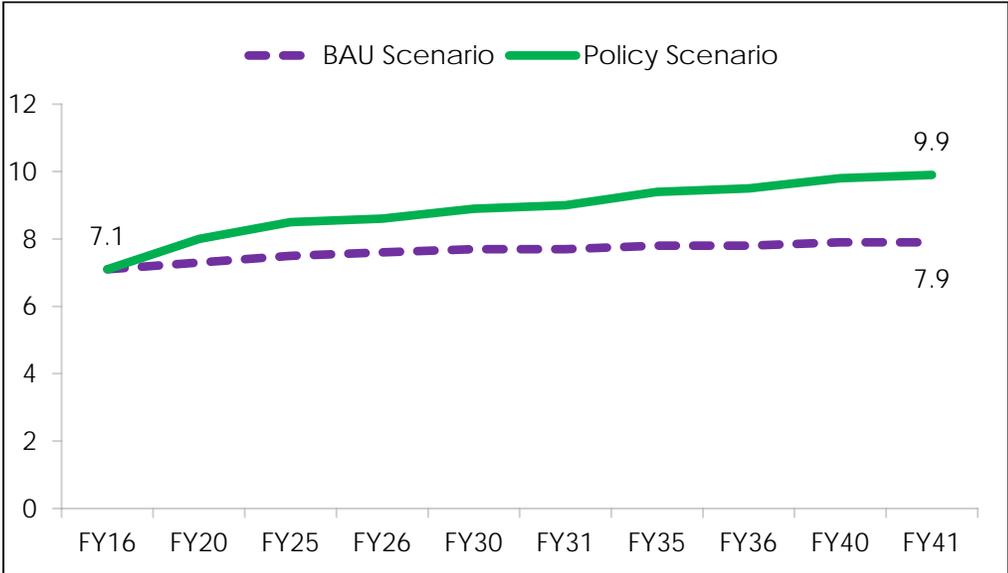
Implications for Growth and Poverty Reduction

While there is a fair amount of debate in Bangladesh about adverse consequences of the environmental degradation and the need to take action, quantitative analysis of how environmental degradation might affect the GDP growth and poverty reduction performance of Bangladesh are scarce. A special effort was made in the context of the macroeconomic framework for the Bangladesh Delta Plan (BPD2100) to develop a quantitative model that specifically allows for the incorporation of the estimated impact of environmental degradation on long-term GDP growth and poverty reduction (Government of Bangladesh 2017). The projections were subsequently updated in the context of the macroeconomic framework for the Vision 2041(PRI 2017).

Macroeconomic Effects: At the macro-level, indicative projections show that the combined effects of moderate climate change could cause an average GDP growth loss of about 1.3 % per year between FY2017 and FY2041. The time paths for the GDP growth in the case of unchecked environmental degradation (termed business as usual or BAU) and for the case where all necessary

actions to protect the environment including the adoption of the Delta Plan are taken (termed the Policy Scenario) are illustrated in Figure 10. Starting from the same base year growth of 7.1% in FY2016, the divergence in the two growth paths grows progressively as the adverse effects of environmental degradation reduces the capital stock as well as the productivity of capital.

Figure 10: Real GDP Growth (% per year)



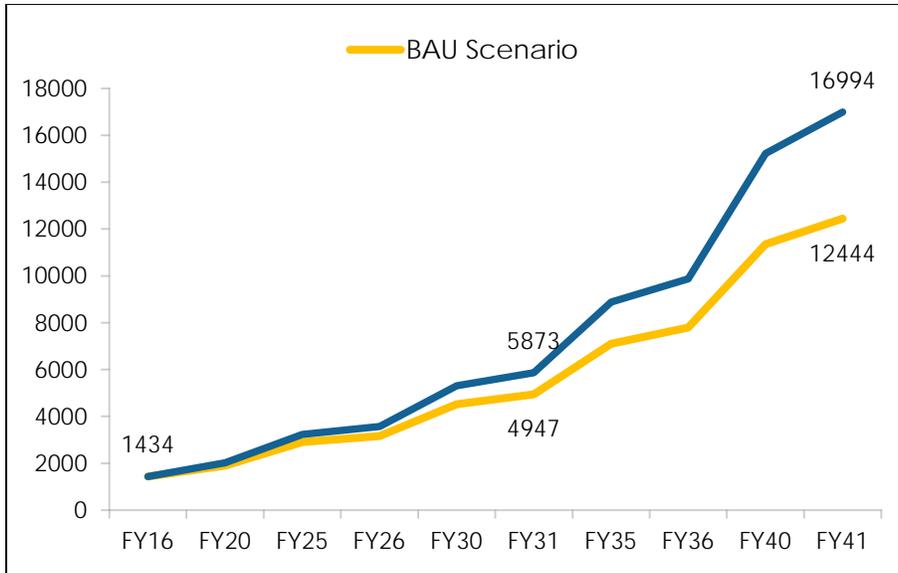
Source PRI (2017)

Most of these adverse effects come from the loss of farm productivity, forest resources and physical capital stock. Social costs in terms of loss of lives, health hazard, loss of livelihood and displacement from home are additional and not taken into account in these projections. Importantly, unless adequate measures are taken to offset these environmental losses, Bangladesh will not be able to achieve its target to secure upper middle income status by FY2031 and higher income status by FY2041. This result is shown in Figure 11. Using World Bank data and projecting forward, the upper middle income threshold for FY2031 is estimated at \$5372 and the high income threshold for FY2041 is estimated at \$16, 618 (PRI 2017). The projections shown in Figure 11 show that Bangladesh will miss both targets under BAU but meet them under Policy Scenario. The cumulative per capita income gap between the two scenarios grows progressively and by FY2041, the income gap will be as high as 27%. The cumulative loss of national income is substantial, which demonstrates the financial cost of environmental degradation.

Growth slowdown in the BAU case also has negative consequences for the growth of employment in productive activities and the progress with absolute poverty reduction in both form: extreme and moderate. The projected poverty outcomes are shown in Figure 12. Under the BAU Scenario Bangladesh will fail to achieve its target to eliminate extreme poverty by FY2031. The incidence of moderate absolute poverty will also remain significant at above 10% even by FY2031. On the other hand, under the Policy Scenario, Bangladesh will eliminate extreme poverty by FY2031 as

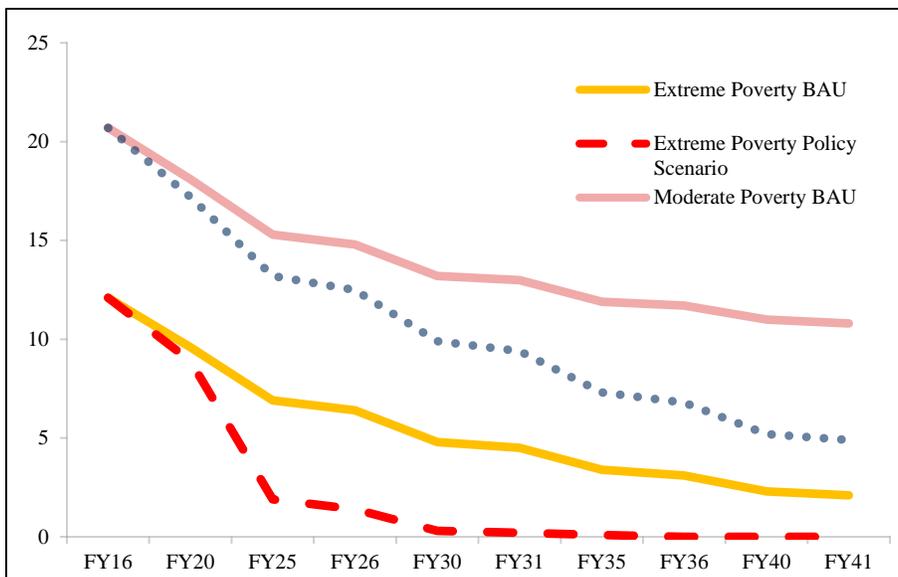
per target and sharply cut back moderate poverty that will fall to below 5% by FY2041. The poverty implications of neglect of environmental degradation can be substantial.

Figure 11: Per Capita GNI (\$)



Source: PRI 2017

Figure 12: Projected Poverty Outcomes



Source: PRI Projections

It is important to note that these indicative quantitative estimates of the costs of environmental degradation are possibly lower limits of the real costs because the social costs of loss of lives and limbs from unmitigated effects of climate change on natural hazards and the health hazards from

air and water pollution are not reflected in these estimates. In financial terms, the health costs alone can be substantial.

C. Government Policies and Governance of Sustainable Development

The Government is very much aware of the growing environmental degradation and the need for policy actions. The global attention to climate change and the risks presented to Bangladesh have caught the imagination of the policy makers at the highest level and there is a much more serious effort now underway to come to grips with this long-term challenge. Bangladesh participates actively in all global discussions on climate change and is a signatory to all related global action programs. Many laws and regulations have been enacted to protect the environment and programs and policies are in place to adapt and mitigate the adverse effects of climate change. However, the results on the ground are less than satisfactory as indicated by the analysis of Section B that shows the much weaker performance of Bangladesh in environmental management relative to other countries. The main constraints are resource limitations and administrative capacity.

Environment Laws, Regulations and Plans

There is no shortage of environmental rules, regulations and plans in Bangladesh. Environmental activism started in Bangladesh right after independence but gathered force in the post 1990 period (Table 3). The momentum further accelerated since 2009 in the wake of global pressure on the growing threat of climate change. Indeed, in many ways Bangladesh is a leader from the developing world in pushing the climate change agenda. Accordingly, much of the policy action and programmes in recent years is focused on implementing the global climate change agenda as relevant to Bangladesh.

The impressive list of environmental laws, regulations and plans covers a wide range of environmental issues including forestry control, air pollution, water pollution, bio-diversity preservation and wetland management. Additional laws, regulations and programmes related to agriculture, land, water management, fisheries and disaster management seek to safeguard environmental concerns in these areas including land degradation, sustainable management of fisheries resources, management of water resources, waste management and disaster risk mitigation. Despite this array of policies and programmes, the overall environmental management performance in Bangladesh is weak because of the absence of strategic focus, implementation capacity constraints and financing problems.

Absence of Strategic Focus

Despite the numerous laws, regulations and programmes, the overall sustainable development framework lacks strategic focus. These laws, regulations and programmes did not emerge as a part of a coordinated and integrated sustainable development strategy. Instead, in most cases they have emerged as ad hoc responses to meet certain international obligations or as a part of a donor

agenda. How these laws and regulations interact with each other and how they connect to the overarching goal of ensuring the sustainability of growth and poverty reduction efforts are mostly missing. Sustainable development as a strategy emerged only very recently and the current strategy reflected in 2013 National Sustainable Development Strategy Paper does not properly integrate sustainable development issues with the mainstream development agenda. The environmental management issues are treated in most cases as free standing rather than as an integrated part of the national development agenda. As an example, the strategy paper misses out on most of the sectoral inter-linkages and lacks an integrated macroeconomic framework that links environmental degradation costs and offsetting measures with investment requirements, capital stock, GDP growth, pricing and fiscal policies.

Table 3: Environmental Protection Laws, Regulations and Plans

| | Laws /Regulations | Year |
|-----|---|------|
| 1. | Water Pollution Control Act | 1973 |
| 2. | Bangladesh Wildlife Preservation Act | 1974 |
| 3. | Environmental Pollution Control Ordinance | 1977 |
| 4. | Forest Amendment Act | 1990 |
| 5. | National Environmental Policy | 1992 |
| 6. | Adoption of the Ramsar Convention (September, 1992) | 1992 |
| 7. | National Forestry Policy | 1994 |
| 8. | The Bangladesh Environment Conservation Act | 1995 |
| 9. | National Environmental Management Action Plan (NEMAP) Management Action Plan (NEMAP) | 1995 |
| 10. | The Bangladesh Environment Conservation Rules | 1997 |
| 11. | Forest Amendment Act | 2000 |
| 12. | The Brick Burning (Control) (Amendment) Act | 2001 |
| 13. | Ozone Depleting Substances (Control) Rules, 2004 | 2004 |
| 14. | The Clean Dhaka Master Plan | 2005 |
| 15. | Noise Pollution (control) Rules | 2005 |
| 16. | National Adaptation Programmes of Action (NAPA) | 2005 |
| 17. | The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) | 2009 |
| 18. | The Bangladesh Climate Change Trust Fund (BCCTF) | 2009 |
| 19. | The Bangladesh Climate Change Trust Fund Act | 2010 |
| 20. | The Bangladesh Climate Change Resilience Fund (BCCRF) | 2010 |
| 21. | The Environment Conservation (Amendment) Act | 2010 |
| 22. | Hazardous Waste and Ship Breaking Waste Management Rules | 2011 |
| 23. | Bangladesh National Biosafety Rules | 2012 |
| 24. | National Sustainable Development Strategy | 2013 |
| 25. | Brick Manufactures and Kiln Establishment Control Act, 2013 | 2014 |
| 26. | National Biodiversity Assessment and Programme of Action 2020 | 2014 |
| 27. | Ozone Depleting Substances (Control) Rules Amendments | 2014 |

Source: Author compilation.

A major missing link in sustainable development policy making is the use of incentive policies for environmental management. Neither fiscal policy nor pricing policies seek to achieve environmental sustainability. For example there no tax and subsidy policies to create disincentives for air and water pollution or incentives to adopt clean air/water measures. Ronald Coase (1960) had long ago expounded the polluter pays principle that has found its place in most countries that have adopted sound environmental management. Bangladesh is yet to adopt this major economic policy for environmental management. On the contrary, pricing policies of energy heavily subsidize carbon-emitting fossil fuel that have not only created tremendous budgetary burden but also contributed to air pollution (PRI 2016). In a market economy where investment and consumption decisions are mostly market determined, the absence of incentive/disincentive policies is a severe gap in sustainable development strategy.

Governance and Institutional Arrangements for Environmental Management

In 1989 the government created the Ministry of Environment and Forestry (MoEF) as the main agency responsible for managing the environment. The MoEF's terms of reference was broadly defined through the National Environment Policy (NEP) 1992 and the National Forest Policy (NFP) 1994. There are 5 specialized entities that support the implementation of the MoEF agenda: the Forest Department (FD), Department of Environment (DoE), Bangladesh Forest Industries Development Corporation (BFIDC), Bangladesh Forest Research Institute (BFRI), and the Bangladesh National Herbarium (BNH). As is obvious from the institutional set up, much of the early focus of MoEF has been on the management of the Forestry resources. Other environmental matters received much less attention (World Bank 2006a).

The DOE has the main institutional responsibility for handling environment related matters. The mandate for the DOE was formalized through the Environment Conservation Act 1995. The DOE undertakes 6 major tasks: (1) monitoring environmental quality; (2) controlling and monitoring industrial pollution; (3) establishing regulations and guidelines for activities affecting the environment; (4) reviewing environmental impact assessments and managing the environmental clearance process; (5) promoting environmental awareness through public information programs; and (6) coordinating the implementation of a number of international protocols and conventions to which Bangladesh is a signatory. These are tough challenges and require considerable resources; technical skills and strategic vision. Unfortunately, experience shows that the capabilities of the DOE and the overall MoEF are very limited (World Bank 2006a; EDGG 2017).

DOE faces several major constraints. First is shortage of funding. Second is the excessive focus on environmental clearances, which itself suffers from several issues and challenges including non-transparent procedures and discretionary influences. Third is the inadequacy of technical skills. Fourth is the large number of donor-driven projects that is uncoordinated and poorly implemented. Fifth is the absence of a quantitative monitoring and evaluation framework.

Technical data on environment performance is scarce and not regularly monitored to check progress.

Another major institutional weakness is the lack of proper coordination between the MoEF and other ministries that have major input in determining the quality of the state of the environment. These include the Ministries of Water, Land, Fisheries and Local Government. Although MoEF has the overall responsibility for managing the environment it has little or no control over the work of these other line ministries. There are no formalized institutional arrangements for coordinating policy making related to the protection of the environment in the context of ensuring the sustainability of development. For example, the MoEF has no say in the setting of fuel prices or prices for water and sanitation. Neither does it have much say in determining the proper tax and subsidy policy for environmental management.

A final major institutional weakness is the absence of role of local government institutions (LGIs) in environmental management (World Bank 2006). This is a reflection of the general pattern of highly centralized governance in Bangladesh and the MoEF is no exception. MoEF lacks technical capacity to come up with policy suggestions to implement the polluters pay principle as enunciated in the 6th Five Year Plan ended in 2015. In the absence of a framework for operationalizing the polluters pay principle a good number of manufacturing industries with high environmental externalities continue to run their business with maximizing profits while risking the environment and public health.

Financing Challenge

At the heart of the weak performance of environmental protection are two binding constraints: the absence of a strategic vision and strategic focus on sustainable development (discussed above) and the shortage of financial resources. The functioning of at least 4 line ministries and one department have a major influence on the natural environment: ministries of environment, water, land, fisheries and the local government division (LGD) of the ministry of Local government and rural development (LGRD). The LGD plays the all-important role of water supply and waste management through the city corporations and the municipalities. The budgetary allocations for these ministries/ department are shown in Table 4.

Table 4: Public Spending by Core Environment-Related Ministries

| Ministry/ LGI | FY2000 | | | FY2010 | | | FY2016 | | |
|-------------------------------------|---------|-------|-------|---------|--------|--------|---------|---------|---------|
| | Current | ADP | Total | Current | ADP | Total | Current | ADP | Total |
| Environment & Forestry | 0.52 | 0.8 | 1.32 | 7.69 | 0.62 | 8.31 | 5.61 | 4 | 9.61 |
| Water | 1.38 | 8.8 | 10.18 | 6.98 | 11.38 | 18.36 | 9.3 | 27.07 | 36.37 |
| Land | 1.48 | 0.6 | 2.08 | 4.16 | 0.88 | 5.04 | 8.83 | 0.87 | 9.7 |
| Forestry & Fisheries | 1.32 | 1.7 | 3.02 | 4.73 | 2.22 | 6.95 | 8.46 | 6.82 | 15.28 |
| LGD (water & sanitation) | -- | 5.37 | 5.37 | 0 | 23.9 | 23.9 | 0 | 51.99 | 51.99 |
| LGI own resources | -- | -- | 5.39 | -- | -- | 23.2 | -- | -- | 41.7 |
| Total | 4.7 | 17.27 | 27.36 | 23.56 | 39 | 85.76 | 32.2 | 90.75 | 164.65 |
| GDP | 2685 | 2685 | 2685 | 7975.4 | 7975.4 | 7975.4 | 17328.6 | 17328.6 | 17328.6 |
| % of GDP | 0.18 | 0.64 | 1.02 | 0.30 | 0.49 | 1.08 | 0.19 | 0.52 | 0.95 |

Source: Ministry of Finance and Bangladesh Bureau of Statistics

Data in Table 4 tell an interesting story. Direct spending by the coordinating ministry responsible for managing the national environmental programmes (MoEF) is very limited. Historically it has been almost negligible (0.05% of GDP in FY2000) and even as late as FY2016, it barely increased (0.06% of GDP). It is hardly surprising that the MoEF has developed very little capacity to prepare proper environmental policies and programmes, ensure their good implementation and monitor progress. This also reflects the relatively low priority assigned by the government to the strategic and coordinated management of environmental programmes and policies with a view to securing the long-term sustainability of growth and poverty reduction.

As against this relative neglect of the MoEF, allocations for other programmes, especially water management, have been relatively more encouraging. In total, public spending of the core ministries dealing with water and environment-related services and the water and sanitation component of the local government division and local government institutions (LGIs) have constituted 1% of GDP. Much of the resources come from spending on water, sewerage and waste management funded by the LGD and own resources of LGIs (0.54% of GDP in FY2016).

Yet, a spending level of 1% of GDP for a country with 160 million plus people, with a huge environmental protection backlog, and rated as the 5th most natural-hazard prone country in the world speaks volume about the relative neglect of the environmental protection agenda. As indicated by the evidence presented in Section C, the cost of environmental degradation is large and public investment in environmental protection will have a high financial, economic and social rate of return. The macroeconomic projections of the Policy Scenario showed that on average Bangladesh could grow by 1.3% of GDP faster per year when the cost of environmental degradation including from climate change is internalized and policies and investment programmes are adopted to address these sources of environmental degradation.

D. 2041 Perspective Plan Vision and Targets for Green Growth Strategy

Given the high cost of environmental degradation, it is natural to expect a major transformation of the Bangladesh environmental sector as an essential part of the strategy to transfer to a high-income economy. Consistent with good practice global experience, the environmental factors will need to be integrated in the underlying growth and poverty reduction strategies to facilitate the journey to upper middle country status by FY2031 and eventually to high-income economy by FY2041. The characteristics of Bangladesh in 2041 will be like the natural environment found in present day high-income economies that are vastly different from the present day Bangladesh.

2041 Vision for the Environmental Management

Specifically, the 2041 Perspective Plan Vision for the environmental sector is to:

- Have an economy where some 80 percent of the population lives urban areas and enjoys a quality of life that is comparable to those found in the present day high income economies of North America, Europe and Asia.
- A physical environment prevails where there is a proper balance between ecology, the natural environment and needs of the population. In particular, the productivity of land is preserved, forest resources are strengthened, bio-diversity is improved and water resources are preserved to prevent flooding and water shortages.
- Cities are normally flood free with proper drainage, modern sewerage, proper waste management and clean air.
- A social structure prevails where there is no incidence of absolute poverty, there are no slums and every household has a basic minimum housing quality.
- Environmental governance is such whereby there is a sound mix of incentives and regulatory policies including the application of polluter pays principle, and a decentralized implementation of environmental policies and programmes.

Core Objectives and Targets

To translate this Vision into monitorable indicators of progress, the targets for the environmental management are shown in Table 5. The objectives and targets are set in a manner that these are consistent with the natural environment found in high income countries. These targets and objectives are necessary to also ensure the sustainability of the Bangladesh growth and poverty reduction targets.

A careful review of Table 5 will show the large magnitude of the environmental management challenge moving forward. This is partly the result of years of neglect of the environmental protection agenda. Yet the ability to address the environmental challenge will also determine the ability to achieve high income target by FY2041. The environmental management agenda and the high-income agenda will need to go hand-in hand.

Table 5: Core Objectives and Targets for Environmental Management

| Objectives / Targets | 2017 Base Year Values | FY2041 Values |
|---|------------------------------|----------------------|
| Share of urban population in total Population (%) | 30 | 80 |
| Urban households with tap water connectivity (%) | 40 | 100 |
| Urban households with water-sealed sanitary toilets (%) | 42 | 100 |
| Urban households with modern sewerage connection (%) | N/A | 100 |
| Rural households with tap water connectivity (%) | 0 | 50 |
| Rural households with water-sealed sanitary toilets (%) | 0 | 50 |
| Rural households with safe sewerage connection | 0 | 100 |
| Incidence of absolute poverty (%) | 24.0 | 0 |
| Percent of household living in slums (UN definition) | 55 | 0 |
| Percent of urban centers with modern waste disposal facilities | N/A | 100 |
| Percent of urban centers with waste water treatment facilities | N/A | 100 |
| Core environmental spending (% of GDP) | 1 | 3.5 |
| Spending by environment coordinating entity (% of GDP) | 0.005 | 0.5 |
| Application of polluter pays principle (% of cases) | 0 | 100 |
| Carbon tax (% of fuel prices) | 0 | 15 |
| Green area Dhaka (square meter per million people) | N/A | 5 |
| Green area other 6 major cities (square meter per million people) | N/A | 12 |
| Urban water bodies compliance with water quality standards (%) | 0 | 100 |
| Air quality (annual average, µg/m ³ PM 2.5) | 86 | 10 |
| Percent of cities flood free with proper drainage | 0 | 100 |
| Percent of land degraded | 18 | 5 |
| Area under forest cover (% of land) | 10 | 15 |
| Protection of Habitat and Biodiversity International Ranking | Bottom 5% | Top 30% |
| Environmental Performance Index International Ranking | Bottom 5% | Top 30% |

Source: GED Projections

E. Determinants of Strategy for Green Growth

The agenda for green growth for Bangladesh is undoubtedly daunting. This is in part the result of years of relative neglect and inadequate progress with policies, institutions and allocation of adequate resources for proper environmental management. The growth and poverty reduction strategies were pursued without proper coordination with the need to preserve the natural environment. The growing intensity of the global climate change and inadequate progress with the global carbon emission agenda is also at fault. While Bangladesh is at the receiving end of the adverse effects of the excessive global carbon emission, it nevertheless cannot sit idle and must do all it can to ensure the sustainability of its growth agenda while continuing to play an active role in the global fight against climate change. As well, it must also do all it can to limit its own use of fossil fuel and take advantage of the global progress with new technology and increase its reliance on renewable clean energy.

Integration of Environmental Considerations in Growth Strategy

A first major strategic consideration in translating the above vision and targets for environmental management into actions is to integrate the environment with the growth agenda. This is the essence of adopting a green growth strategy. Growth and poverty reduction are positively correlated. So, the adoption of green growth strategy will also help poverty reduction (World Bank 2012). However, this correlation is not automatic and policy actions will be necessary to ensure that green growth is also inclusive in allowing the poor to participate effectively in the growth process.

One policy debate is whether there is a trade-off between environmental protection and growth? Critics argue that environmental protection absorbs resources that raise the cost of doing business. This is a rather simplistic view. A careful review will show that the neglect of environment can hurt the long-term development prospects through rising health costs owing to air and water pollution; depleting natural resources that can raise the price of the depleting resource and hurt future production; degradation of land resources that can severely reduce agricultural production and hurt food security; and natural disasters that are intensified by the neglect of climate change and deforestation can cause serious damage to physical capital and land availability.

Green growth strategy can help the growth agenda through a number of ways. In the context of a neo-classical growth model, green growth strategy can help accelerate growth by increasing the availability of capital that substitutes for exhaustible natural resources (e.g. renewable energy; conservation of surface water) and by increasing the productivity of capital (e.g. avoiding land degradation, reducing the adverse effects of natural disasters, cost savings on health, etc). An additional factor that can cause the production possibility frontier to expand out is through technical progress that supports energy conservation, climate and salinity-resistant and water conserving farm technology etc. Investment in environmental protection is similar to investment in physical capital and human capital. They become a third input in the neoclassical production function as natural capital.

The challenge therefore is to identify the policies, institutions and programmes that internalize environment as an integral part of the growth process and not as an add-on to worry about as an international commitment or as a part of a donor commitment. Bangladesh has made a start in this integration process by integrating climate change agenda in the national plans and in the budget. But there is a long way to go.

At the macroeconomic level, the growth strategy should recognize this as an integral part of the macroeconomic framework in the same way as was done for the Delta Plan. The costs of environmental degradation were explicitly recognised in the BAU Scenario and offsetting measures were taken in the Policy Scenario. Similarly, the macroeconomic framework of the 2041 Perspective Plan should allow for the adverse effects of environmental degradation, recognize the

associated costs in terms of loss of growth prospects and slower pace of poverty reduction. In the Policy Scenario compensatory measures should be introduced to offset the adverse effects of environmental degradation.

More importantly, the sectoral policies, programmes and institutions need to internalize the environmental considerations in developing proper sectoral objectives and strategies that are consistent with the targets and objectives of the macroeconomic framework. The core objectives and targets for environmental management for the Perspective Plan 2041 illustrated in Table 5 defines some of the major sectoral objectives. The implications of these for specific sectoral policies, institutions and financing options are developed more fully below.

Implications for Sectoral Policies

Adoption of the Bangladesh Delta Plan: One of the highest priorities is to reduce the vulnerability of the population to natural hazards and climate change. As was noted in Section A, evidence shows that there is positive correlation between vulnerability to natural hazards and poverty in Bangladesh. A whole range of mitigating measures are needed including better management of water resources, better land management, better forestry management and preservation of biodiversity.

Fortunately, the government recognizes the challenge to better manage in a holistic manner the national water resources and the associated linkages with climate change, environment, biodiversity and land management and is in the process of developing the Delta plan 2100 (BDP2100). The BDP2100 seeks to integrate the short-to-medium-term aspirations of Bangladesh to achieve upper middle income (UMIC) status and eliminate extreme poverty by FY2031 with the longer-term challenges of sustainable management of water, ecology, environment and land resources (Government of Bangladesh 2017). The BDP2100 includes major policies, investment programmes and institutional reforms that if adopted and implemented properly will address the sources of long-term climate change vulnerability at source thereby reducing the adverse effects of climate change on the population.

Macroeconomic projections show that the adoption of the Delta Plan will allow Bangladesh to offset the projected long-term loss of 1.3% of GDP per year owing to climate change and enable the 8% GDP growth path that is necessary to achieve UMIC status by 2031. By focusing attention to the vulnerable districts, BDP2100 also allows a sharp reduction in poverty (Government of Bangladesh 2017).

The BDP2100 also identifies major investment programmes, policy and institutional reforms. Some of the important investment programmes include: sharply improved polder management; a range of flood control programmes including in the haor areas; Ganges Barrage Project; Brahmaputra Barrage Project, the Gorai River Restoration Project; River Dredging and River Training projects; and projects to restore the ecological balance of major lakes (major haor, baor

and jheels). These critical projects will fundamentally alter some of the major sources of vulnerabilities including better flood control in the plains and the haor areas; better availability of river and rain-based fresh surface water; better control of river bank erosion and river flooding, better control of sea water intrusion and salinity reduction; prevention of damage to Sunderban owing to sea water intrusion; and protecting the natural habitats of birds, flora and fauna through better protection of the lakes.

Important policy reforms consist of increasing public spending on water resources from 0.8% of GDP now to 2% of GDP by FY2020; increasing O&M spending from a negligible amount now to at least 0.5% of GDP by FY2020; provide incentives to encourage public-private partnerships (PPP) in water supply, water transport, river dredging and sanitation; strengthen dialogue with India on better and more equitable sharing of upstream water including joint projects that yield multiple benefits so that water sharing is not a zero sum game.

Major institutional reforms include: establishment of the Delta Act, the Delta Commission and the Delta Fund that will provide the institutional framework for holistic planning, budgeting, project selection, research and monitoring and evaluation of water and water-related projects; and the establishment of the WUA at the local level that will have primary responsibility for implementing all local level water projects including O&M. Following the Dutch model, the government will introduce beneficiary-pays-principle for all local water projects and O&M so that over time the water resource and related hazard management become largely beneficiary managed and financed and therefore fully sustainable.

The finalization of the Delta Plan and its full adoption is one of the highest priority reform for adopting a green growth strategy in Bangladesh.

Managing Air and Water Pollution: The adoption of the Delta Plan will also have positive effects on water quality by improving access of the population to clean water and sanitation and better management of solid wastes. But a fuller management of this agenda will require immediate attention to the adoption of proper pricing policies for water and fossil fuel. More generally, this calls for an integration of fiscal policies with environmental management. In particular, Bangladesh needs to adopt two major principles in the conduct of fiscal policy for better environmental management: (1) beneficiary pays principle; and (2) polluter pays principle. The beneficiary pays principle is particularly relevant both for generating resources to ensure sustainable supply of these services. As noted in Table 5, there is a huge backlog of unmet demand for piped water and safe sewerage services in both urban and rural areas. The adoption of the Delta Plan will address this gap. The beneficiary pays principle is discussed more fully under financing options. The polluter pays principle is most relevant to internalize the environmental degradation of two major and scarce public goods: clean air and clean water.

The adoption of polluter pays principle is absolutely essential to improve air quality and water quality. Clean air and clean water are increasingly becoming scarce environmental services in Bangladesh partly because of limited supply but also because of continued degradation by users. Some of the major sources of air pollution are fossil fuel using vehicles, power plants and industrial units. As noted in Section B, fossil fuel is subsidized in Bangladesh. This is one major example of inconsistency of the government's growth strategy and environmental protection that needs urgent policy attention.

Removal of Fuel Subsidies: Fossil fuel subsidy reform can support climate change policy and goals (Merrill, L. et al, 2015). It can be recognized as part of a package of measures to implement 'Intended Nationally Determined Contributions' (INDCs), because reform can both reduce emissions and free up resources to invest in sustainable energy systems. The IEA (2015) points to fossil fuel subsidy reform as one of five key measures to help bridge the gap between current commitments and the emissions reductions needed from the energy sector to stay within the 2 °C degrees warming target. The IEA encourages the reform of consumer subsidies by 2030 (IEA, 2015). A recent study of 20 countries including Bangladesh finds that a phasing out of fossil fuel subsidy by 2020 leads to an average national carbon emissions reduction of between 6 and 11%. Additionally, if a part of fiscal savings is used to improve energy efficiency and invest in renewable energy, the reduction in CO₂ emission could average about 18%. In the case of Bangladesh, the CO₂ reduction estimates are 8.7% from removal of subsidies and 13.6% when gains from energy efficiency and renewable energy investments are taken into account (Merrill et.al. 2015).

Most GHG emission reduction policies cost government resources to implement (e.g., renewable and energy efficiency policies). Very few climate policies actually save government funds at the same time as effectively removing CO₂ from the atmosphere. Fossil fuel subsidies can be thought of as a "negative" form of carbon pricing, and their removal is a necessary step toward policies that seek to correct carbon pricing, such as carbon taxes or emissions trading systems. Indeed, the IEA (2015) calculates that currently 13% of all energy-related CO₂ emissions are linked to an average subsidy of US\$ 115 per tonne of CO₂ emitted. On the other hand only 11% of global energy related CO₂ emissions are subject to carbon pricing, with an average cost of only US\$ 7 per tonne of CO₂.

Adoption of Green Tax on the Consumption of Fossil Fuel: The removal of subsidy on fossil fuel is a first step. A second step is to introduce a green tax on fossil fuel consumption. The green tax has been adopted by a large number of countries. India also introduced a green tax on fossil fuel in 2015 (PRI 2015). The green tax on fossil fuel is a tremendously useful policy for integrating environmental considerations in the growth strategy because it not only discourages the consumption of CO₂ emitting fossil fuel but also provides a very attractive resource of revenue generation that can be used for investing in clean energy and other environmental programs. A green tax on fossil fuel is also a very good example of the application of the polluter pays principle.

Taxation of Emission from Industrial Units: This is the classic case for the application of the polluter pays principle. A huge amount of air and climate pollutants are emitted by industrial units, especially the brick manufacturing kilns. The usual practice in OECD countries to control industrial air pollution is to use a combination of laws, regulations, technology and taxation. Industrial air pollution control policies are just emerging in Bangladesh. The first policy initiative is regarding the control of air pollution from brick manufacturing kilns. The Brick Manufacturers and Kiln Establishment Control Act 2013 was enacted in July 2014 to prohibit the use of older heavily-polluting Kiln technology and replace it with new cleaner technologies. This is an important policy initiative. Policies are also needed to control emission from other polluting industries like cement, steel and rerolling, plastic, polyethylene, battery, foundry, etc. and sources from economic activities. The adoption of clean technology requires consultation and cooperation with the industrial enterprises. Bangladesh has set air quality standards but monitoring by industrial units is difficult because of the absence of proper testing equipment and database. This problem will need to be addressed urgently with technical assistance from international donor agencies. Japan in particular has an excellent track record of reducing air pollution at the same time that its industrialization base has deepened. Once data and monitoring equipment are in place, a system of air pollution taxes could be levied to create incentives for industrialists to adopt clean technology. Bangladesh is way behind on this front. But since it aspires to reach high income status by FY2041, it cannot afford to lag behind too much on the monitoring and control of industrial air pollution.

Prevention of Surface Water Pollution: A major source of surface water pollution is the uncontrolled disposal of industrial and household liquid and solid wastes in adjacent rivers, lakes and ponds. As noted earlier, many of the industrial plants like textiles dyeing, washing and power plants are located near river or lake to take advantage of access to water. This advantage has unfortunately also resulted into heavy pollution of these sources of surface water owing to uncontrolled dumping of industrial wastes into these water bodies. Similarly, much of urban household wastes end up in adjacent lakes or ponds. Importantly, urban open drains and underground sewerage drains also end up in lakes and ponds untreated. The environmental clearance process for new business established under the Environmental Conservation Act 1995 and Environmental Conservation Rule 1997 requires new enterprises that are considered as heavy pollutants to establish Effluent Treatment Plant. The Government has also banned the use of polythene shopping bags that end up in water bodies. These are important first steps but not adequate. Furthermore, the application of ETP policy is uneven.

As an example, the leather tanning industry created huge water pollution problem for the Buriganga River at the Hazaribagh Tannery Area. After years of lobbying by NGOs and actions by the Court System, the government finally agreed to relocate the Tannery industry to Savar with its dedicated Central Effluent Treatment Plant. Yet, the evidence shows that the Central Effluent Treatment Facility does not work properly and there is a risk that the adjacent Turag River may feel the brunt of the tannery waste pollution.

Arguably, water pollution owing to inappropriate waste disposal is amongst the most pressing environmental challenge in Bangladesh. In addition to laws and regulations that set preventive measures, the polluter pays principle must be applied to create a strong disincentive against illegal disposal of industrial, commercial and household wastes in surface water bodies. At the same time, urgent actions are needed to launch surface water clean- up drive including arrangements to treat drainage / sewerage water before it reaches public water bodies. This effort should continue until the target for 100% compliance set in Table 5 is reached.

Policies for Sustainable Management of Forestry Resources: The adoption of the Delta Plan will have major positive implications for sustainable forestry management. A particularly important step is the restoration of the Gorai River that will restore the supply of fresh water to the Sunderban mangroves and clean out the intrusion of saline water. Another important step will be to manage oil spillovers from shipping and dumping of shipping scraps in the Bay of Bengal area. On the policy front, however, the biggest challenge is to control the illegal poaching of forest resources and to prevent the jhum cultivation. This is partly a challenge for ensuring alternative livelihood for the poor settlers in the forest areas, especially in the Sunderban locality and the Chittagong Hill Tracts. But it is also a major challenge for preventing corruption and ensuring good governance. It is well known that collusion between forest officers and the logging business is a huge factor behind illegal poaching. A related issue is the lack of adequate data on forest resources that prevents effective monitoring and evaluation. It not only makes it difficult to assess the adequacy of forest resources but also makes it difficult to control illegal poaching and hold forest officers accountable.

Once an adequate database is established that allows effective monitoring of forest resources, the planning of forest investments based on demand and supply forecasts and the consistency of these with needs for sustainable use can be done. In addition to public and private investments in new forest areas and reforestation of existing areas to increase forest density, the government might review the role of forest taxation to ensure its sustainable use. A combination of new investments and taxation of forest for logging as appropriate could be instrumental in securing the forestry targets of Table 5.

Implications for Institutional Reforms

The proper implementation of the Delta plan and other sectoral policies will require substantial improvements in the institutional arrangements for sound environmental management. The main institutional reforms are highlighted below.

Strengthening Environmental Coordination: The disconnect between the growth strategy and environmental management is partly due to the sectoral policy weaknesses noted above, but it also reflects the absence of a coordinating body for integrating growth with environment. The NSDS 2010-21 recognized this gap and recommended the establishment of the Sustainable Development

Monitoring Council (SDMC) and the Sustainable Development Board (SDC) to serve as the technical secretariat to SDMC. This recommendation was approved by the government in principle based on the adoption of the NSDS 2010-21 but its implementation has lagged behind (Government of Bangladesh 2013). The government may want to consider the implementation of this recommendation.

Strengthening MoEF: In order for MoEF to play its role as the central body for environmental management, its capabilities must be sharply strengthened. As a first step, progressive increases in its budget must be provided to reach the target of 0.5% of GDP by FY2041. This is a modest target but essential to build up capacity through better staffing, including professional staff, establishing a strong digital management information system based on a data bank that gets regularly updated, and implementing a regular monitoring and evaluation of environmental compliance. MoEF needs to build strong partnerships with the private sector, the NGOs and the research community in the areas of compliance monitoring and knowledge management, including data gathering and policy research. A system of regular dialogue with stake-holders including public hearing and participatory policy development will be essential to improve policy implementation and compliance. The Department of Environment (DOE), which is a technical arm of the MOEF, needs to be restructured in line with the international experiences, to enable it to genuinely contribute cater to environmental management in a more effective manner.

Strengthening the Delta Management Institutions: Many of the institutions needed for implementing the Delta Plan are also important for implementing environmental programs. The Delta Plan calls for major institutional reforms that include: establishment of the Delta Act, the Delta Commission and the Delta Fund that will provide the institutional framework for holistic planning, budgeting, project selection, research and monitoring and evaluation of water and water-related projects; strengthening of all water and water-related institutions including the city corporations, the municipalities and the WASAs; and the establishment of the water user association (WUA) at the local level that will have primary responsibility for implementing all local level water projects including O&M. The strengthening of the City Corporations, municipalities and WASAs are particularly important to achieve the water and sewerage targets of Table 5.

Decentralization of Environmental Management: To ensure proper environmental management, the government also needs to decentralize implementation to local institutions for proper management of the environment. The local governments including in urban and rural areas are best placed to play this function. More generally, the decentralization of political, administrative and financial authorities is a cross-cutting and burning institutional agenda facing Bangladesh. Once there is a political buy-in for this critical cross-cutting reform, the appropriate assignment of environmental functions by different levels of government institutions can be decided. Bangladesh can learn from the good- practice international examples of what might be the appropriate division of responsibilities. Typically, community-level issues are best managed at the local level while

cross-cutting national level issues are best handled at the national level. To ensure seamless implementation and avoid conflicting signals a formal coordinating mechanism between national and local government agencies responsible for environmental management must be established so that there continuous dialogue and exchange of information. The LGIs themselves will need to be participatory in their approach and adopt proper mechanisms for allowing citizen's participation in all local issues including environmental management. Strong dialogue and ownership of the environmental agenda at the community level can be instrumental in ensuring proper compliance and reduce the burden on public agencies.

Strengthening Environmental Concerns in Planning and Budgeting: Integration of environmental concerns in budgetary management is an essential element of a green growth strategy. Bangladesh has made progress recently. In 2014, the Finance Division of the Ministry of Finance and the General Economic Division of the Planning Commission came together under the Poverty Environment and Climate Mainstreaming project (UNDP) to produce the first Climate Fiscal Framework under UNDP supported Poverty, Environment and Climate Mainstreaming Project (Torrance and Khan 2017). Recommendations from this Framework are currently being implemented by the Inclusive Budgeting and Financing for Climate Resilience (IBFCR) project in the Ministry of Finance supported by UNDP. Much of the focus initially is in terms of ensuring higher resources for climate change management and environmental improvement. As noted earlier taxation and incentive policies for environmental management is almost non-existent. Progress on green public financial management (PFM) in terms of green accounting, procurement and auditing also remains to be made (Khan and Torrance 2017). The planning process does incorporate environmental concerns in public investment decisions. But owing to capacity constraints, full accounting of environmental degradation issues in investment projects does not happen except in the case of major donor-financed project.

The full incorporation of the green PFM agenda is a long-term endeavor and will require long-term commitment, resources and efforts. Institutional capacities in Ministries of Finance, Planning and concerned line ministries will have to be substantially strengthened. The Torrance and Khan paper on strengthening green PFM in Bangladesh contains some useful lessons of international experience and suggestions for initiating a green PFM strategy for Bangladesh that can be used to initiate a strategy for implementing green PFM in Bangladesh.

Financing Options

Investments needed to secure the targets of Table 5 will be substantial. Although environment typically is a public good, the public sector alone cannot finance it. Innovative solutions must be found to ensure a good division of financing options between public and private sectors.

Private Financing Options: There are three main instruments for boosting private financing for environment. First, in a number of areas, such forestry for timber, fisheries, eco-tourism, water supply and waste management, private supply can be encouraged with proper regulatory and

pricing policies. These are commercial components of the environmental services and many good-practice international experiences exist for boosting private supply in a framework that is consistent with environmental protection. Bangladesh can learn from these experiences and develop proper policies and institutions to attract private investment. Second legal and regulatory policies can be used to encourage proper adoption of measures that include private investment in protection of the environment. Important examples include adoption of clean air technology in industries, installation of ETPs in industries and private hospitals, and prevention of land degradation through proper farming practices including the banning of jhum cultivation while providing alternative livelihoods to the affected population. Third, the public sector can enter into co-financing arrangements of a range of environmental services through public-private partnerships including partnerships with communities. For example, programs for clean rural water supply and sanitation, cleanup of rural ponds used for bathing and household cleaning, public toilet and public bathing facilities can all be implemented through public subsidy to private suppliers as well as through cost-sharing arrangements with the community.

Public Financing Policies: The public finance constraint on the budget in Bangladesh is well-known. Most public programs are under-funded. Large infrastructure and human development needs threaten to over-shadow financing requirements of other programmes. Table 5 calls for a sharp increase in public funding for environmental services from 1% of GDP now to 3.5% of GDP by FY2041. How can this level of public funding be mobilized? The options are illustrated in Table 6.

Table 6: Public Financing Options for Environmental Protection for the Perspective Plan

| Financing Options (% of GDP) | FY2017 (Base Year) | FY2031 | FY2041 |
|--|-------------------------------|---------------|---------------|
| Tax Resources | 1.0 | 2.0 | 3.0 |
| Cost Recovery (Beneficiary pays principle) | 0.0 | 0.3 | 0.3 |
| Green Taxes (Polluter pays principle) | 0.0 | 0.2 | 0.2 |
| Foreign Financing including Green Climate Fund | 0.0 | 0.5 | 0.0 |
| Total Financing | 1.0 | 3.0 | 3.5 |

Source: Author Estimates

Fortunately, the government has already shown keen interest to implement the Delta Plan, which calls for a sharp increase in the financing of the water management programme from 0.8% of GDP now to 2.0% of GDP by FY2020. This level of public funding for water management will then be maintained thereafter. Once this is achieved, the combined allocation of resources for other core environment-related ministries comprising of environment and forestry, land and fisheries and livestock needs to be increased from 0.2% of GDP now to 0.5% of GDP by FY2031 and to 1% of GDP by FY2041.

The proposed financing plan in Table 6 is feasible and consistent with the macroeconomic framework prepared for the Vision 2041 exercise that also allows for the implementation of the

Delta Plan (PRI 2017). Overall, some 2% of GDP of additional financing will need to come from tax resource mobilization. Bangladesh has one of the lowest tax to GDP ratio in the world and the Perspective Plan Macroeconomic Framework allows for an additional tax/GDP ratio increase of 5% that can accommodate this additional financing. The remaining 0.5% of GDP domestic financing can be mobilized through the application of the beneficiary pays principle (cost recovery) and the polluter pays principle (green taxes). Prospects for cost recovery from the supply of water, sanitation and solid waste management are large. Presently, there is minimal cost recovery from water and sewerage services provided by WASAs and Municipalities. Cost recovery is based on partial recovery of operation cost only. This imposes a serious financing constraint on the public agencies that in turn limits the quality and quantity of supply. This pricing policy must change, both to mobilize funding for new investments as well as to ensure efficient use of water. The water and sewerage pricing policy must move to full operating cost recovery by FY2020 and 100% capital cost recovery by FY2031.

Regarding green taxes, the combination of fossil fuel tax and pollution tax on industries polluting air and water and households polluting water should generate adequate revenues to finance environmental protection and other important transport sector programmes. Emission taxes may be imposed, if legal limits are exceeded, on: fired bricks and brick materials, steel and rerolling mills, all types of motor vehicles, steamers, engine boats, tractors, stone crushers, cement factories, earth moving, excavation and construction equipment, etc.

Indirect tax could be levied on production inputs or consumer goods whose use can damage the environment. They are plastic, polythene bags, plastic packaging materials, paints, all types of agrochemicals including pesticides, tires, kerosene, diesel, furnace oil, batteries, glass.

In the same vein some materials or consumer goods may incentivized in the form of reduced tax. They are non-fired bricks, ultra-low sulfur petrol (ULSP) and ultra-low sulfur diesel (ULSD), solar panel, electric and hybrid motor vehicles, organic fertilizers etc.

Harnessing The Green Climate Fund (GCF): The Delta Plan assumes foreign financing of the Delta Plan in an amount of 0.5% of GDP. This is again a very modest target compared with possible options. The most important possibility is the effective use of resources from the Green Climate Fund (GCF). From the perspective of eligibility, Bangladesh is ideally placed to do so. The main challenge is to gear up capacity to mobilize these resources by following the guidelines of the GCF.

The GCF was established in 2009 with the objective to mobilize climate finance to support scaled-up mitigation and adaptation actions in developing countries. The Fund identified 5 investment priorities: Transforming energy generation and access; creating climate-compatible cities; encouraging low-emission and climate-resilient agriculture; scaling up finance for forests and climate change; and enhancing resilience in Small Island Developing States (SIDS). An amount

of \$10.2 billion of climate finance was initially pledged to the GCF; as of January 2016, some \$5.9 billion was confirmed. The Paris Agreement of 2014 defines the framework for the functioning of the GCF (Box 2).

Box 2: Green Climate Fund for Climate Change Adaptation in Developing Countries

Green Climate Fund and the Paris Agreement

- The Paris Agreement and the supporting Decision include provisions on finance that both directly and indirectly relate to the role and operation of the Green Climate Fund (GCF).
- The Agreement emphasizes the GCF's role as a key provider of predictable financial resources in the post-2020 framework.
- The introduction of a floor of USD 100 billion annually on the level of climate finance going forward post-2025 acknowledges that climate finance needs to be further scaled-up.
- A roadmap to achieve this funding level is expected to introduce clarity on Parties' pledges, supporting the GCF in making future funding decisions.
- Development of modalities for the accounting of financial resources and the requirement to provide biannual reporting will introduce further transparency to the funding and operating of the GCF.
- Developed countries are to continue taking a leading role in mobilizing climate finance, which is already reflected in the contributions made into the GCF to date.
- Funding is to be balanced between mitigation and adaptation initiatives, acknowledging the importance of sustainable development co-benefits and prioritizing action in least developed countries and Small Island Developing States.

Funding ambitions

The Paris Agreement does not explicitly refer to the GCF and the amount of funding that it is to mobilize. The text recognizes however that 'the Financial Mechanism of the Convention, including its operating entities, shall serve as the financial mechanism of this Agreement' (Art. 9.8). The Financial Mechanism was established under the Convention (Art. 11) to formalize and streamline efforts to provide concessional financial resources to developing country Parties. Designated bodies – the operating entities – are entrusted to realize the goals of the Mechanism. The GCF, together with the GEF, are the two operating entities of the Financial Mechanism of the Convention and the Paris Agreement and as such represent the main channels through which future sources of international climate finance are expected to flow in the years to come.

The Paris Decision, serving as guidance for the implementation of the Paris Agreement and pre-2020 action, 'strongly urges developed country Parties to scale up their level of financial support, with a concrete roadmap to achieve the goal of jointly providing USD 100 billion annually by 2020 for mitigation and adaptation' (para 115). The Decision furthermore mentions that prior to 2025 the COP shall set a new 'collective quantified goal from a floor of USD 100 billion per year' (para 54). The reason both quantitative targets are missing from the actual Agreement is a pragmatic one – in doing so the COP has enabled the US President to adopt the Agreement as a 'sole-executive agreement' under the US law, without the requirement for the US Senate to approve.

From the perspective of the GCF, while the annual target of USD 100 billion is in itself not new, the introduction of a floor on the level of climate finance going forward post-2025 presents an acknowledgment that climate finance needs to be further scaled-up in order for the Agreement's objectives to be realized. The GCF is explicitly recognized in the Decision as a key multilateral funding source that is to support the flow of 'adequate and predictable financial resources' (para 55). The urge to develop a roadmap for reaching the stated financing target by 2020 and beyond is also a significant development given the current ambiguity revolving around the magnitude and origin of future finance flows. More certainly and clarity on Parties' future funding pledges and its underlying terms and conditions will support the GCF in making funding decisions going forward.

Source: Adapted from the Bangladesh Delta Plan (Government of Bangladesh 2017)

The GCF is split between two pots of funding: mitigation and adaptation. Half of the adaptation funding will go to Least Developed Countries (LDCs). Upon request, governments can access grants or concessional loans for both adaptation and mitigation, and to finance the cost of

overcoming policy barriers, address information gaps, and capacity constraints that impede local private sector activity. The fund also seeks to minimise the transaction costs of working with SMEs by having accredited entities originate, approve, administer, and manage financing on behalf of the GCF through a programmatic approach. The accredited entities can be national, regional or international intermediaries that are accredited by the GCF for project management purposes and for the purpose of approving grants and loans.

Bangladesh has had significant success in using its public sector intermediaries to incentivize the private sector, particularly in the renewable energy industry. The Bangladesh Bank launched an initiative that gives incentives to the financial sector to lend to SMEs and micro finance institutions (MFIs) aiming to invest in green technologies such as solar home systems, irrigation pumps, etc. The “policy guidelines for green banking,” introduced by the central bank in 2011, requires every bank to allocate a specific budget to finance green projects. This includes direct or wholesale lending for renewable energy projects. Banks are expected to set achievable targets and strategies and disclose these in their annual reports. Banks are also required to establish a green branch in the second phase.

More recently, Bangladesh Bank has also established a USD 200 million Green Transformation Fund (GTF) to help textile and leather sector firms to adopt environmentally friendly green technologies. The GTF established in January 2016 following extensive consultations with relevant stakeholders will provide fund at very subsidized rates to the textile and leather industries in order to increase water efficiency and reduce chemical pollution by these firms through adoption of better technologies and green practices. Under these initiatives, compliant participating banks receive preferential treatment through a refinancing model that provides access to low-cost finance.

The Infrastructure Development Company Limited (IDCOL) is another example of a government-owned financial intermediary that channels donor and government finance to decentralized climate-friendly energy projects. IDCOL has supported the setup of more than 3 million solar home systems in Bangladesh, and its business model is now being replicated in several countries in Africa. The success of IDCOL lies in its one stop shop model. The model includes supporting the delivery of energy access projects, offering an end-to-end package that incentivizes market creation, delivery networks, access to capital, quality assurance, after sales service, training, and institutional strengthening support for partnering organizations and SMEs, etc.

These existing institutions and policies provide evidence of tested models of how local financial intermediaries can be instrumental in promoting the participation of private sector actors in Bangladesh. Such entities can also become accredited GCF intermediaries, fitting with the fund’s ambition to ensure country ownership and direct access. Accessing GCF funds directly through Bangladeshi organizations is an opportunity for more SMEs to access finance. However, a lot more

needs to be done to ensure private enterprises fulfill their crucial role in the fight against climate change.

To access to the GCF the recipient countries have to ready themselves by meeting certain criteria and standards. Necessarily countries have to appoint a National Designated Authority (NDA) to operate the Fund and criteria based National Implementation Entity (NIE)/Multilateral Implementation Entity (MIE) to access to the Fund. As of 6th February 2015, the GCF has received 96 initial NDAs or Focal Point Designations (GCF 2015), where Bangladesh has nominated its Economic Relations Division (ERD) of the Ministry of Finance as NDA or Focal Point, the apex body to facilitate access to the Fund.

Meantime, the NDA in Bangladesh launched an inclusive consultation process and short-listed 14 national institutions considering their potential of being NIE/NIEs while meeting basic and specialized standards set by the GCF. The NDA also completed a 'self-assessment' process to identify strengths, gaps of the prioritized institutions. To help out the selection process Bangladesh Government, in close partnership with GIZ, appointed an international consultant who meantime completed 'one to one' meeting sessions with the potential institutions.

Following the self-assessment process, during 28-29 January 2015, country's NDA focal point, (Senior Secretary of Economic Relations Division of the Ministry of Finance) organized a consultation workshop titled "NIE Accreditation Process: Getting Bangladesh Ready for the Green Climate Fund". The workshop discussed the outcomes of the self-assessment process; discussed capacity/eligibility gaps of the potential institutions and explored required technical assistance to make Bangladesh ready for gaining access to GCF. So far, two national entities, IDCOL and PKSF, have been accredited as NIE to partner with GCF. Bangladesh should take all possible steps to accelerate the accreditation of more NIEs to enable a faster access to GCF funds.

Harnessing Other International Climate Funds

Bangladesh doesn't have an effective institutional mechanism to access other international climate fund windows like Adaptation Fund, LDCF, CIF, FIP, GEF, REDD, NAMA etc. In a global resource-scarce regime securing climate finance from multilateral and bilateral sources is becoming highly competitive. Owing to the lack of a robust mechanism Bangladesh fares badly in accessing these funds. It is now imperative to set up a dedicated wing in the Economic Relations Division (ERD) to effectively coordinate and access other international climate funds as indicated above. It is expected that the wing will represent the government in international negotiations on climate finance matters and mobilize resources for financing of climate proofing and mitigation programmes of the government.

F. Concluding Remarks

Bangladesh has made important progress in a number of areas relating to environmental management but this has not matched the progress with the growth and poverty reduction agenda. Importantly Bangladesh is yet to adopt formally a “green growth strategy” that fully reconciles the development agenda with the protection of the environment. In the absence of the green growth strategy and associated regulations, policies and institutions, the costs of environmental degradation have grown over time. Additionally, the adverse effects of climate change are mounting and creating substantial downside risks and vulnerabilities. Against the backdrop of this, the government’s preparation of Vision 2041 under which Bangladesh is envisaged to reach World Bank-defined high income threshold provides an important opportunity to take a fresh look at the environmental degradation and climate change risks. Unless required regulations, policies and institutional reforms are undertaken to fully reconcile the growth and poverty-reduction agenda with the environmental protection needs, there is a substantial risk that the income and poverty targets of Vision 2041 will not be achieved. The 8th Five Year Plan may be the starting point to align sectoral activities in line with the green growth strategy as enunciated in the vision 2041.

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