

## *Low-Carbon, Climate-Resilient Development NAMA Concepts for Bangladesh*

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### *Summary*

This policy brief presents the results of a screening exercise to identify nationally appropriate mitigation action (NAMA) concepts for Bangladesh. Multiple government planning documents were reviewed and applied to IISD's standardized NAMA quick screen process to identify NAMA concepts that could be further validated and turned into NAMA proposals for Bangladesh. In total, 18 NAMA concepts were identified. A next step would be to conduct more detailed analysis to first prioritize the NAMA concepts and then develop detailed proposals highlighting emission, cost and sustainable development outcomes for priority NAMAs.

This document is part of IISD's continued effort to promote low-carbon, climate-resilient development globally.

## Table of Contents

1.0 Introduction .....	3
2.0 Identifying NAMA Concepts: A Quick Screen Methodology .....	4
3.0 Country Overview.....	5
3.1 National Socioeconomic Overview .....	5
3.2 National GHG Emission Overview .....	6
3.3 Overview of Vulnerability to the Adverse Effects of Climate Change.....	6
3.4 Major Climate Change Effects.....	6
3.5 Vulnerability Assessment of Major Climate Change Effects .....	6
3.6 National Government Priorities .....	7
3.7 Relevant National Policies .....	8
4.0 NAMA Concepts by UNFCCC Sector .....	9
4.1 Agriculture.....	9
4.2 Energy .....	10
4.3 Forestry and Other Land Use.....	11
4.4 Industry .....	11
4.5 Transport.....	12
4.6 Waste .....	12
5.0 NAMA Concepts and Next Steps .....	13
References.....	16
Appendix A: Quick Screen Methodology .....	18
Step 1: Research and Categorization .....	18
Step 2: Long List of Potential NAMAs.....	19
Step 3: Short List of NAMAs .....	20
Step 4: Review and Development of Draft Country Report.....	22
Step 5: Validation and Finalization.....	23

## 1.0 Introduction

Countries are developing nationally appropriate mitigation actions (NAMAs) to communicate that they are preparing for increased climate mitigation financing and that they are contributing to lowering global greenhouse gas (GHG) emissions. The concept of NAMAs emerged from the United Nations Framework Convention on Climate Change (UNFCCC), and is broadly understood as a project, program or policy initiative that reduces GHG emissions in developing countries while contributing to sustainable development.

There is evidence that designing, evaluating and implementing NAMAs will be building blocks for the post-2012 mechanisms under the UNFCCC. There is therefore much attention being placed on a variety of capacity-building and pilot programs underway on NAMAs. Although the concept continues to evolve, donors have expressed an interest in funding first-generation NAMAs and are poised to do so through available fast-start climate change financing pledges. With the forthcoming introduction of a NAMA registry, it will be possible for developing countries to submit NAMAs to receive support for the preparation phase.

While NAMA activities are increasing, there continues to be an absence of guidance from the UNFCCC and the negotiations on modalities. A lack of overall clarity is not necessarily negative at this stage, given that the NAMAs are inherently bottom-up mechanisms. In time, as learning occurs and more NAMAs are developed, the NAMA UNFCCC architecture can be trued up. In the interim, there is a need to share experiences and add to the information base.

To help inform this NAMA development process, the International Institute for Sustainable Development (IISD) is testing a standardized, country-driven approach to identify NAMA concepts across 13 countries. This document applies that framework to Bangladesh. The goal of this high-level country analysis is to identify NAMA concepts that align with Bangladesh's development aspirations, conform to pre-existing policy frameworks, and have associated sustainable development co-benefits.

The report begins with an overview of the methodology used in identifying NAMA concepts. Next, a brief overview of the economic and emissions context in Bangladesh is provided, along with a discussion of government priorities and policies. The subsequent two sections provide a long list and screened short list of NAMA concepts that could be taken forward by Bangladesh for further consideration.

## 2.0 Identifying NAMA Concepts: A Quick Screen Methodology

The process for prioritizing and implementing NAMAs involves first developing a **NAMA concept**, then a detailed **NAMA proposal** and finally a **NAMA implementation plan**. IISD's approach to NAMA development so far has focused on the first two steps:

1. The **NAMA quick screen** is used to conduct a rapid assessment that identifies a list of NAMA opportunities that can be developed into **NAMA concepts** to attract climate finance.
2. The **NAMA deep screen** is a more elaborate analysis using standard criteria to explore feasibility, as well as possible emission, cost and sustainable development outcomes necessary to produce full-fledged **NAMA proposals**.

This document presents the results of the first step, the quick screen, applied to Bangladesh.

The purpose of the quick screen exercise is to develop a country report that outlines a list of potential NAMA concepts using a standardized set of criteria. The quick screen is a qualitative assessment that identifies potential NAMA concepts that have:

- Medium or high mitigation potential
- Alignment with government priorities
- Evidence of existing action
- Sustainable development (economic, environmental and social) co-benefits that outweigh any negative impacts
- Possible climate resilience (adaptation) co-benefits

The quick screen has five steps:

1. **Research and Categorization** – Collect, review and categorize relevant documents and data that provide country context, including a description of the socioeconomic context, information on GHG emissions, government priorities and climate change-relevant actions.
2. **Long List** – Develop a comprehensive list of NAMA opportunities organized by the six UNFCCC mitigation sectors: agriculture, energy, forestry and other land use, industry, transportation and waste.
3. **Short List** – Screen the long list of potential NAMAs against a set of criteria to develop a short list of NAMAs with the greatest opportunity by UNFCCC sector.
4. **Country Report** – Develop the country report that provides context for NAMA identification and presents the long and short lists of NAMAs. Evaluate the short list using an analytical grid that examines NAMAs in the context of mitigation potential, government priorities, current actions and co-benefits.
5. **Validation and Finalization** – Validate the short list of priority NAMA opportunities with government authorities and key stakeholders; revise the short list and country report based on expert input.

Appendix A provides a detailed guide to the quick screen steps.

## 3.0 Country Overview

This country overview provides context relevant to the development of NAMAs in Bangladesh, with a particular focus on the economic drivers of energy use and emissions.

### 3.1 National Socioeconomic Overview

Bangladesh has made strong economic gains since its independence in 1971, with the GDP more than tripling in real terms. Over the past 20 years, growth has accelerated, averaging 6 per cent per year over the past eight years. Bangladesh aspires to be a middle-income country by 2020, and is on track to meet this goal (Government of the People's Republic of Bangladesh [GPRB], 2008). In terms of inflation, Bangladesh has "generally succeeded in maintaining reasonable price stability," but there have been significant periods of high inflation brought about by "supply disruptions due to natural disasters, global price shock and poor regulation" (Ministry of Planning [MOP], 2010). Bangladesh's public expenditure is among the lowest in the world, at approximately 14 per cent, and is "meager in relation to the increasing need for public services" (MOP, 2010).

Food production has tripled since independence, but Bangladesh's agricultural sector is fragile, and food security and malnourishment are growing concerns. The country has one of the lowest (and shrinking) percentages of arable land in the world, and is approaching the limit of cropping intensity, while contending with demographic pressures (Board of Investment, Prime Minister's Office [BOI], n.d.; IRIN Global, 2011). The agricultural sector's contribution to GDP is 18.8 per cent, industry's contribution is 28.5 per cent and the services sector is the largest contributor to GDP at 52.6 per cent (BOI, n.d.).

Bangladesh is seeking to modernize its key sectors and increase the rate and broaden the base of its economic growth. However, it faces challenges of poor regional trade integration, "significant and chronic energy shortages and inadequate infrastructure, as well as bureaucratic barriers which make the investment climate and private sector less competitive than they could be" (Department for International Development [DFID], 2011). Climate change is expected to severely challenge the country's ability to achieve its desired rates of economic growth, due to "increasingly frequent and severe floods, tropical cyclones, storm surges, and droughts" (GPRB, 2008).

Bangladesh has made enormous social development progress since its independence. Poverty rates have been reduced by 60 per cent, and the country is on track to meet most of its Millennium Development Goals (MDGs) by 2015 (BOI, n.d.). However, DFID (2011) reports that poverty remains a significant concern, with over 50 per cent of people living on less than US\$1.25 per day and 80 per cent on less than US\$2.00. In Bangladesh, "one in fifteen children dies before they reach 5 years old, 250,000 babies die every year in their first month of life, and 40% of children are underweight" (DFID, 2011). Despite these figures, however, much progress has been made since independence, especially in child mortality and gender parity in education (GPRB, 2008).

The population growth rate has shrunk significantly, from 2.9 per cent in 1974 to 1.4 per cent in 2006. However, the population is still growing and the high population density means many people are crowded into "remote or ecologically fragile parts of the country, such as river islands and cyclone-prone coastal belts." Bangladesh is especially vulnerable to climatic risks due to its "combination of frequent natural disasters, high population density, poor infrastructure and low resilience to economic shocks" (GPRB, 2008).

### 3.2 National GHG Emission Overview

Bangladesh's contribution to global GHG emissions is small, at "less than one-fifth of one percent of the world total" (GPRB, 2008). GHG emissions in the country are primarily methane from flooded rice fields and waste, the latter particularly in urban areas. The country's low emissions are due to its extremely low energy production and consumption. Expansion of the energy sector is a government priority, reflecting a desire for economic development and reflecting the importance of electrification, increased and improved transportation systems, and industrial development. Climate change mitigation efforts are not to "jeopardise the legitimate demand for and supply of energy" (GPRB, 2008). However, there is considerable scope to keep GHG emissions from energy production and consumption low, and improvement of low-carbon energy supplies will be attractive to both the Bangladeshi government and donors.

### 3.3 Overview of Vulnerability to the Adverse Effects of Climate Change

Bangladesh is a recognized leader in planning for adaptation, and has developed a Climate Change Strategy and Action Plan. The country has expressed an interest in undertaking mitigation activities that contribute to the country's development goals and that entail adaptation and sustainable development (i.e., environment, economic and social) co-benefits. This interest and initiative in adapting to climate change, as well as Bangladesh's vulnerability to its effects, mean that the country could benefit significantly from developing and seeking funding for NAMAs, and is well positioned to do so.

### 3.4 Major Climate Change Effects

Climate change is already being felt in Bangladesh. Observed data indicate that the average temperature is increasing during the monsoon season (July/August), and maximum and minimum winter temperatures are decreasing and increasing, respectively. A study looking at the 1960-1990 period found a significant increase in annual mean maximum temperature. Saline intrusion in coastal zones is a clearly observed trend, but coastal erosion has until now been largely offset by coastal accretion. However, sea-level rise has been a significant issue, with observed sea-level rise in the past 30 years occurring at many times the magnitude observed globally over the past 100 years. It should be noted that this is not wholly attributable to climate change, as regional tectonic subsidence is also a factor (Ministry of Environment and Forests [MOEF], 2005).

Climate model scenarios estimate that mean annual temperatures will rise 1.0°C by 2030 and 2.4°C by 2100. Mean annual precipitation is expected to increase 5 per cent by 2030 and 10 per cent by 2100, and sea level is expected to rise 14 centimetres by 2030 and 88 centimetres by 2100. This is a major problem for the country, since much of its land is low-lying (MOEF, 2005).

### 3.5 Vulnerability Assessment of Major Climate Change Effects

Research into Bangladesh's vulnerability to the effects of climate change has shown that Bangladesh is particularly vulnerable to changes experienced in the water sector. Climate change-driven changes to the prevalence of floods, droughts and salinity intrusion are particularly important for the country. The specific challenges in the water sector are the "scarcity of fresh water due to less rain and higher evapo-transpiration in the dry season; drainage congestion due to higher water levels in the confluence with the rise of sea level; river bank erosion; frequent floods and prolonged and widespread drought; and wider salinity in the surface, ground and soil in the coastal zone" (MOEF, 2005).

The agriculture sector’s crop productivity is especially sensitive to changes along these dimensions, and is predicted to fall significantly as a result of the predicted climate change effects outlined above. Additionally, Bangladesh’s low level of economic and social development, limited investment capacity and infrastructure, lack of institutional capacity, and high dependency on the natural resource base make the country even more vulnerable to climate change. Coastal populations are particularly vulnerable due to their exposure to salinity intrusion and sea-level rise (MOEF, 2005).

### 3.6 National Government Priorities

The GPRB developed the Bangladesh Climate Change Strategy and Action Plan in 2008, National Adaptation Plan of Action in 2005 and National Communications in 2002. In addition, the Bangladesh Climate Trust Fund has been created, with domestic resources and the multi-donor Climate Resilient Trust Fund allowing the government to implement the Bangladesh Climate Change Strategy and Action Plan with support from developed country parties. Bangladesh has shown leadership at UNFCCC negotiations and has been a driver of positions of the least developed country negotiating bloc.

While Bangladesh tends to focus on adaptation, given the country’s vulnerability to climate change, mitigation also requires serious attention to ensure the country pursues a low-carbon development path. In June 2011 Bangladesh presented to the UNFCCC on its *Low Carbon Path of Development and NAMAs* (MOEF, 2011). The presentation indicated that Bangladesh plans to reduce emissions from business-as-usual projections by at least one third by 2030. Bangladesh stresses that economic growth and poverty alleviation should not be compromised by mitigation efforts. Energy consumption will increase, but there is scope to reduce emissions with appropriate international capacity building, financing and technology support.

**TABLE 1: BANGLADESH GOVERNMENT PRIORITIES**

SECTOR	PRIORITY
Overall development	a. Employ low-carbon modes of development
	b. Make climate strategy pro-poor
	c. Reduce poverty
	d. Increase employment
	e. Have stable and sustainable economic growth
	f. Make economic growth inclusive
	g. Enjoy food security
	h. Reduce hunger, improve nutrition
Agriculture	1. Increase agricultural productivity
	2. Promote competitiveness of agricultural sector
	3. Achieve self-sufficiency in food production
	4. Improve irrigation
	5. Diversify crops
	6. Reduce/arrest/reverse land degradation
	7. Make agricultural production sustainable
	8. Preserve and enhance water and soil quality

SECTOR	PRIORITY
Energy	1. Expand supply of energy/meet demand
	2. Make energy sector financially viable
	3. Increase the efficiency of the sector and of energy use
	4. Enjoy energy security
	5. Pursue sources of renewable energy
Forestry and other land use	1. Conserve biodiversity
	2. Provide an acceptable level of forest cover
	3. Use forest resources efficiently
Industry	1. Increase the sector's contribution to GDP
	2. Increase employment in the sector
	3. Use indigenous raw materials
	4. Ensure industrial development is physically decentralized
	5. Emphasize small- to medium-sized industrial enterprises
	6. Provide adequate human resources and technology transfer
Transport	1. Expand and improve the railway system
	2. Manage traffic more effectively
	3. Provide an acceptable level of air quality
	4. Provide improved transport services
Waste	1. Manage wastes to lower GHG emissions
	2. Manage wastes to increase cities' and towns' liveability
	3. Manage hazardous wastes effectively

Sources: GPRB (2008); Ministry of Agriculture (2010); MOP (2009, 2010, 2011a)

### 3.7 Relevant National Policies

The overarching policy document setting out economic development objectives is *Government Vision 2021* (BOI, n.d.). This document sets out goals around political institutions and political engagement, economic development, and Bangladesh's role and place in the global arena. The economic development objectives cover: meeting basic needs, population and labour force, poverty alleviation, food and nutrition, health care, education, industry, energy security, infrastructure development, housing, environment and water resources. This overarching document is accompanied by a series of five-year plans to achieve the goals, currently in their sixth iteration (MOP, 2011b) and complemented by the *Draft Outline Perspective Plan for Bangladesh 2010-2021* (MOP, 2010). Bangladesh has also established development goals as part of its Millennium Development Goals (MDGs), and through membership in the South Asian Association for Regional Cooperation (MOP, 2009, 2011).



## 4.0 NAMA Concepts by UNFCCC Sector

### 4.1 Agriculture

Agriculture is the dominant economic activity in Bangladesh and regarded as the lifeline of the Bangladesh economy. It contributes about 21 per cent of the GDP, and sustains the livelihood of about 52 per cent of the labour force. And because it has major ramifications for issues like food and nutritional security, income generation and poverty reduction, it is a high priority in government planning efforts (Ministry of Agriculture, 2010).

It is estimated that agricultural land is declining by 1 per cent per year and the land quality is deteriorating due to degradation of soil fertility (e.g., nutrient imbalance), soil erosion and soil salinity. Water resources are also shrinking. In order to produce more food for an increasing population, and raw materials for agro-industries, there is a need for increasing agricultural growth through higher productivity, including increased yield, agricultural intensification and diversification, and value addition. Addressing these issues in a sustainable fashion will be a major challenge for the country going forward (Ministry of Agriculture, 2010).

Table 2 identifies the complete list of potential NAMAs that were generated at Step 2 of the methodology described above.

**TABLE 2: LONG-LISTED NAMA OPPORTUNITIES FOR THE AGRICULTURE SECTOR**

MEASURE	SOURCE
Promote agroforestry	MOEF (2002); MOP (2010)
Develop/disseminate climate-resistant crops	BOI (n.d.); MOEF (2002); MOEF (2005); GPRB (2008)
Lower emissions from agricultural land (soil carbon sequestration)	GPRB (2008)
Sustainably intensify production	BOI (n.d.)
Protect land suitable for agriculture	MOEF (2002); GPRB (2008); MOP (2010)
Improve rice cropping methods, eliminate continuous flooding	GPRB (2008)
Disseminate eco-friendly technologies and techniques that are tested and in use	BOI (n.d.); MOEF (2002); MOA (2010); MOP (2010)
Introduce climate-friendly livestock practices	MOEF (2002); GPRB (2008); MOP (2010)
Improve irrigation, promote water-smart crop rotation and similar practices	BOI (n.d.); MOEF (2002); GPRB (2008); MOA (2010); MOP (2010)
Improve water efficiency and energy efficiency	MOEF (2011)

## 4.2 Energy

“Bangladesh is a low energy-consuming but energy-starved country ... Only Nepal, among its neighbours in South Asia, consumes less energy on a per capita basis. Despite the low level of energy use, the country is unable to meet even the present demand for energy” (GPRB, 2008). Demand for energy in Bangladesh is expected to climb at least 50 per cent faster than GDP in the coming years, meaning that energy security is a fundamental development concern in the country.

There is little scope for additional power generation from gas and Bangladesh will increasingly be looking to its coal reserves to increase the supply of electricity (MOP, 2010). But there are also renewable energy options present in the country. “Solar energy has real prospects in Bangladesh,” and wind energy is feasible but “requires correct wind flow mapping for the whole year for the whole country” (MOP, 2010).

Table 3 identifies the complete list of potential NAMAs that were generated at Step 2 of the methodology described above.

**TABLE 3: LONG-LISTED NAMA OPPORTUNITIES FOR THE ENERGY SECTOR**

MEASURE	SOURCE
Make infrastructure more efficient—less loss and waste	BOI (n.d.); MOEF (2002); GPRB (2008); MOP (2010)
Gas exploration and reservoir management	GPRB (2008)
Develop fossil fuel resources in as climate-friendly a way as possible—e.g., replace old power plants using improved and new technologies, clean coal technology	MOEF (2002); GPRB (2008); MOEF (2011)
Develop solar renewable energy capacity	BOI (n.d.); MOEF (2002); GPRB (2008); Asian Development Bank (ADB) (2011); MOEF (2011)
Develop wind renewable energy capacity	BOI (n.d.); MOEF (2002); GPRB (2008); ADB (2011); MOEF (2011)
Develop hydro renewable energy capacity	GPRB (2002); GPRB (2008); ADB (2011)
Encourage energy conservation, introduce demand management measures	BOI (n.d.); MOEF (2002); MOP (2010)
Efficient building design, refrigeration, more energy-efficient lighting (e.g., Compact Florescent Lamps [CFLs]) and cooling	BOI (n.d.); MOEF (2002); GPRB (2008); MOEF (2011)
Make cooking less carbon-intensive: substitute fuels, have more efficient stoves, use solar cookers	BOI (n.d.); MOEF (2002); AWG-LCA presentation
Make use of waste-to-fuel technologies	BOI (n.d.); MOEF (2002)

### 4.3 Forestry and Other Land Use

Thirteen percent of the country is forest area, but dense population and present deforestation trends mean that “Bangladesh is not on track to achieve the MDG target of 20% tree cover with density greater than 70% by 2015... Bangladesh has less than 0.02 hectares of forest land per person, one of the lowest ratios in the world. If the current trend continues, forests are likely to disappear in the next 35-40 years” (BOI, n.d.).

The sector is important for economic and social development, and poverty reduction through social forestry has been a success in Bangladesh, where “about 0.335 million rural poor are now engaged as participants of the social forestry programme. This sector contributes 1.7% (2010) of the nation’s GDP” (BOI, n.d.).

Table 4 identifies the complete list of potential NAMAs that were generated at Step 2 of the methodology described above.

**TABLE 4: LONG-LISTED NAMA OPPORTUNITIES FOR THE FORESTRY AND OTHER LAND USE SECTOR**

MEASURE	SOURCE
Encourage co-management of forest resources	BOI (n.d.)
Afforestation and reforestation	BOI (n.d.); MOEF (2002); GPRB (2008); MOP (2010)

### 4.4 Industry

While some East Asian economies have developed rapidly, Bangladesh has experienced a gradual and steady rate of industrialization (BOI, n.d.). In the 1990s, Bangladesh’s improved policy framework focused on “investment deregulation, trade liberalization, better exchange rate management and improved financial sector performance,” which permitted export-driven, private-sector-led expansion of manufacturing, increasing from 12 per cent of GDP in 1990 to 17.3 per cent in 2009 (BOI, n.d.). Despite these advancements, the manufacturing and industrial sector remains relatively small (BOI, n.d.).

Table 5 identifies the complete list of potential NAMAs in the industry sector that were generated from the review of key documents (Step 2 of the methodology described above).

**TABLE 5: LONG-LISTED NAMA OPPORTUNITIES FOR THE INDUSTRY SECTOR**

MEASURE	SOURCE
Disseminate technologies to modernize brick kilns and make less carbon-intensive	MOEF (2002); MOEF (2011)
Retrofit building stock	MOEF (2002)
Modernize and rehabilitate old machinery in urea fertilizer plants, sugar mills and cement factories	MOEF (2011)

## 4.5 Transport

Bangladesh's transport system consists of roads, railways, inland waterways, sea ports, maritime shipping and civil aviation catering to both domestic and international traffic (BOI, n.d.). It is primarily the domain of the public sector, but "recently [the] private sector has also been involved in domestic air transport and railway on a very limited scale" (BOI, n.d.). Overall, limited data is available on the sector.

Table 6 identifies the complete list of potential NAMAs that were generated at Step 2 of the methodology described above.

**TABLE 6: LONG-LISTED NAMA OPPORTUNITIES FOR THE TRANSPORT SECTOR**

MEASURE	SOURCE
Improve traffic management	MOEF (2002); MOP (2010)
Conduct travel demand management; encourage use of public transportation, car-pooling, etc.	BOI (n.d.); MOEF (2002); MOP (2010)
Improve rail network	BOI (n.d.); MOP (2010)
Improve public transportation infrastructure, especially in Dhaka; expand mass transportation facilities	BOI (n.d.); MOP (2010); MOEF (2011)
Improve fleet efficiency, replace inefficient vehicles and engines	BOI (n.d.); MOP (2010); MOEF (2011)

## 4.6 Waste

Urban environmental problems are a central concern for policy-makers, since adverse environmental conditions resulting from inadequate waste management, poor drainage, air pollution, lack of access to safe water and sanitation, exposure to excessive noise level, traffic congestion and inadequate health services are exacting a heavy toll on the quality of life (BOI, n.d.). "In Dhaka, for example, the quantity of solid waste generated at present varies between 3000 to 3500 tons per day. DCC is capable of collecting only 50% of this waste, leaving the remaining half unattended. A part of this waste either remains in the streets or on nearly open ground. Some of the waste flows to the open drains and blocks the normal drainage flow" (BOI, n.d.). Because of these issues, the sector would be a valuable one to target for NAMAs.

Table 7 identifies the complete list of potential NAMAs that were generated at Step 2 of the methodology described above.

**TABLE 7: LONG-LISTED NAMA OPPORTUNITIES FOR THE WASTE SECTOR**

MEASURE	SOURCE
Improve systems of waste management and disposal	MOEF (2002)
Methane capture and electricity production	GRPB (2008)

## 5.0 NAMA Concepts and Next Steps

Eighteen NAMA opportunities were identified in this quick screen for Bangladesh: three for the agriculture sector, seven for the energy sector, two for the forestry sector, two for the industry sector, two for the transport sector and two for the waste sector. The final list of NAMA opportunities is as follows.

### Agriculture:

- Lower emissions from agricultural land (soil carbon sequestration)
- Improve rice cropping methods—eliminate continuous flooding
- Improve water efficiency and energy efficiency

### Energy:

- Develop solar renewable energy capacity
- Develop wind renewable energy capacity
- Develop hydro renewable energy capacity
- Encourage energy conservation; introduce demand management measures
- Encourage efficient building design, refrigeration, more energy-efficient lighting (e.g., CFLs) and cooling
- Make cooking less carbon-intensive: substitute fuels, have more efficient stoves, solar cookers
- Make use of waste-to-fuel technologies

### Forestry:

- Promote agroforestry
- Afforestation and reforestation

### Industry:

- Disseminate technologies to modernize brick kilns and make technologies less carbon-intensive
- Modernize and rehabilitate old machinery: in urea fertilizer plants, sugar mills and cement factories

### Transport:

- Conduct travel demand management; encourage use of public transportation, car-pooling, etc.
- Improve fleet efficiency, replace inefficient vehicles and engines

### Waste:

- Improve systems of waste management and disposal
- Methane capture and electricity production

Through IISD's screening exercise, numerous NAMA opportunities have been identified for Bangladesh. A next step would be to conduct a more detailed analysis to first prioritize the NAMA concepts and then develop detailed proposals highlighting emission, cost and sustainable development outcomes for priority NAMA proposals.

**TABLE 8: NAMAS CONCEPTS AND EVALUATION GRID**

MEASURE	SECTOR	REDUCTION POTENTIAL (L/M/H)	GOVERNMENT PRIORITIES (SEE TABLE 1)	EXISTING ACTION	CO-BENEFITS			
					ADAPTATION	ECONOMIC DEVELOPMENT	ENVIRONMENTAL	SOCIAL
Promote agroforestry	Agriculture	M	A, D, G, H, 1, 2, 3	Yes	+	+	+	+
Lower emissions from agricultural land (soil carbon sequestration)	Agriculture	M	G, H, 1,6,7,8	Yes	+	+	+	+
Improve rice cropping methods—eliminate continuous flooding	Agriculture	M	G, H, 1, 3, 5, 7, 8	Yes	+	+	+	+
Improve water efficiency and energy efficiency	Agriculture	M	A	Yes	+	+	+	+
Develop solar renewable energy capacity	Energy	M	A, 1, 4, 5	Yes	neutral	+	+	+
Develop wind renewable energy capacity	Energy	H	A, 1, 4, 5	Yes	neutral	+	+	neutral
Develop hydro renewable energy capacity	Energy	H	A, 1, 4, 5	Yes	neutral	+	neutral	neutral
Encourage energy conservation, introduce demand management measures	Energy	M	A, 1, 4	Yes	neutral	+	+	+
Efficient building design, refrigeration, more energy-efficient lighting (e.g., CFLs) and cooling	Energy	M	A, B, 1, 3, 4	Yes	neutral	+	+	+
Make cooking less carbon-intensive: substitute fuels, have more efficient stoves, use solar cookers	Energy	M	A, B, 1, 3, 4	Yes	+	+	+	+

MEASURE	SECTOR	REDUCTION POTENTIAL (L/M/H)	GOVERNMENT PRIORITIES (SEE TABLE 1)	EXISTING ACTION	CO-BENEFITS			
					ADAPTATION	ECONOMIC DEVELOPMENT	ENVIRONMENTAL	SOCIAL
Make use of waste-to-fuel technologies	Energy	M	A, B, 1, 4, 5	Yes	neutral	+	+	+
Afforestation and reforestation	Forestry	M	A, 1, 2	Yes	+	+	+	+
Disseminate technologies to modernize brick kilns and make technology less carbon-intensive	Industry	M	A, 6	Yes	neutral	+	+	+
Modernize and rehabilitate old machinery: in urea fertilizer plants, sugar mills and cement factories	Industry	H	A, 6	Yes	neutral	+	+	neutral
Conduct travel demand management; encourage use of public transportation, car-pooling	Transport	M	A, 2, 3, 4	Yes	neutral	+	+	+
Improve fleet efficiency, replace inefficient vehicles and engines	Transport	H	A, 3, 4	Yes	neutral	+	+	neutral
Improve systems of waste management and disposal	Waste	M	A, 1, 2, 3	Yes	neutral	+	+	+
Methane capture and electricity production	Waste	H	A, E, 1, 5	Yes	neutral	+	+	neutral

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## *Appendix A: Quick Screen Methodology*

### **Step 1: Research and Categorization**

#### *Objective*

The first step is to collect, review and categorize the information that underlies the identification of nationally appropriate mitigation action (NAMA) opportunities. This includes relevant documents and data that provide country context, information on GHG emissions, government priorities, and ongoing and planned actions in the six UNFCCC sectors.

#### *Process*

#### **Collection**

A desk review is undertaken to identify and access various information sources. The research will focus on assembling and categorizing information on the following topics:

- Economic growth and development (e.g., main economic sectors, growth trends)
- Social development (e.g., population and urbanization trends, percentage of rural population)
- GHG emissions inventory and forecast
- National government priorities and policies (e.g., from national development plans)
- Major government policies and priorities in the six mitigation sectors
- Sectoral context (e.g., trends, energy use and access to energy, modes of transport, forestry cover and rates of deforestation, main agricultural crops, technologies or interventions recommended for implementation)
- Major initiatives on the part of government, non-governmental organizations, private sector, multilateral institutions and donors in the six sectors
- Any other information that is potentially relevant to NAMAs

This review can include Internet research, and if possible and desirable, in-country research. Documentation that is not accessible on the Internet may be available in-country from bureaus of statistics and local experts. Government, donor, academic and multilateral organization publications may be useful. This information should be organized by the six UNFCCC mitigation sectors, in addition to one general climate change category (e.g., national development plans, national economic reports, etc.).

Researchers should note important documents that are not accessible at this stage, and major data and information gaps. There may be an opportunity to locate the information at a later stage in the research (for example, through the validation process in Step 5), or through in-country consultations with experts.

The information collected during this stage will be used to develop the short list (Step 2), the long list (Step 3) and the country report (Step 4); and should be organized to allow researchers to find and access particular data, and identify sources. Mindjet's MindManager software is one way to organize the documentation, but a range of other data management products or techniques could potentially be used. This library can be a useful deliverable for the developing country.

### **Categorization**

Categorization of information will be done concurrently with the document collection and review. To facilitate the identification of priority NAMAs, select information should be organized by the following categories:

- List of government priorities, overall and by sector (see Table 2 for an example of a list of government priorities identified in the NAMAs quick screen for Bangladesh)
- List of ongoing initiatives and activities by UNFCCC mitigation sector—including government, donor funded, non-governmental organizations and private sector
- List of planned or needed actions in the six sectors, as articulated in government documents

The initiatives and actions should be those that have the potential to reduce GHG emissions or enhance sinks—that is to say, mitigation actions.

### *Outputs*

Step 1 develops a collection of relevant documents regarding the country's economy, development priorities, national and sectoral policies and priorities, and major initiatives that is organized by the six UNFCCC mitigation sectors. The collection and categorization process will also result in three lists of important information needed to identify potential NAMAs: government policies and priorities, current initiatives by sector, and actions recommended in government documents.

## **Step 2: Long List of Potential NAMAs**

### *Objective*

The objective is to develop a credible long list of possible NAMAs for the country. This long list is the basis for the short-listing of NAMAs that occurs in Step 3.

### *Process*

The lists of current initiatives and recommended actions developed in Step 1 are examined for actions that could be NAMAs—that is, that have the potential to lead to emissions reductions or enhance the sequestration or removal of carbon from the atmosphere (sinks). The actions could be policies, programs or projects. Examples of potential actions are listed below by sector:

- Energy supply – renewable energy (hydro, solar, wind, geothermal), clean coal, biofuels, electricity generation from landfill gas
- Energy demand – improved cookstoves, renewable lamps replacing kerosene, energy-efficient appliances, energy-efficient lighting, solar water heating, improved buildings, energy efficiency improvements in industry, co-generation in agriculture
- Transport – bus rapid transit, light rail transit, improved vehicle stock efficiency, improved heavy-duty vehicle stock efficiency, biodiesel, shift of freight to rail, improved non-motorized transport
- Industry – improved cement processing, charcoal production
- Waste – methane avoidance from landfill gas
- Agriculture – conservation tillage, agroforestry, livestock management, reduced burning of grazing and cropland
- Forestry – reducing deforestation and forest degradation, tree planting, restoration of degraded forests

The lists above are not complete and other options may be identified. Expert opinion is used to draw out the options from the lists developed in Step 1. The degree of specificity is also dependent on expert opinion. For example, public transport policies can be grouped as a single NAMA, or can be separated into different NAMAs to cover various programs and initiatives. Source information is indicated for each identified NAMA.

### *Outputs*

The output of Step 2 of the quick screen is a comprehensive long list of potential NAMAs for a given country.

## Step 3: Short List of NAMAs

### *Objective*

The objective of Step 3 is to filter the long list to develop a short list of NAMAs that are potentially implementable in the developing country.

### *Process*

The NAMAs on the long list are analyzed against the following screening criteria:

- **Significant mitigation potential** – Defined as 0.1 per cent of total 2010 emissions, or large enough to have a notable mitigation impact on sector emissions at the national level. The mitigation potential is estimated at this quick screen stage. Those actions with low mitigation potential are removed from the list.
- **Alignment with government priorities** – Actions must build on or contribute to the government’s national and/or sectoral priorities. Actions that are not in line with government priorities are removed from the list.
- **Evidence of existing action** – The NAMA should build upon and feed into existing initiatives to avoid duplication and demonstrate some in-country capacity to implement the action. Existing action could be enabling, planning or investment activities that directly relate to the NAMA. If there is no evidence of similar or complementary initiatives from either the government or major donors, the action is removed from the list.

- **Sustainable development and climate resilience co-benefits** – Recognizing that NAMAs are expected to contribute to sustainable development, and that development is a priority, all short-listed NAMAs are expected to have at least one clear economic, social, environmental or climate resilience benefit.
  - Economic benefits – economic growth, improved livelihoods, increased household income, improved energy security; negative impacts can be increases in energy prices
  - Social benefits – enhanced food security, decreased time for fuelwood collection, improved indoor air quality; negative impacts can be displaced populations, lack of access to forest and grazing lands
  - Environmental benefits – improved local air quality, improved water quality, enhanced biodiversity; negative impacts can be flooding of land, monoculture in tree plantations
  - Climate resilience – improved water availability, reduced soil erosion, reduced deforestation and forest degradation; maladaptation can result from land degradation

The process screens out those actions that do not meet all of the above criteria. In other words, a short-listed NAMA has significant mitigation potential, aligns with government priorities, has sustainable development benefits, and there is evidence of similar action in the country.

This is a high-level screen, where evidence of the above screening criteria is noted in the literature or understood through expert opinion. Analysts are not expected to undertake extensive additional research at this stage, but to use the understanding and knowledge gained in Step 1.

The results of the short list area are organized by UNFCCC mitigation sector, and can be displayed in an Excel spreadsheet. The table below provides an example of a short list of options

**TABLE A1. SHORT LIST FOR THE ENERGY SECTOR**

MEASURE	REDUCTION POTENTIAL (L/M/H)	GOVERNMENT PRIORITIES	EVIDENCE OF EXISTING ACTION	CO-BENEFITS (-/NEUTRAL/+)			
				ADAPTATION TO CC	ECONOMIC DEVELOPMENT	ENVIRONMENTAL	SOCIAL
High-efficiency furnaces and stoves	H			+	+	+	+
Substituting other fuels for wood	H			+	+	+	+
Hydro-electricity	M			neutral	+	+	neutral
Geothermal energy	M			neutral	+	+	neutral
Biogas	M			neutral	+	+	neutral
Methane capture	M			neutral	+	+	neutral

### *Outputs*

The output of Step 3 is a short list of NAMA opportunities that have medium to high mitigation potential, sustainable development benefits, align with government priorities, and likely are feasible to implement because of existing initiatives.

## **Step 4: Review and Development of Draft Country Report**

### *Objective*

To evaluate the short list using an analytical grid that examines NAMAs in the context of mitigation potential, government priorities, current actions and co-benefits.

To prepare a report for country stakeholders that outlines the results of the analysis, including the short list of NAMAs.

### *Process*

The country report can be developed concurrently with the collection and organization of information (Step 1) and the development of the lists of NAMAs (Steps 2 and 3). The report brings together information and context about the country that is relevant to NAMAs. The outline of the country report is set out below:

1. Introduction
2. Quick Screen Methodology
3. Country Overview
  - a. National Socioeconomic Overview
  - b. National GHG Emission Overview
  - c. Overview of Vulnerability to the Adverse Effects of Climate Change
  - d. National Government Priorities
  - e. Identification of Existing National Policies
4. List of Potential NAMAs
  - a. Agriculture
  - b. Energy
  - c. Forestry and Other Land Use
  - d. Industry
  - e. Transport
  - f. Waste
5. NAMAs Evaluation Grid
6. Results
7. References

This report of approximately 15–20 pages in length is an overview of the NAMAs in the developing country, providing context on the economy, government priorities and sectoral actions that inform the selection of priority NAMAs.

### *Outputs*

The country report is the output of Step 4.

## **Step 5: Validation and Finalization**

### *Objective*

The objective of this step is to validate the selection of potential priority NAMAs, including analysis and assumptions, with country experts.

### *Process*

There are various options for validating the NAMAs lists (Steps 2 and 3) and the country report (Step 4). The desired approach is through an in-country stakeholder meeting that includes experts from government, the private sector and civil society. Alternatives are reviewed by a select number of country experts, or reviewed by representatives from the climate change unit. A simple option is to discuss the results with representatives from select ministries or the climate change unit. The method of validation should be noted in the country report.

Discussions with country experts through the validation process will help to determine if actions align with government priorities, if there is sufficient “readiness” to prepare and implement the NAMA, if there are barriers that impact the feasibility of NAMA implementation and if additional actions should be considered in the analysis. Country experts will identify potential priority NAMAs. The NAMA lists and the country report will be revised after local validation and the final lists and report are developed.

### *Outputs*

The final report, which is informed and improved by expert input, is the output of Step 5. The report can also be used for a variety of purposes, including: to form the basis for fact sheets on high-priority NAMAs to attract funding, to form the basis of information of a preparation proposal to submit to the UNFCCC’s prototype registry, and to raise awareness of NAMAs and NAMA opportunities.

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