Year 19: Issue 66
October-December 2020

Wetland with full of Water Hyacinth

the CEGIS NEWSLETTER

Safeguarding Environment for Future

Upcoming

- Visit of Honorable Chairperson of the Board of Trustees to CEGIS
- City Level Climate Change Vulnerabilities and Infrastructures Assessment
- Opportunities of Groundwater Management in Bangladesh

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Dissemination Workshop on Dredging at the Outer Bar Area of Mongla Port Channel

Mongla Port has adequate logistics and capacities to handle 10.5 m draft cargo vessels. However, the existence of a wide bar at the entrance of the Passur River prohibited vessels with larger drafts to enter into the anchorage area. In this regard, the GoB has undertaken a project titled "Dredging at the Outer Bar Area of Mongla Port Channel". To observe the performance, evaluate the targets, and overcome the shortfalls, Mongla Port Authority (MPA) awarded CEGIS with "Monitoring the performance of the dredging in connection with hydrological & morphological impacts and assessment of the effectiveness of dredging at the outer bar area in the Passur Channel of Mongla Port". CEGIS was engaged for the said consultancy services from August 2018 to Dec 2020. During this project period, CEGIS with the developing partner HKRE-CCECC conducted joint surveys and examined the correctness of the pre, post & interim hydrographic surveys to ensure 8.8 mCD (including 0.3 m tolerance) draft throughout the two sections which have ensured safe passage for vessels with 10.5 m draft into the Pussur Channel to the Mongla Port. In addition to these, CEGIS also monitored the environmental issues associated with the proposed dredging. CEGIS monitored the application of the Environmental Management Plan (EMP) as per directions provided in the EIA study of the project and conditions specified in the Department of Environment (DoE) clearance.

CEGIS upon, completion of the dredging activities by the development partner HKRE-CCECC and submission of the Draft Monitoring Report, organized a workshop on 29 December 2020 at the conference room of the Chairman's Office (MPA) to disseminate the outcomes generated during the implementation of the dredging activities. The honorable Chairman Rear Admiral M. Shahjahan (NPP, NDC, PSC, BN), along with Mrs. Yeasmin Afsana, Member, Engineering & Development, Mr. Sk. Sowkat Ali, Chief Engineer, Civil & Hydraulics, Mr. Md. Bazlur Rahman, Deputy Chief Engineer, Hydraulics, and other concerned high officials of MPA were present in the workshop. The honorable Executive Director, Mr. Malik Fida A Khan; Mr. Md Motaleb Hossain Sarker, Director; Dr. Maminul Haque Sarker, Senior Advisor;

Cont'd at page 3

Coastal Resilience: Developing New and Innovative Approaches in India and Bangladesh along the Bay of Bengal

Benzir Huq Mou, Water Resources Management Division

The World Bank has planned to expedite and review the physical and socio-economic setting of the coastal communities along with the past and current interventions to increase their resilience, including multi-purpose cyclone and flood shelters, roads and bridges, hydro-meteorological services enhancements, early warning and dissemination systems, coastal embankments, erosion control measures, coastal governance and Community-based Disaster Risk Management (CBDRM). In order to achieve this goal, a project has been started and this documents the results of Phase 1 of the Technical Assistance (TA) "Improving the empirical evidence and analytical support on future investments", which is the first Component of "Coastal Resilience: Developing New and Innovative Approaches in India and Bangladesh along the Bay of Bengal".

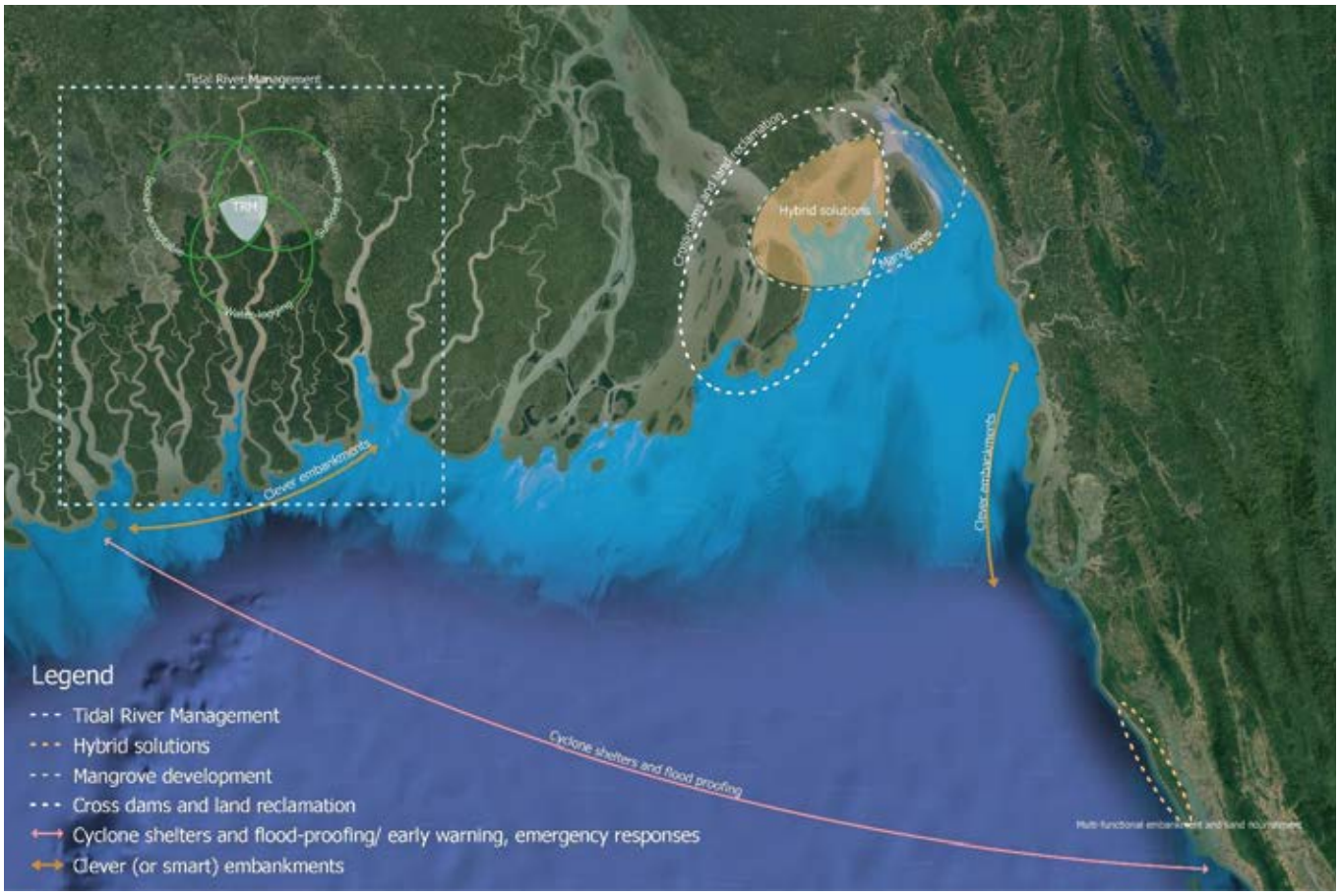
For this Phase 1 of the TA, 76 mainly donor-funded projects (Bangladesh 36, India 40) with a total investment of over US$ 9 billion (2018 price level) from the 1960s till now have been screened and classified using the coastal resilience cascade with 5 intervention categories: Hazard Reduction, Coastal Protection, Landuse Regulation & Planning, Impact Reduction and Residual Risk Reduction. This was followed by an in-depth assessment of a selection of interventions through interviews with key stakeholders, field visits and literature study. Also, a re-analysis allowed a quantification of impacts of four key interventions. Combining these observations enabled us to identify the performance and impact of past interventions with respect to coastal resilience and cost benefit ratios and draw conclusions and lessons learned for future investments.

Over the past 60 years, the main emphasis to reduce coastal risk in Bangladesh has been on three pillars from the coastal resilience cascade: protection against storm surge (polder embankments rehabilitation and improvement programs), reduction of the cyclone impact (cyclone shelters & early warning systems programs) and residual reduction of risk (livelihood improvement and awareness/preparedness programs).

An in-depth assessment of the four key interventions in Bangladesh implemented in the past decades (polder development, shoreline stabilization, cyclone shelters/early warning, land use planning) provides insight into their potential to reduce risk by: Polder development improved livelihoods and reduced risks, Shoreline stabilization projects show success stories and mixed results, Cyclone shelters and early warning have significantly reduced risks, Coastal planning and policy need strengthening.

The assessment of the past interventions in Bangladesh presented in this report reveals various challenges which should be considered if future investment programs are to be developed. Six key issues are summarized below: stronger link needed between the strategy/policy for the coastal zone and the implemented interventions, project implementation requires more realistic planning, operation & maintenance needs more attention, tidal riverbank and coastal erosion are becoming an increasing risk in the coastal zone, water logging in polders could worsen but can be resolved, better analytical knowledge base improves decision-making.

In summary, embankments and shelters/early warning are proven interventions for reducing cyclone risk in the coastal zone in Bangladesh and India and thereby improving livelihoods of millions of people in the coastal zone. Also, mangrove restoration were successful in specific parts of both countries to stabilize the coastline. The analysis also revealed that, although interventions by themselves can contribute to increasing coastal resilience, their effectiveness and sustainability often depends during the impleme ntation.



Proposed Coastal Intervention Locations

Contract Signing for Different Studies

During fourth quarter of the year 2020 (October-December), CEGIS has signed nine number contracts with different organizations and clients. The contract titles with date of signing are given below:

i) Optimizing the Dredging in the Padma, Meghna, Jamuna, M-G Cannel, Tetulia, Surma, Arial Khan, Sitalakhya, Kumar, Lower Kumar, Shibsha, Pasur, Turag, Balu, Buriganga, Modhumati, Ichamoti, Lalmohon, Boral, Kalabodor, Sugandha, Kumarkhali, Hurasagar, Khagdon, Pona, Gomoti, Karnatoli Canal, Kirtonkhola, Lohalia, Lawkhati, Machkhata Canal, Kocha, Brahmaputra, Sugandha, Bakkhail Rivers and other routes for Emergency purpose with other necessary needs by BIWTA and also monitoring of the dredging activities and volume calculation for the year 2020-21 with Bangladesh Inland Water Transport Authority (BIWTA) on 13 October 2020;

ii) A Study on baseline development of SDG Indicators: 6.6.1 and 15.1.2 with Department of Environment (DoE) on 1 November 2020;

iii) Training of Trainers (ToT) on IWRM with Bangladesh Water Partnership (BWP) on 1 November 2020;

iv) Action Research Examining for the Ecological Dynamics of Reforestation at Landscape Level for Strengthening Resilience with Local Government Engineering Department (LGED) on 12 November 2020;

v) Conducting Environmental Monitoring Report (EMR) & Social Safeguard Report (SSR) for Construction of 132/33/11 kV Grid Substation in DESCO Area with Dhaka Electric Supply Company Limited (DESCO) on 30 November 2020;

vi) Environmental Monitoring Report (EMR) & Social Safeguard Report (SSR) for Augmentation and Rehabilitation of Distribution System in DESCO Area (for 24 nos. 33/11 KV Sub-station) with DESCO on 10 December 2020;

vii) Carrying Out Comprehensive Environmental & Social Impact Assessment (ESIA) including Land Acquisition Plan (LAP) and Resettlement Action Plan (RAP) for Nawabganj Economic Zone with Bangladesh Economic Zones Authority on 20 December 2020;

Contract Signing between BEZA and CEGIS

viii) Baseline Survey, Mid-term Evaluation under Sustainable Coastal and Marine Fisheries Project (SCMFP) with Department of Fisheries on 22 December 2020;

ix) Supplementary ESIA study for the Development of Water Distribution and Supply Facilities at Purbachal New Town Project through Public Private Partnership Project Basis with Rajdhani Unnayan Kartripakkha (RAJUK) on 27 December 2020.

Dissemination Workshop on ... Cont'd from page 1

Brigadier General Ahsan Huq Miah (Rtd.), Former KDA Chairman & Senior Advisor; Mr. Md. Rafiqul Alam, Former Director-General of RRI and Advisor of CEGIS; Dr. Md. Shahjahan Ali, Professor of KUET, and other concerned professionals of CEGIS also attended the workshop. Ms. Jakia Akter, Senior Specialist of River, Delta, and Coastal Morphology Division of CEGIS presented the findings and interpretations of the project through PowerPoint. The workshop was a success with the valuable feedback from the audience.

CEGIS Environmental Lab ... Cont'd from page 5

photometer that gives real-time aerosol mass readings in air, based on the scattering of light by the particles and collects environmental air sample. It uses a sheath air system that isolates the aerosol in the optics chamber to keep the optics clean for improved reliability and low maintenance. It is suitable for low consumption for continuous, unattended monitoring in remote outdoor locations, clean office settings as well as harsh industrial work places, construction and environmental sites. It is used for measuring air pollutants like PM1, PM2.5, PMresp, PM10 and PMtotal of different project like Rampal power plant project, Environmental monitoring of 24 substation of distribution system in DESCO Area etc. In CEGIS, this instrument will be used in the aerosol research studies, engineering studies, engineering control, evaluations, industrial/occupational hygiene surveys, outdoor environmental impact assessment and monitoring, process monitoring and so on.

New Face

Lt Col Syed Afzalul Abedin, psc, MDS, MBA (Retd.) joined CEGIS on 3 August 2020 as Director of Administration, Finance, Accounts, Audit and Logistics Division. Mr. Abedin was an upper level military officer who has challenging career of over 30 years in the crops of Infantry of Bangladesh Army. He has experience of working in multinational environment, United Nations (UN) as Peace Keeper in Mozambique and Sierra-Lion, experienced in disaster and crisis management both home and abroad, and commanded multi group forces RAB, BGB & Police. He has experience in human resources, operations, administrations, security strategy and planning.

He completed MBA (Major in Human Resources & Organizational Behavior), awarded Chancellor's Gold Medal and Masters in Defense Strategy (MDS) and Pass Staff College (PSC) from Defense Service Command and Staff College (DSCSC). He is an ex-cadet of Jhenidah Cadet College and an active member of JEXCA.

Initial Environmental Examination for Infrastructure Development of Power Evacuation Facilities of Rooppur Nuclear Power Plant

Tanvir Ahmad Rifat, Socio-Economic and Institutional Division

The Power Grid Company of Bangladesh (PGCB) intends to implement the project named "Infrastructure Development of Power Evacuation Facilities of Rooppur Nuclear Power Plant" which will ensure the capacity of electricity supply in different parts of the country. This project will ensure a sustainable power transmission that will be generated from the first nuclear power plant in Bangladesh named Rooppur Nuclear Power Plant. The proposed project is expected to construct transmission lines and finally support power supply to the existing transmission network of the Power Grid Company of Bangladesh (PGCB). CEGIS conducted the Initial Environmental Examination (IEE) study for this project.

The entire project is to construct 638 km long five transmission lines starting from Rooppur Nuclear Power Plant, which are:

i) Rooppur - Dhaka (Aminbazar-Kaliakoir) 164 km, 400 kV double circuit transmission line,

ii) Rooppur -Dhamrai, 167 Km 400 kV double circuit line (Initially operated at 230 kV),

iii) Rooppur -Gopalganj 155 km 400 kV double circuit line,

iv) Rooppur -Bogura, 89 km 400 kV double circuit line,

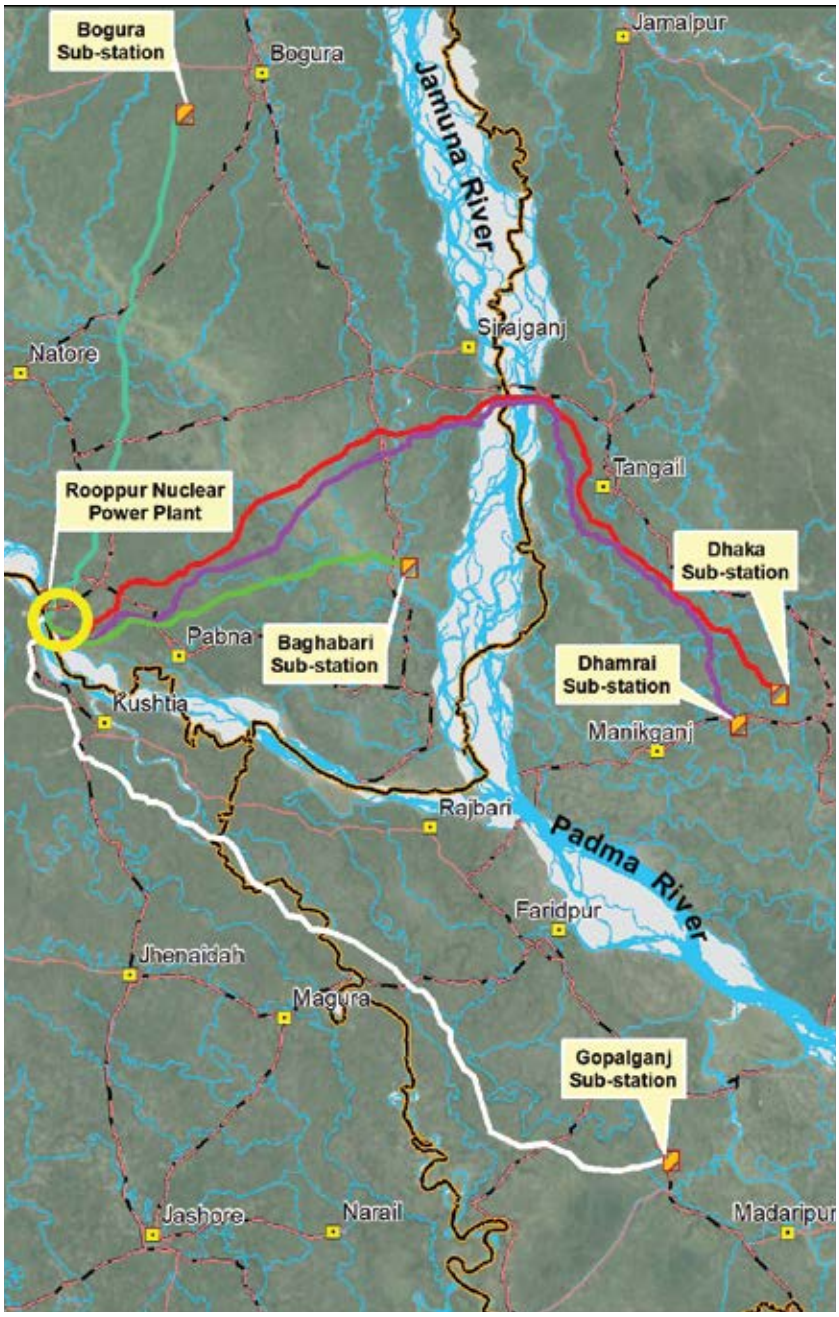
v) Rooppur -Baghabari, 63.89 km 230 kV transmission line.

In line with the national relevant legislation and Environmental Conservation Act (ECA), 1995 (amendment 2010) and the Rules, 1997 (amendment in 2017) with subsequent amendments to exercise these acts, this project falls under Orange B category.

The long transmission line will cross through 10 districts starting from Pabna (Rooppur Nuclear Power Plant). For impact analysis CEGIS team has identified 20-meter strip of transmission line as Direct Impact Area (DIA) and treated a 40 meter strip of both side of RoW as general impacted area. Around 1909 towers will be installed for implementing the project including 20 river bed towers which will cross the Padma and the Jamuna Rivers. CEGIS team has conducted erosion analysis and navigation draft and the rivers. Besides, the flood prone area and water level of the rivers will also be also analyzed in terms of impact due to construction activity. Different hydrological and environmental quality (air and surface water) will also be analyzed. In nutshell, probable impacts have been identified and mitigations measures for those issues are suggested.

CEGIS team also analyzed Ecologically Critical Area (ECA), Protected Areas, Forest Areas, Ramsar Sites, World Heritage Sites, Important Bird and Biodiversity Areas and International Migratory Bird Flyway and breeding places.

The transmission lines will not cross any areas of those areas. Apart from that around 19,197 trees and 1,380 structures are found in the 20-meter strip. CEGIS team suggested proper mitigation measures for this during construction period. About 13 million dollars is regarded as the Environmental and Social Management Plan (ESMP) budget. CEGIS team conducted the field visit during Covid situation (August, 2020) maintaining proper safety and security. About 21 consultation meetings were conducted with different stakeholders during these field visits. Special measures were also suggested during construction activity keeping in mind about Covid-19 crisis.



Five transmission lines from Rooppur Nuclear Power Plant to five different Sub-stations

Moreover, CEGIS team presented the report to Department of Environment (DoE) on 24 January 2021 and this report has been approved by DoE.

CEGIS Environmental Lab: DustTrak DRX Aerosol Monitor

Md. Rafiqul Alam, Water Resources Management Division

DustTrak DRX Aerosol Monitor

This Monitor is a continuous, real time, laser photometer that simultaneously measures mass concentrations (mg/m3) and size fractions PM1, PM2.5, PM Respirable, PM10 and PM total of particulate matter such as dust, smoke, fumes and mist in air. It has color touch screen. It is easy to read display which shows mass concentrations and graphical data. It can program start time, total sampling time, logging interval, download data, upload sampling programs, view data, statistical reports and create graphs which are printable as output. Its application includes: industrial hygiene investigations, industrial machinery check-up to keep comfortable air pollutants, to safe and healthy life of people by the evaluation of industrial air pollutants or labor health environment at offices, factories, roads, urban areas, or construction works. CEGIS has one Dust Trak Monitor and the model of which is desktop 8533EP, TSI incorporate, USA. It is used for outdoor monitoring applications. It has power connecting cable and flow tubing cable. The external pump should be first connected and then Dust Trak Monitor has to turn ON. Inlet cap should be put over during air sampling. It is factory calibrated and is optimized as per ISO Standard. Zero calibration is required for every use. Inlet and 2.5 impactor should be cleaned.

Startup screen is displayed when the instrument is ON. Run mode tab brings up sampling mode options. It includes Survey, Manual and Log mode. Manual mode is used to set the instrument for logging data for specified run time. Log interval can be set from 1sec to 60 sec. Test length can be set from 1 min to the limit of data storage. Time constant can be set from 1 to 60 sec. In manual mode, data will be stored to file named 'Manual XYZ'. Prior to start the measurement should be zeroed from the setup screen. Start button will have to be pressed To start taking measurements. The readings of mass concentrations and size fractions will be displayed on the screen. MIN, MAX, AVG and TWA data can be seen by pushing fraction size button. Display of current readings in graphical form can be seen during sampling. Data button opens a list of data files for viewing with file name, date and time.

Basic Principle: Leading the industry in real-time dust monitoring, it can simultaneously measure mass concentrations and size fractions. It is a multi-channel, battery-operated, data-logging, light-scattering laser

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Nature: Water Hyacinth and its Productive Management

Mashuda Parvin, Ecology, Forestry and Biodiversity Division

Water Hyacinth (Kochuripana)

Water hyacinth (Eichhornia crassipes) known as Kochuripana in Bangladesh is a fast growing tropical free-floating aquatic plant and originated from Amazon Basin of South America.

This perennial herbaceous plant belongs to the Family Pontederiaceae and all the species in the Genus Eichhornia are aquatic. Water Hyacinth shows considerable variation in both leaf and flower form and colour, also depending on the age of the plant. The flowers are bluish purple, large and self-fertile.

Now the plant is treated as invasive species due to its fast growing within the wetland surface and hence it is called 'noxious weed'. Floating mat of water hyacinth hinder sufficient light penetration to underwater and slow down the photosynthesis of phytoplankton. It also absorbs large amount of nitrogen and phosphorus for which other hydrophytes are deprived from the nutrient intake. Decomposition of water hyacinth leads anaerobic condition to the fishes and other aquatic creatures and causes deaths.

Use of water hyacinth in a productive way is practicing nowadays throughout the world. In some parts of Bangladesh people use water hyacinth in different ways. Floating gardening is one of the way to produce vegetables which are practicing by landless peasants of some area. Water hyacinth is made to heap, when decayed; make it wonderful fertilizer for crops. The plant body is used to make fiberboard, yarn and rope in a small scale. Production of biogas, poultry feed and paper from water hyacinth is presently under experiment in Bangladesh.

Decaying water hyacinth for fertilizer use

Settlement Data Extraction using High Resolution Satellite Imagery for Bangladesh

Mohammad Saidur Rahman, Remote Sensing Division

Bangladesh Bureau of Statistic (BBS) is responsible for collecting, compiling and disseminating statistical data of all the sectors of Bangladesh and provides necessary statistics for preparing various national plans and policies for the overall development of the country. In regard to take necessary plans for country's development, population census was conducted in independent Bangladesh at least once in every ten years from 1974. Based on the relevant indicators listed by Sustainable Development Goals (SDGs) mentioned under goal 17, the sixth census is going to be undertaken in 2021. In this regard, BBS entrusted Center for Environmental and Geographic Information Services (CEGIS) and signed anagreement under the Project named, "Delineation of Enumeration Area, Extraction Settlement Information for Urban and Rural Area and Mapping using GIS and Remote Sensing Technology to Support Population Census 2021". CEGIS will deliver Enumeration Area Maps for Zonal operation based on the application of extensive cartographic tools using Geographic Information System (GIS) and Remote Sensing (RS) techniques for rural and urban settlement data and building footprint extraction.

To have a successful census, CEGIS has procured and processed more than 1,200 multispectral satellite images of high resolution of spatial data in which twelve city corporation areas (delineating urban footprint) covering with ≤ 0.5m and the rural and urban areas covering with ≤ 1m of spatial resolution of satellite images to delineate rural and urban settlement areas. The high resolution of satellite images were KOMPSAT-2, KOMPSAT-3 and KOMPMSAT-3A. However, to fill up the gap and cloud cover areas for whole Bangladesh WorldView3, GeoEye 1, TripleSat and Gaofen 2 Satellite Images have been procured. Visual interpretation and on-screen digitization technique has been adopted to delineate the building footprint within the boundary of city corporation areas and rural and urban settlements. The linear or clustered rural settlement with homestead vegetation has been considered as rural and urban settlement. All the images and vector layers are projected into BUTM Projection system with Gulshan 303 datum. During digitization, the scale was fixed between 1200 and 1500. For better identification of features, false color combination of Infra-Red, Red and Green has been used.

High resolution of satellite images of different dates used for various data extraction

Ramification of Covid-19 on Environment

Mushfiq Ahmed, Ecology, Forestry and Biodiversity Division

The environment from local to global scales has witnessed Covid-19 impacts on it

Considering the impending threat and the spreadable nature of the CoronaVirus Disease 2019 (COVID-19) pandemic, globally lockdowns have been implemented to stop the spread of this fatal virus. In Bangladesh, government also imposed "general holiday" (i.e. general lock-down) that came into effect on 26 March to May 27, 2020. Long periods of lockdown have severely affected a wide range of sectors from agriculture to manufacturing, information, hotels, transport and tourism sectors.

In fact, this pandemic has hit the world severely, representing the most severe threat to human health and then on economy in more than a century. But for the restricted movements due to considerable decline in planned travel; nature got relieved from the human induced pressure on its environment. The environment from local to global scales has witnessed positive impacts on it. These include temporary improvements in air quality, lower greenhouse gas emissions and lower levels of noise pollution. Many environmental indices such as lowering NO_2 and CO_2 emissions and reduction in particulate matters in air as a result of less human activities have led to clean air and pollution free water. Undoubtedly, the world was experiencing pollution in several countries mainly due to human activities including urbanization, industrialization, fossil fuel exhaustion etc.

Knowledge gained from the studies suggests that, a substantial relationship exists between the contingency measures and environmental health. Lockdowns during the COVID-19 pandemic may have some direct, short-term, positive impacts on our environment, especially in terms of emissions and air quality, although these are likely to be temporary. Because, it is obvious that, a loss of livelihoods and food insecurity would push old and newly poor people to depend more on harvesting natural resources, leading to over-exploitation of biodiversity and further degradation of ecosystems.

Many rural areas in the tropics are facing increased pressure from land grabbing, deforestation, illegal mining and wildlife poaching. People who have lost their employments in cities are returning to their rural homes, further increasing the pressure on natural resources. Meanwhile, there are reports of increased deforestation, illegal mining and logging in Asia, Africa and Latin America. Therefore, the considerable development of environmental health during lockdown situations is gradually fading away.

Instead, global lockdowns have drastically altered the patterns of energy demand and have caused an economic downturn but at the same time, have provided an upside-cleaner global environment. Such immense unintended advantages offer opportunities for unprecedented insights into the dynamics of our natural and built environments that can lead to viable paths for conservation and perpetuation of the recovered environments and through sensible policies and practices that can help to create new recovery pathways.

Finalization of Sectoral Action Plan for Environment and Climate Change

Ahmmed Zulfiqar Rahaman and Sifath Ara Hossain, Climate Change and Disaster Management Division

Bangladesh is highly vulnerable to climate change and the adverse impact of climate change on environment may hinder the development pace of Bangladesh, while Bangladesh is striving to achieve as Middle-Income Country status by 2021, LDC graduation by 2024 and Upper Middle-Income Country status by 2041. Therefore, the Government of Bangladesh needs to make significant investments holistically at national and local levels to address these challenges. The 7th Five Year Plan of Bangladesh identified that Environment, Natural Resources and Disaster Management areas need wide variety of actions for sustainable development. In this regard, Government of Bangladesh took necessary initiatives to finalize a Sector Action Plan for Environment and Climate Change (SAP ECC) which was vested upon to Center for Environmental and Geographic Information Services (CEGIS) and C3ER (Brac University) by General Economic Division (GED) of the Planning Commission and supported by GIZ Bangladesh. The SAP ECC can be the podium by stating, elaborating and viewing the path for attaining this complex track for sustainable economic growth and development under deep uncertainties considering both national development vision and global agenda.

multidisciplinary and complimentary nature of ECC sector, participatory and inclusiveness, aligned with national priorities, synergic with IEAs and SDGs, flexibility and robustness of formulated measures, promoting private sector engagement, ensuring financial integrity, promotion of green growth and lastly, implementability and sustainability. National and global targets have been cascaded and synchronized with national and SDG targets and with ECC sector objectives to formulate 37 strategies and targets of SAP ECC to be fulfilled by 2030 and beyond to achieve GoB Vision 2041. A total of 248 projects under 10 themes have been proposed with a long-term implementation plan for 15 years starting from the financial year 2020-21 i.e. 8th FYP till 2035 (10th FYP). Pollution Control and Climate Resilient Infrastructures top the budget allocation priority with 18% and 17% allocations respectively. Considering 15 years span of SAP, 142 short term projects (duration 5 years or less), 85 medium term projects (duration 10 years or less) and 21 long term projects (duration more than 10 years) have been proposed. Among 136 total high priority, 105 medium priority and 7 low priority projects have been identified. High priority projects are particularly proposed for initiating the implementation immediately during 8th Five Year Plan.

Thematic Areas of SAPECC

- T1 Local Level Climate Change Adaptation
- T2 Climate Resilient Infrastructure
- T3 Urban Environment Management
- T4 Pollution Control
- T5 Blue Economy
- T6 Forest, Ecosystem and Biodiversity
- T7 Food Security, Social Protection and Health
- T8 Institutional Strengthening, Coordination & Governance
- T4 Green Growth and Climate Change Mitigation
- T5 Research, Innovation and Capacity Development

To formulate this SAP ECC, the boundaries have been devised through reviewing existing plans and policies, conducting SWOT analysis of institutions and anlyzing key development thrusts for next couple of years etc. Based on the analysis, 10 thematic areas have been considered. Lesson learned from successive achievements of past including initiating the National Adaptation Plan (NAP) process, selection of Nationally Determined Authority (NDA), submission of Intended Nationally Determined Contributions (INDC), preparation of NAPA, development of BCCSAP and its implementation, 7th Five Year Plan, Perspective Plan 2010-2021, Perspective Plan 2021-2041, BDP 2100, Biodiversity Strategy Plan, Strategic Waste Management etc. paved the way of preparation of this SAP. The SAP ECC follows 9 guiding principles i.e.

The Government will implement these projects through different line agencies under different ministries. As the prime custodian, MoEFCC will spearhead the implementation of the bulk of the projects through its agencies such as DoE, FD, BFIDC, BCCT, BFRI etc. Other agencies like BWDB, DBHWD, DoF, MoI, LGED, City Corporations, WASA, WARPO etc. will also be engaged during implementation. Potential financing mechanism has been recommended along with special emphasis with specific strategies on private sector engagement through Public-Private-Partnership (PPP) modalities to release the burden of investment from GoB. Furthermore, a result-based monitoring and evaluation framework have been proposed based on SMART indicators to ensure proper and sustainable implementation of the plan.

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