

CLIMATE CHANGE AND THE ENERGY SECTOR IN BANGLADESH

INFORMATION BRIEF



Photo: IUCN / Istiak Sobhan

KEY POINTS

- The energy sector predominantly covers an integral part of climate change impacts due to contribution of Greenhouse Gases emissions in the global atmosphere from use of fossil fuels for harnessing energy. Impacts of climate change, therefore, is limiting the use of fossil fuels for which there are efforts to gradually shifting towards highly efficient and climate-friendly energy sources and services.
- Mitigation efforts to reduce emissions and energy consumption are voluntary to countries like Bangladesh. However, diversification and technological advancement towards sustainable energy viz. renewable energy services imply increasing options for supply and production.
- This policy paper aims to create an understanding on linkage between climate change and the energy sector of Bangladesh to internalize climate change in relevant policies and implementation strategies in line with the vision of energy security for all by 2020 and the National Energy Master Plan.

INTRODUCTION

Climate change constitutes one of earth's most fundamental challenges and will be so for the coming decades. It is a sustainable development problem because rapid climate change will adversely affect all major ecosystems that support human beings and economic activities that promote human welfare. Burning of fossil fuels such as coal, oil and natural gas are increasing atmospheric concentrations of greenhouse gases (mainly CO₂ emissions) causing global warming and change the climate systems. Scientific research discerns that a human footprint on global warming has increased massively since the Industrial Revolution due to accelerated pace of harnessing energy resulting global rising temperatures. Main challenge is now economic development and social welfare through achieving energy security with minimum damage from emissions causing climate change. Therefore, the energy¹ sector is an integral part to address climate change problems under the United Nations Framework Convention on Climate Change (UNFCCC). Effects of climate change such as high magnitude of natural disasters and change in climatic pattern with extreme weather events have been realized in many least developed countries suffering from energy poverty like Bangladesh. Considering that an energy growth of 1.7% is required for each 1% growth in GDP to attain at least 7-8% GDP growth for poverty reduction², the prevailing dismal situation of energy poverty will impact adversely on GDP growth and means to achieve the Millennium Development Goals.

It has also been realized that energy security is a priority goal for poverty reduction and keys to economic growth. Global energy production highly depend on fossil fuels with largest share consumed by the western countries US, Canada, European Union and Japan with the latest addition by emerging economies of China and India. Although debated by many, emission control by reducing energy consumption focuses on the developed countries. Developing countries and emerging economies are given non-binding voluntary mechanisms of adoption requests for climate friendly technologies and to promote alternative energy/fuel supply. Diversification, innovation and technological advancement in energy production, power generation,

energy services and end use are gaining popularity to drive 'green economy' around the world to combat climate change.

CARBON DIOXIDE EMISSION AND BANGLADESH

Global CO₂ emission for Bangladesh is about 45 million tonnes and only 0.32 t CO₂/ person³, less than 1/5th of one percent of world total - reflecting its extremely low consumption of energy. In 2005, the total GHGs emission from Annex 1 parties⁴ was 18.2 billion tonnes of CO₂ equivalent.

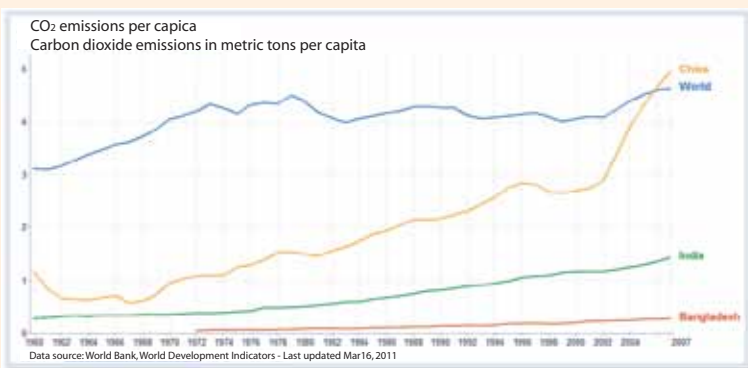


Figure 1: Carbon dioxide emissions in metric tons per capita

ENERGY SECURITY CONCERNS IN BANGLADESH

Bangladesh severely suffers from energy crisis characterized by growing deficits in power and fuel supply leading to energy poverty. Rapid industrial development and economic growth demand an uninterrupted supply of energy presently provided only by using electricity and natural gas. Bangladesh lacks sufficient electricity generation capacity and grid networks to electrify the whole nation and has never enjoyed 100% electrification.

Currently, per capita electricity generation in Bangladesh is the lowest in the world, about 220 KWh/per year. Only 31.2% of the total population is connected to grid electricity (about 80% of urban and 23% of rural households), with the vast majority being deprived of power supply (BBS, 2000, 2008). The Rural Electrification Board (REB), in its master plan 2000 forecasts 97 million

¹ The term 'energy' defined here as fuels or sources used to produce energy or power generated from different fuels/technological sources. Energy sector includes source, production, distribution, power transmission, supply, use and end use of energy for industrial, domestic and commercial purposes. Energy produced and used for transport is excluded in this paper.

² Towards Revamping Power and Energy Sector: A Road Map, Finance Division, Ministry of Finance, GoB, June 2010.

³ 6th Compilation and synthesis of Initial National Communications from Parties, UNFCCC, 25 Oct., 2005.

⁴ Signatories to Kyoto Protocol and UNFCCC are divided into 3 groups for efforts to reduce CO₂/GHGs emissions - Annex I parties: industrialized and economies in transition, Annex II: developed countries which pay for costs of developing countries and Developing Countries.

people with electricity services in 2020 covering 84% of the total rural population. Due to the high cost of transmission and distribution, a large number of rural settlements have not been connected to the grid as they do not meet the load demand criteria. Therefore, it is very clear that many villages and isolated areas may not be connected in the near future to conventional electricity generation and distribution networks.

Box 1: Present Energy Sector at a Glance

(Source: Ministry of Power, Energy and Mineral Resources, Feb. 2010)

Present Energy Scenario:

1. Current average daily gas production: 1970 MMCF (88% share in total fuel supply)
2. Current daily actual gas demand: 2200 MMCF
3. Estimated coal reserve: 3.3 billion tons
4. Present annual extraction: 858,000 tons

Present Power Scenario:

1. Electricity Growth: 5.8 % in 2009 (7.0 % Av. since 1990)
2. **Total Consumer: 11.5 Million**
3. Transmission Line: 8300 km
4. Distribution Line: 2,60,000 km
5. Distribution Loss: 14.6%
6. **Per Capita Generation: 220 KWh / annum**
7. **Access to Electricity: 47 %**
8. Present Generation Capacity (Derated) (MW) : 5250
9. Present Demand (MW) : 4200 ~ 5500
10. Present Available Generation (MW) : 3800 ~ 4300
11. Recent Maximum Generation (MW) :4296 (Sep 18, '09)
12. Maximum Load Shedding in FY-09 (MW):1270 (April 23, '09)

Intermittent power supply and load-shedding are common in summer and in the dry season. Thus, there is a huge unmet commercial demand for energy as the shortfall of power generation capacity is estimated to be around 2500 MW for the next 5 years.⁵ As a result, lack of a reliable electricity service has deterred foreign investment and held back economic growth. While the need for investment in the energy sector is a great challenge faced by the Government of Bangladesh, other important issues such as system losses and unpaid-electricity fees or low revenue are major concerns for this sector. Around the year, the country faces serious shortbacks from the energy supply shortage with power

plants operating at least 450 MW in less capacity. Such inefficiencies in power generation hinders secure services and block development until new primary fuel become viable for large-scale use in the country.

Current shortage in electricity production is about 1500-1800 MW per demand of peak hours. As the concept of energy mix is not given due consideration there is an overwhelming dependence on natural gas as primary fuel for power generation. At present, 88% power plants are run by natural gas which is constrained by supply factor for low reserve. Present average daily gas production is about 1970 MMCF against actual demand of 2200 MMCF⁶ resulting a deficit of 230 MMCF/day. Current information indicates that the existing gas reserves will be able to meet the gas demand (at 7% per annum) up to 2016. As the current reserves (12 trillion cubic feet) would be unable to meet the increasing demand, a total investment of USD 9.5 billion would be required altogether for generation, transmission and distribution of power. About 3.3 billion tons of coal reserves comprising 5 deposits at depths of 118-1158 meters have been discovered so far out of which 4 deposits (118-509 meters) are extractable at present. Currently, it is not viable to extract at greater depths (640-1158 meters). Moreover, over 63% of total production comes from public sector while private sector contribution is inadequate. There is also problem relating to management of the growing demand.⁵

ENERGY CONSUMPTION AND PATTERN IN BANGLADESH

Bangladesh is one of lowest energy consuming countries of the world. About 89 kgoe/capita energy consumption⁷ and 220KWh/day/person power consumption⁵ making Bangladesh the lowest energy consuming nation after Nepal in South Asia. The highest user group comprise resident user with 75% rural fuel supply coming from biomass. Urban energy consumption mix mainly consists of domestic, industrial, commercial and transports. In total of 8000 million KWh grid electricity is consumed by the industrial consumption⁸ implying the highest potential to become energy intensive end user with efficiency potentials yet to be explored. Following figure 2 shows percentage share of energy use by power utilizing sectors.

⁵ Towards Revamping Power and Energy Sector: A Road Map, Finance Division, Ministry of Finance, GoB, June 2010.

⁶ Personal communication, Ministry of Power, Energy and Mineral Resources, September, 2010.

⁷ Ministry of Environment and Forest (MoEF). (2009). *Bangladesh Climate change Strategy Action Plan, 2009*, Government of the People Republic of Bangladesh.

⁸ Infrastructure Investment Facilitation Center (IIFC). National Issues Report on Key Sector of Energy (Mitigation). National Workshop on Capacity Building for Policy Makers on Climate Change, 12-13 Nov, 2008. Press Club, Dhaka.

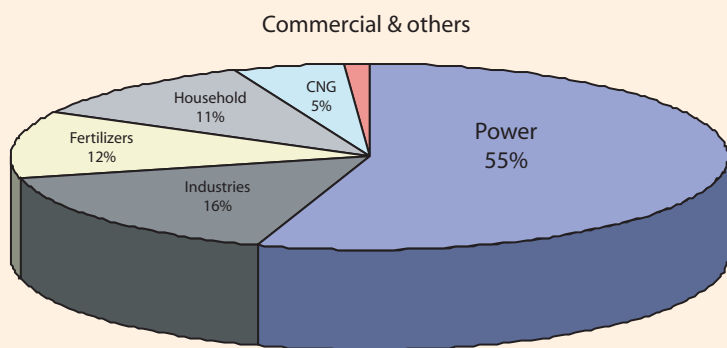


Figure 2: Sectorwise share of gas use

Source: Energy and Mineral Resources Division

From these, it is imperative to note increasing demand of industrial use and power generation compared to economic activities denoted by commercial-residential uses. It points out to problematic saturation regarding energy services, efficiency and allocation as observed by demand of fertilizer factories in energy share of the country.

In countries like Bangladesh where high population depend on small piece of land, energy and food security concerns impose greater challenges. Bangladesh needs optimum production of also food grains from rapidly diminishing agricultural lands that require increasing supply of inputs and uninterrupted power supply for irrigation. Climate change causing infrequent droughts, unilateral withdrawal of water on the upstream of common rivers, massive siltation and pollutions of all rivers and streams, encroachment of rivers, canals and streams have made surface water for irrigation scanty. This adds to growing paddy cultivation around the year like winter rice - *Boro* farming. Agriculture Extension Department has fixed 7,69,263 hectares of land alone in all the eight districts of Rangpur division for *Boro* farming.⁹ According Power Development Board (PDB) in Rangpur, there are 62,494 power run irrigation machines consuming about 130-140 MW power/present season although electricity demand during *Boro* season is 323 MW in this zone.

The demand of electricity in irrigation is also growing since the cost of power driven pump is lower compared to the diesel driven pump. The Ministry of Agriculture

has estimated that 1664 MW of electricity is needed to feed 2,46,000 electricity driven pumps.¹⁰ The 2010 demand is 100 MW more than the previous year while the growth of demand for electricity in agriculture sector is 8 - 9 % on an average.¹¹ The number of irrigation pumps is 15, 00,000 of which about 2,50,000 are operated by electricity.¹² Present monsoon irrigation has added about 1200 MW additional power load and continuing drought and humidity have also increased power demand.¹³ After mid-May irrigation load gradually comes down and the onset of monsoon reduces power demand. Palli Bidyut Samity across the country received about 3, 00,000 applications in 2010 from farmers for electricity connections to run their irrigation pumps during summer. Following rationing of power supply, the farmers are in precarious position to irrigate their lands. On the other hand, frequent load-shedding followed by low voltage is causing the irrigation machines to go out of order resulting serious financial loss for the poor farmers, particularly in Northern districts. The REB authorities have submitted a Tk 300 crore project titled "Improvement of existing distribution system to meet the demand of irrigation" to the planning commission to boost the irrigation.¹⁴

IMPACTS OF CLIMATE CHANGE ON ENERGY SECTOR

Climate change impacts in energy production linked to fuels, energy infrastructures and energy use. Current, policies and impact assessment comprise in CO2 emission reduction energy through using efficient technological advancement and fuel switch. However, limited studies are available in determining impacts of climate change and climate variability on the energy sector in developing countries. In most cases, climate change and energy relationship translates to mitigation efforts and transition to renewable energy sources. Actual quantification or valuation of climate-related disasters and changes to any part of energy-power generation to end-use pathway is missing. In production and use of energy, climate change impacts – i) consumption of energy, ii) production and supply of energy and energy services, and iii) indirectly by shaping supply/production and

⁹ Power Crisis Hits *Boro* Farming in Northern Districts. Energy Bangla. Feb. 14, 2011. URL: <http://www.energybangla.com/index.php?mod=article&cat=PowerSector&article=3077>.

¹⁰ Call to Provide more Power for *Boro* Irrigation. Energy Bangla. Feb 28, 2011. URL: <http://www.energybangla.com/index.php?mod=article&cat=PowerSector&article=4596>.

¹¹ Ibid.

¹² Ibid.

¹³ Kh.A.Saleque. Confronting Energy "Famine?" e-Bangladesh. April 17, 2010. URL: <http://www.e-bangladesh.org/2010/04/17/confronting-energy-%E2%80%9Cfamine%E2%80%9D/>.

¹⁴ Ibid, see footnote 2, 3.

consumption pattern of energy. Rising temperatures will increase demand of summer to post-monsoon and spring season power intake for cooling, heating, irrigation etc. purposes. This may be additional burden on scarce supply of electricity as well as affect energy costs and their demands on energy supply institutions. Impacts can be significant on production and supply: (a) if extreme weather events become more intense, (b) where regions dependent on water supplies power plant cooling to face reductions in water supplies, (c) temperature increases may change overall power generation efficiencies, and (d) changed conditions affect facility setting decisions. Most effects are likely to be severe for possible regional effects of extreme weather events and water shortages.

In areas with an increase in flooding and excessive rainfall, impacts on groundwater levels and on seasonal flooding could have a different set of impacts. For existing plants, these impacts could include increased costs to manage on-site drainage and run-off, changes in raw material handling etc. For renewable energy sources, energy resource production and delivery systems are mainly vulnerable to effects of sea level rise and extreme weather events.

Some impacts on energy production in Bangladesh could be predicted as below from various evidences:

- Seasonal and daily temperatures and precipitation changes affect the timing of peak electricity demands and the size of these peaks.
- Extended periods of drought lead to reduced water availability for hydropower generation as well as water availability for heating/cooling in power plants.
- Changes in temperature and precipitation affect water availability for cooling power generators.
- Changes in cloud cover, temperature and pressure patterns directly affect wind and solar resources (affecting resource availability or productivity).
- Increased intensity and frequency of extreme weather events impacts on energy infrastructure, power plants, transmission lines,

refineries, oil and gas drilling platforms, pipelines and power lines resulting high energy prices.

- Increased intensity and frequency of severe weather events impact design and safety requirements of future energy infrastructure and other capital investments.
- Increased occurrence of blackouts may be observed as a result of higher electricity demand for cooling and refrigeration caused by higher temperatures.
- Changes in precipitation could affect prospects for hydropower, positively or negatively.
- Drier than historically normal conditions appear to have a greater detrimental effect on overall benefit-cost ratios than positive effects expected under wetter than normal conditions.¹⁵
- Increase of energy used to supply other resources for climate-sensitive processes, such as pumping water for irrigated agriculture and municipal uses.
- Changes in the balance of energy use among delivery forms and fuel types, as between electricity used for air conditioning and natural gas used for heating.
- Changes in energy consumption in key climate-sensitive sectors of the economy, such as transportation, construction, agriculture, and others.

Climate change has other effects that indirectly shape energy production and consumption in Bangladesh. Based on mixed evidence, it appears that climate change is likely to affect risk management in the investment behaviour of some energy institutions, and it is very likely to have some effects on energy technology R & D investments, energy resource and technology choices. In addition, climate change can be expected to affect other countries in ways that in turn affect Bangladesh energy conditions through their participation in global and regional energy markets. Climate change concerns could interact with some driving forces behind policies focused on in-country energy security.

¹⁵ Paul Block and Casey Brown. Does Climate Matter? Evaluating the Effects of Climate Change on Future Ethiopian Hydropower. The Third Interagency Conference on Research in the Watersheds, 8-11 September 2008, Estes Park, Colorado, USA.

MANAGING CLIMATIC HAZARDS

The economic costs of internalizing current energy externalities will require a basic reordering of the global economy as well as the nation's. Many countries have come forward to reduce GHGs emission as realized objectives of the Kyoto Protocol and beyond. In 2002, World Summit of Sustainable Development agreed that sustainable development requires direct refocus on sustainable energy development translating mainly into access to energy services which is reliable and affordable, and contribute to halving poverty by 2015. An international (non-binding) regime is at place to allow global use of market-based mechanisms to reduce global GHG emissions and to increase carbon sinks (storage of GHGs) in nature. These mechanisms promote sustainable development by letting economic development to base upon more efficient energy production and services. In Bangladesh, like many countries, Clean Development Mechanisms (CDM) is being encouraged by fuel switch, energy efficiency, use of renewable energy and conversion to technology to reduce GHGs.

Mitigation

Mitigation of climate change impacts in the energy sector comprises reducing GHG emission through supply and demand sides efficiencies, use of energy efficient and durable technologies (such as improving fuel quality and plant conversion efficiencies, Compact Fluorescent Lamp/CFL, low-energy consuming electronics, clean-coal development), strategic conservation, load management and intermediate steps towards transition towards low-carbon path. For countries like Bangladesh, mitigation efforts can be built in demand-side management through power conservation to manage current energy crisis. The more energy is saved, the more adequate will be the existing storage capacity as well as the margins of installed capacity over demand, and the lower will be the import dependence.

Adaptation

Energy sector adaptation to climate change is enormous as it demands change in production and use of fuels and energy services. Renewable energy resources such as solar, wind, hydropower, biogas, biofuel etc. can reduce the pressure on conventional fossil fuel supply although require large-scale capital investment. Other possible adaptation measures include technologies that minimize the impact of

increases in ambient temperatures on power plant equipments, technologies that conserve water-use for power plant cooling processes, planning at the local and regional level to anticipate storm and drought impacts, improved forecasting of the impacts of global warming on renewable energy sources at regional and local levels, and establishing action plans and policies that conserve both energy and water.

FINANCING ADAPTATION IN THE ENERGY SECTOR

Finance for climate change in the energy sector of Bangladesh is one of the most crucial parts which require immediate attention under adaptation and mitigation measures. Additionally, energy sector reform can be envisaged linking climate change financing instruments to supplement and adhere to the sustainable energy for all principle for the country. Moreover, low carbon energy technologies and systems are unlikely to be widely deployed unless they become cheaper than traditional generation or if policies to support their uptake are not duly adopted. Current challenges in the energy and power sector finance is associated with absence of adequate public and private investment in power generation, absence of Cost Reflective Tariffs, absence of Primary Energy supply chain and lack of effective revenue collection system. These barriers could be addressed through adopting decentralized renewable energy schemes in addition to conventional energy systems. Implementation in low emission energy projects will help pave the way for banks to increase their sustainable energy finance portfolios and decrease their non-performing loans by making them more aware of environmental risks.

The government has already allocated Tk 7 billion to build Climate Change Trust Fund and finalizing the Draft Climate Change Trust Fund Act, 2010. The government has allocated Taka 1,400 crore in 2009-2010 and 2010-2011 fiscals for Climate Change Trust Fund. So far 44 public sector projects and 52 projects submitted by different non-government organizations were given approval by the trustee board at a cost of Taka 487.94 crore.¹⁶

Organizations such as IDCOL promote dissemination of solar home system (SHS) in the remote rural areas of Bangladesh through its Solar Energy Program with the financial support from the World Bank, Global Environment Facility (GEF), KfW, GTZ, Asian

¹⁶ Ministry of Environment and Forest, pers. Comm. November 2010.

Development Bank and Islamic Development Bank. Its initial target was to finance 50,000 SHSs by the end of June 2008 achieved in September 2005, 3 years ahead of schedule and US \$ 2.0 million below estimated project cost. IDCOL then revised its target and decided to finance 200,000 SHSs by the end of 2009. Currently, IDCOL's target is to finance 1 million SHSs by the end of year 2012.

Therefore, international financing institutions in line with national climate change funding institutions and private finance must play synergistic roles in mobilizing the resources needed for transformation. Cluster funding mechanisms to train bankers on evaluation of plans and projects can be undertaken that serve the need of renewable energy and energy efficiency market.

POLICY AND INSTITUTIONAL ARRANGEMENT

National policies on energy can be linked to measures of mitigation and adaptation pertaining to enabling conditions for private and public sector investment and service implementation. In line with the National Energy Policy 1996, the government has adopted the following policy measures:

- Private Sector Power Generation Policy of Bangladesh adopted in 1996;
- Policy Guidelines for Small Power Plants (SPP) in Private Sector in 1998;
- Guidelines for Remote Area Power Supply Systems (RAPSS) in July 2007;
- Policy Guidelines for Enhancement of Private Participation in the Power Sector in 2008;
- Renewable Energy Policy of Bangladesh adopted in January 2009;
- The government has highlighted mitigation of climate change by reducing reliance on fossil fuels and encouraging the removal of GHGs from the atmosphere as one of the pillars of Bangladesh Climate Change and Strategy Action Plan 2009 (BCCSAP'09). Transition to low-carbon economy has been set as goal that also matches with the Vision 2020 Power perspective Plan to increase use of renewable resources and DSM.

At present, it is estimated that renewable sources of power generation is about 20 MW.¹⁷ Besides the conventional energy, in order to promote the renewable energy the activities of Sustainable Energy Development Authority (SEDA) have been accelerated. As per approved renewable energy policy 5% of the total generation (450 MW) would be added by 2015 and 10% of the total generation (1600 MW) would be added by 2020 from renewable sources. Infrastructure Development Company Limited (IDCOL) was established in 1997 by the Government of Bangladesh (GoB). It promotes and supports renewable energy projects from financial supports received from the international donor agencies. Bio-gas and solar powered Small House Systems (with IDCOL's project) have been installed in many parts of Bangladesh. Gasifier-based systems and wind turbines are under trial, along with micro hydro plants. GoB has initiative for integrated power generation and distribution facility under Remote Area Power Supply System, to reach off-grid remote rural areas or isolated islands. There is also large number of small captive power plants having capacity of about 1000 MW in different private industrial units across the country. The following renewable energy sources have huge potential in Bangladesh that currently focus on small-scale off-grid solutions.¹⁸

- **Solar energy:** Average solar radiation in Bangladesh varies from 5.05 KWh/sqm in winter to 8.76 KWh/sqm in summer which permits to harness solar energy effectively. In Bangladesh, with abundance of sunlight and sub-tropical summer seasons, solar energy can induce wide coverage of household to commercial energy services across the country.
- **Wind energy:** Long-term wind flow in Bangladesh in islands and coastal belts indicates average wind speed to remain between 3- 4.5 m/s for months of March to September and 1.7- 3.3 m/s for the remaining period for the year. Wind has very little in Bangladesh for power generation although the government has planned to set up 100 MW wind-mills at the coastal island and chars in south eastern part of Bangladesh by 2020.
- **Co-generation:** Technical co-generation potential for industrial, commercial and agricultural use is about 1000MW which shows significant improvement in energy supply.¹⁸ Utilization co-generation requires awareness and advanced technical know-how if efficiency is concerned to 85% from conventional 35%.

¹⁷ Energy and Power. Bangladesh Development Forum 2010, Dhaka. Ministry of Power, Energy and Mineral Resources. Feb 2010.

¹⁸ IIFC. Nov. 2008.

- **Biogas:** Presently there are tens of thousands rural village-level household biogas plants in the country used for cooking and electrification during power shortfalls.
- **Hydro:** There are micro and mini-hydro limited potential in Bangladesh excluding in Chittagong and CHT.
- **Bio-fuel:** Large-scale biotechnological production of such enzymes could allow the conversion of agricultural waste into bio-fuel. Bangladeshi scientists should get involved in this type of research as production of bio-fuels from waste material has huge potential in our country.

CONCLUSION AND RECOMENDATIONS

At present, Bangladesh is poised towards going to industrialization path for which per capita emission would be increased. Commercial emission of GHGs such as CO₂ is negligible in Bangladesh, from a global perspective, if the trend of widespread usage of solar home systems can be extended in all developing countries including Bangladesh, the emergent global environmental benefit of mitigating GHGs could be quite significant. If such efforts do become reality, this will result in: i) avoidance of fossil fuel use for providing electricity in rural areas; and ii) lowering of renewable energy technology and faster cost recovery of solar

photovoltaic/other in the global market, stimulating applications in both developed and developing countries that would otherwise have been delayed. At the same time, accelerated adoption of an environment-friendly policy to harness non-renewable resources (such as coal) is to be made a priority.

Comprehensive assessment & documentation will be needed so that new findings may lead to a change in perception and valuation of energy technology alternatives, energy policies and decision-making processes of the country. Institutional development for promoting the reduction of CO₂, and awareness and capacity building in low carbon technologies with implementation strategies will be needed in the energy sector and it associated high-impact sectors like industry and agriculture.

There is a huge scope for the country to develop faster without emission caps and take leap-frog in efficient modern energy production and technologies. The range of options varies from improving energy mix to renewable energy systems to innovative technological advancement to eradicate energy poverty. These are also coupled with increasing trade liberalization (fuel trade, generation and distribution) and creation of diverse investments in continental energy market. The strategy for Bangladesh is, therefore, to learn about energy efficient technologies and embed them into planning process for future uptake.



Ministry of Environment and Forests
Government of the People's Republic of Bangladesh

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