



Golpata (Nipa Palm) of Sundarban Forest

Upcoming

- ❑ Preparation of Stormwater Management Plan for Thimphu Thromde
- ❑ Online Processing and Tracking of Project Clearance and NOC for WARPO
- ❑ Environmental and Social Safeguard Compliance Monitoring for Electricity Distribution Projects of DESCO

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the CEGIS NEWSLETTER

Safeguarding Environment for Future

World Wetlands Day 2020 observed by Bangladesh Haor and Wetlands Development



Mr. Kabir Bin Anwar, Secretary, Ministry of Water Resources is addressing on the occasion of World Wetland Day, 2020

World Wetlands Day 2020 was observed by the Department of Bangladesh Haor and Wetlands Development on 02 February 2020, through launching of a seminar in the conference room of WARPO, 72 Green Road, Dhaka.

The theme of the day is “Wetlands and Biodiversity”. Two papers on this occasion were presented by Dr. M. Niamul Naser, Professor of Zoology, University of Dhaka and Dr. Mohsinuzzaman Choudhury, Biodiversity Specialist, IWM. The title of both the papers was “Sustainable Wetlands Management: A prosperous livelihood”. The major contents of the paper of Dr. M. Niamul Naser were: wetlands and water resources, wetlands functions, threats on wetlands, valuation of wetlands, conservations issues etc. Dr. Mohsinuzzaman highlighted the existing laws, policies for conservation and protection of wetlands, some statistics of biodiversity in the Hakaluki and Tanguar Haors, Kaptai Lake, Halda River, Beel Halti etc. He also emphasized on the coastal and marine ecosystem especially of the

Sundarban, the only mangrove forest (Ramsar Site) of Bangladesh. Among the discussants the Director General of Bangladesh Water Development Board discussed about the activities of his organization for the development of the water resources. He was confident that BWDB would be a unique organization soon with the dynamic leadership of Secretary of the Ministry of Water Resources and his personnel. Mr. Malik Fida A. Khan, during his discussion emphasized on the management aspects of the wetlands. He mentioned that the increasing use of pesticides was a threat to the environment. He suggested to cultivate native variety of rice to save the nature from pesticides contamination.

Mr. Abu Saleh Khan said the human being as the key element who can govern all the components of ecosystem. Moreover, the high population pressure in nature is going to be unbearable in the South East Asian Countries like Bangladesh. Unplanned and indiscriminate industrialization are seriously degrading the environment

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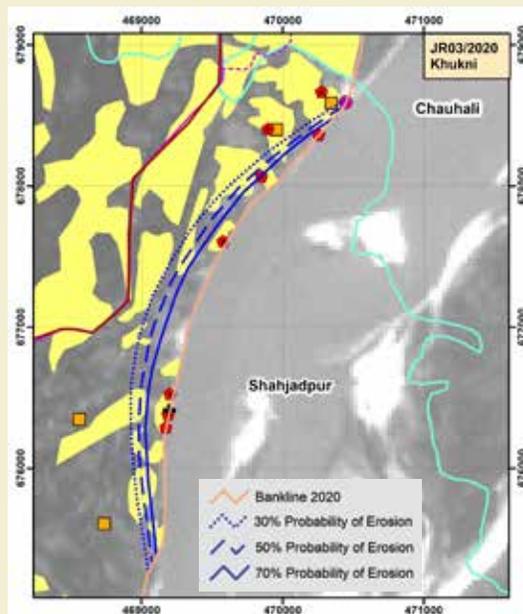
Riverbank Erosion Prediction Results in the Major Rivers of Bangladesh for 2020

Sudipta Kumar Hore, River, Delta and Coastal Morphology Division

Riverbank erosion, one of the major natural disasters in Bangladesh, causing untold miseries every year to thousands of people living along the banks of the rivers of Bangladesh. Bank erosion alone rendered millions homeless and became a severe social hazard. Structural interventions to provide protection against riverbank erosion is very costly. Along with structural measures, less costly nonstructural measures, like erosion prediction, could be used to reduce the loss due to riverbank erosion and lessen the sufferings of people.

CEGIS has developed a unique tool using time series satellite images for riverbank erosion prediction in the Jamuna, the Ganges and the Padma Rivers. Like previous years, CEGIS for 2020 has predicted 16 probable vulnerable locations along the banks of the Jamuna, the Ganges and the Padma Rivers for three different probabilities (70%, 50% and 30% probability of erosion) which is supported by Research and Development fund of CEGIS. Among which, 11 locations are in the Jamuna River; 4 are in the Ganges and 1 in the Padma Rivers. The prediction is not only limited to the identification of the vulnerable locations but also provides information on the vulnerability of the land, settlement and other physical infrastructures of the predicted locations.

It was predicted that riverbank erosion in the Jamuna River would be about 1120 ha whereas for the Ganges and the Padma Rivers it would be 375 ha and 890 ha correspondingly (Table 1). Moreover, approximately 365 ha of settlement, 5.4 km of road (District, Upazila and Rural road), 32 educational institutions, 3 hat/bazars, 29 mosques, 3 health centers, 2 government offices and 1 non-government office would be vulnerable to riverbank erosion in 2020. It is to be noted that due to Corona Virus situation, it was not possible to include physical infrastructures like schools, madrasa, hat-bazaars, etc. in the vulnerability analysis of the Padma River.



Erosion Prediction Line along the River Jamuna at Shahjadpur, Sirajganj

The riverbank erosion is predicted to affect 12 districts situated along the banks. These are Kurigram, Jamalpur, Gaibandha, Bogura, Sirajganj, Tangail, Manikganj, Pabna, Rajbari, Rajshahi, Faridpur, and Madaripur.

Additionally, CEGIS regularly monitors the erosion prediction to assess the robustness of the prediction tool. It is observed that erosion prediction made in the previous year (2019) have shown a good match with the occurrences although there were few locations of slight riverbank erosion where erosion was not predicted. However, the overall accuracy of this prediction tool is approximately 70-80%.

World Wetlands Day 2020 ... (Cont'd from page 1)

worldwide. Mr. Chandidas Kundu emphasized on the biological control of pest and judicious use of modern pesticides in crop cultivation. He opined that the wide range cultivation of indigenous/native rice varieties would not be the wise decision on the aspects of food security of the country.

The chief guest, Secretary of MoWR covered many aspects of wetlands management. He emphasized on implementation of the existing policies and laws in integrated way by different Ministries/Divisions for the conservation and restoration of wetlands of Bangladesh. He traced on indigenous species of tree plantation for the well survival of native birds. He mentioned the importance of the component of the "Food Chain" of both the terrestrial and aquatic ecosystem. He also outlined some important and recent issues like maintenance of fish sanctuary, mapping of natural breeding ground of fishes, preparation and the breeding calendar of different species of fishes etc. The Hill Tracts of Bangladesh are the place of high resources, he added. The entire hilly area could be developed as 'fruit basket' of native delicious fruits. He discouraged the indiscriminate cultivation of fruits by destroying the

ecosystem and beauty of the hills of the country. The Secretary was hopeful about the development of the Golanchadbari Wetlands (600 acres of land) under Digu Mouza of Mirpur area of Dhaka City as water retention area which could improve the total environment of the Northern part of Dhaka City and will be converted as a recreation place for the people. He further emphasized on the wetland management of the inner portion of polders, safety measure for the protection of farmers from death by the lightning, cluster houses/villages instead of scattered houses in the haor and wetland areas, high raised threshing floor/bed for drying rice after harvest etc.

In the concluding speech, the Director General of DBHWD mentioned few activities regarding to restoration of wetlands of the country. Classification and preparation of inventory of the wetlands of the country are the two most important works, he mentioned. Based on these study reports, further delineation of wetlands e.g.; identification, nomenclature, area covered, present condition etc. of the wetlands will be documented by June 2020. These were most important for the conservation and restoration of wetlands of Bangladesh.

Contract Signing for Different Studies



During first quarter of the year 2020 (January-March), CEGIS has signed 8 (Eight) contracts with different organizations and clients. The contract titles with date of signing are given below:

i) "Flood Management Plan for Paro Dzongkhag" with Apec Consultancy on 5 January 2020; ii) "Stormwater Management Plan For Thimphu Thromde" with Apec Consultancy on 5 January 2020; iii) "Feasibility Study of the Route from Paturia to Baghabari for the Improvement of Navigability as Class-I" with Bangladesh Inland Water Transport Authority (BIWTA) on 12 January 2020; iv) "Feasibility Study on Improvement of the Navigation and Restoration of the Kumar, Upper Kumar and Lower Kumar

River of Madaripur District" with Bangladesh Inland Water Transport Authority (BIWTA) on 14 January 2020; v) "Climate Change Vulnerability Assessments (Physical Vulnerability and Social-Economic Vulnerability) with Infrastructure Assessments of 9 LIUPC (Livelihoods Improvement of Urban Poor Communities) Cities, LIUPC" with UNDP on 14 January 2020; vi) "Monitoring of Environmental Parameters and Implementation of Environmental Management Plan during construction period along with Engineering Activities for 2x660 MW Maitree Super Thermal Power Project at Rampal in Bagerhat District of Khulna Division, Bangladesh" with Bangladesh-India Friendship Power Company (Pvt.) Ltd. (BIFPCL) on 30 January 2020 vii) "Basic Environmental Survey For Data Collection Survey for the Water Resource of Southern Chattogram Region in People's Republic Of Bangladesh" with Nippon Koei on 26 February 2020 and viii) Midterm Evaluation of the project titled "Afforestation in Coastal Region including the Newly Accreted Chars of Bay of Bengal with the Project Director, Afforestation in Coastal Region including the Newly Accreted Chars of Bay of Bengal Project on 25 March 2020.

CEGIS Environmental ... (Cont'd from page 5)

process control. The measurement is simple and fast, and most advanced sensors require only a little maintenance. The measured conductivity reading can be used to make various assumptions on those happening in the process. In some cases, it is possible to develop a model to calculate the concentration of the liquid.

Basic Principle

Electrical Conductivity, resistivity, salinity, and TDS meters all these measure the conductance of water samples in order to determine or calculate a value. Common laboratory conductivity meters employ potentiometric and electrodes method. Often, the electrodes are cylindrical and arranged concentrically, the electrodes are usually made of platinum metal. An alternating current is applied to the outer pair of the electrodes.

The process by which these instruments measure specific conductance consists of measuring the AC resistance of the

solution between two electrodes. In fact, this is the very principle which is used in a conductivity meter, a set of electrodes to measure conductivity whose signal is fed to the meter. Potential between the inner pair electrode is measured.

Conductivity could in principle be determined using the distance between the electrodes and their surface area using Ohm's Law but generally, for accuracy, a calibration is employed using electrolytes of well-known conductivity. Calibration for EC is single point procedure by 12.88 mS/cm conductivity solution. There is no need to calibrate it for TDS. NaCl calibration is also single point procedure by 100% NaCl standard solution. In CEGIS Laboratory, EC/TDS and temp of water samples of different study projects were analyzed for several periods and this is incorporated in test reports. This Instrument can also be used for environmental monitoring or related projects.

Visit of IHE Rector Professor Eddy Moors in Bangladesh

Dr. Farhana Ahmed, Research, Development and Training Division

Netherlands Alumni Association of Bangladesh (NAAB) organized an auspicious gathering to honor Prof Eddy Moors, Rector of IHE-Delft, the institute of Water Education in the Netherlands in Lake Castle Hotel, Dhaka on 4th February 2020. He was accompanied by Prof. Biswa Bhattacharya of IHE. Dr M.A. Quassem, Sr. Water Resources Advisor, CEGIS and President, NAAB facilitated the program. Netherlands Embassy representatives along with participants from Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Center for Environmental and Geographic Information Services (CEGIS), Department of Public Health Engineering (DPHE), Institute of Water Modelling (IWM), Dhaka Water Supply and Sewerage Authority (DWASA) and other govt. agencies, NGOs were present. Participants of MSC and PhD program shared their exciting moments experienced in the Netherlands during their study period at IHE. Prof Moors was delighted to see the alumni and listening to the professional's achievement after obtaining higher degrees.

The next day, Prof. Moors visited CEGIS to personally meet with alumni of IHE working at CEGIS and to explore business opportunities. Future partnership in capacity building, training and research projects were discussed. CEGIS and IHE hopes to expand the existing bonding of mutual trust and take it to newer heights in developing projects in the field of water resources, climate change, morphology, ecology, modeling etc.



IHE Rector Professor Eddy Moors with Malik Fida A Khan, Executive Director and other professionals of CEGIS

CEGIS Service in Power Transmission and Distribution Sector

Abu Sayed Md. Faysal, Power, Energy and Mineral Resources Division

The power transmission and distribution sector plays key role in infrastructure development and economic growth of Bangladesh. The Government of Bangladesh (GoB) has initiated different activities for upgradation and improvements of the technical efficiency of the transmission system. At CEGIS we focus on delivering services that uphold the quality of environment for transmission of generated electrical power.

Since 2006, CEGIS has played a major role to conduct engineering, environmental and socio-economic studies for transmission lines, substations and distribution systems throughout the country. CEGIS enjoys an excellent working relationship with the Power Grid Company of Bangladesh (PGCB) and other electricity generation and distribution organizations which entrust CEGIS to render consultancy services with much of the energy infrastructure development of the country.

CEGIS offers various services in different stages (i.e. planning, implementation and operation) of a power transmission, distribution and substation project ranging from Detail Feasibility study, Initial Environmental Examination (IEE), Environmental and Social Impact Assessment (ESIA), Resettlement Action Plan (RAP), Stakeholder Engagement Plan, Environmental Compliance Monitoring, Detailed Route Survey, Topographic Survey, Geotechnical Investigation, Training etc. following the national and international guideline along with requirements from development partners. Furthermore, CEGIS also suggests particular tools and methodologies integrated with environmental, social acceptability, and biodiversity issues into the project design and suitable Grievance Redress Mechanism (GRM) that helps to resolve any unattended issues in compliance with the highest international standards.

CEGIS experts have extensive knowledge and experience in providing consultancy services for high voltage power transmission line (such as 132kV, 220 kV, and 400 kV) and lower voltage distribution lines (11 kV or 33 kV) and associated substations. It also provides required intellectual service during construction and installation of overhead transmission lines and underground power cables. Moreover, CEGIS has experience in design and development of Geographic Information System (GIS) based distribution network system; preparation of Master Plan; Feasibility Study of prepaid metering system, load



Southwest Grid Network Expansion Project

flow and reactive power compensation study independently and in collaboration with other national and international organizations.

CEGIS's rich experiences coupled with the dedicated team of professionals allows it to deliver the very best of services to the clients.

Rainstorm Flow Assessment ... (Cont'd from page 8)

maximum rainfall intensity. Furthermore, this intensity have been used to calculate average intensity of these times frame for different return periods.

Applying rational methods, design flood volume was determined for which the annual maximum rainfall intensity for specific durations was determined from rainfall measurements for every year of record.

Due to the backfilling of the project area, existing drainage path of the surrounding catchment area has been affected. For convenient drainage of the storm water the adjoin catchment area is divided into two sub-catchments. Finally, as per standard, peak discharge for those two catchments have been calculated for 5 year return period rainfall intensity. For designing drainage section Manning's velocity equation is used, where Manning's roughness co-efficient is taken 0.014 as lined channel is suggested. Maximum width of drainage section is 1.0 m at the outlet of catchment 02 and 0.65 m for catchment 1. And maximum permissible velocity for concrete lined canal is 2-7 m/s, where design velocity range is 1.2-1.4 m/s.

Visit of Mr. Frodo van Oostveen ... (Cont'd from page 8)

that all industries must have proper waste management systems and water bodies to fight any fire incident well to keep the environment pollution free. To implement her desire, Mr. Frodo van Oostveen expressed that Netherlands embassy would provide assistance in the study of shadow price of water which is an implementing project of CEGIS funding by WARPO. The Dutch government wants to give input in this project by giving innovative tools, technological assistance, capacity building etc.

Dutch organization also expressed their interest to give proper training regarding industry water use, waste water management, Effluent Treatment Plant etc. to the people managing industries. However, CEGIS showed its interest to organize the trainings to create technical awareness by including DoE. Dutch organization would support in this regard.

The discussions ended up with the mutual understanding to help each other on water sector related activities.

CEGIS Environmental Lab: EC/TDS/NaCl/Temp Meter

Rafiqul Alam, Water Resources Management Division

Electrical Conductivity (EC) and Total Dissolved Solid (TDS) Meter measure the electrical conductivity, total dissolved solid, sodium chloride and temperature of water samples or of any solutions. It has multiple applications in research and engineering, with common usage in hydroponics, aquaculture, aquaponics and fresh water systems to monitor the amount of nutrients, salts or impurities in the water. CEGIS has five EC/TDS/NaCl/TEMP meters.

This meter is a waterproof portable battery operated automatic and logging microprocessor-based Conductivity/TDS/NaCl/temperature meter and its model is Mi 306. This meter is manufactured by Milwaukee Instrument, Romania and (auto ranging) measurement range and accuracy is as the following: EC measurement range is 0 to 500 mS/cm and accuracy is ± 1 of reading. TDS measurement range is 0 to 400 g/L and accuracy is ± 1 of reading. NaCl measurement range is 0 to 400% and accuracy is ± 1 of reading. TEMP measurement range is 0 to 60°C and accuracy is ± 0.4 °C. The auto ranging feature of EC and TDS ranges automatically sets the meter to the scale with the highest possible resolution. The Auto Endpoint (HOLD) feature automatically freezes the display when a stable reading is reached.



EC/TDS/NaCl/Temp Meter

The measurements are Automatically (ATC) or Manually (MTC) Compensated for Temperature. The temperature coefficient value is user selectable. It is possible to disable the temperature compensation and measure the actual conductivity (NoTC). The Battery Error Preventing System (BEPS) switches the meter off when the batteries are too weak to support proper function. The meter can store measurements in memory by logging function for retrieval at a later time upon users request. Mi 306 also allows data transfer to computer through the RS232 port. Double LCD displays for simultaneous readings of the electrical conductivity/ TDS/NaCl and temperature.

The conductivity of an aqueous solution is the measure of its ability to carry an electrical current by means of ionic motion. The conductivity invariably increases with increasing temperature. It is affected by the type and number of ions in the solution and by the viscosity of the solution itself. Both parameters are temperature dependent. As conductivity of a solution is highly temperature dependent, so it is important either to use a temperature compensated instrument, or to calibrate the instrument at the same temperature as the solution being measured. Conductivity measurement is a versatile tool in

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Nature: Golpata (Nipa Palm): an Economically Important Flora of Sundarban

Md. Amanat Ullab, Ecology, Forestry and Biodiversity Division



Golpata fruits of Sundarban Forest

Nipa Palm (*Nipa fruticans*) is a large, evergreen palm forming a loose clump commonly known as 'Golpata' in Bangladesh. This mangrove palm is native to the coastlines and estuarine habitats of the Indian and Pacific Oceans. In Bangladesh, it is distributed all over the coastal mangroves including the Sundarban Reserve Forest. Usually this plants are grown on mudflats along the canal sides and somewhere ponds or ditch banks inside the coastal polders. It is assumed that, the Nipa palm is probably the oldest palm species which had a pantropical distribution in 13-63 million years ago (<http://tropical.theferns.info/viewtropical.php?id=Nypa+fruticans>).

Golpata is one of the economic plants in Sundarbans whose fronds are mostly used as roofing material in rural areas. The white endosperm of immature seeds are creamy flavored, sweet, jelly-like and consumable. Sugary sap from immature inflorescence is directly consumed or used to make molasses. First flower occurs after two years from the germination and looks like complex velvet stand. Long fronds and clumps provide habitats and sheltering place for birds, amphibians including crocodile; reptiles, mammals including the Royal Bengal Tiger, crustaceans and various fishes. It has an excellent soil stabilizing power and enhances aesthetic beauty of forests. Collection of Golpata fronds is one of the livelihood to the inhabitants surrounding the Sundarban Reserve Forest.

Increasing salinity, infrequent inundation, accretion of silt and extensive coastal erosion affect the abundance of this species. Within the Sundarban Reserve Forest of Bangladesh, this species have shown declining trends in the mixed fresh-brackish swamps areas at Karamjal, Jongra, Mora Passur, Nandobala, Harbaria, Choraputia, Andharmanik, Tamulbunia, Supoti and Kochikhali (Rahman, Md Mizanur & Vacik, Harald, 014).

Application of High Resolution KOMPSAT-3 and KOMPSAT-3A Satellite Images

Mohammad Saidur Rahman, Remote Sensing Division

Building footprint is the most basic information necessary for improved geocoding, improved customer service providing, enhanced insurance underwriting, vulnerability evaluating, 5G planning, city planning, building monitoring and population mapping.

Recently, satellite images based building footprint identification has gained significant importance. CEGIS has been using high resolution KOMPSAT-3 and 3A satellite images to identify building foot prints in the the city corporations areas of Bangladesh.



*RAJUK Uttara Apartment Project, Sector-18, Uttara, Dhaka
KOMPSAT-3A, January 06, 2019*



*Shelter Homes for Forcibly Displaced Myanmar Nationals at Bhashan Char in Char Ishwar Union, Hatiya, Noakhali.
KOMPSAT-3A, April 23 2019*

Dredging Monitoring at Outer Bar of Mongla Port

Jakia Akter, River, Delta and Coastal Morphology Division

Mongla Port is situated on the east bank of the Passur River, approximately 131 km upstream from the Fairway Buoy (approaches to the Passur River), as shown in Figure. The Passur River is a part of a very big and complex river system in the Southwest region of Bangladesh. In the navigation channel at the Passur River- entrance crosses, a wide bar known as the outer bar, which is a morphological characteristic of an estuary system. With the existing depth in the outer bar, maximum 8.5 m draft vessels can cross the outer bar and enter the anchorage area during normal high tides. But the depths over the anchorage area of the channel permits anchoring of more than 9 m draft vessels. The outer bar area is the only obstacle for the ships of 9 m and above to enter into the anchorage area. If the depth of the outer bar could be increased, it will make safe passage of 9 m draft vessels in the normal high tide. Mongla Port Authority (MPA) could then handle more ships means handling of more cargoes. If needed the cargo of the bigger vessels could be transhipped through feeder vessels to the jetty areas. To bring 10.5 m draft ships up to the anchorage area of Mongla Port, it was designed to increase the depth of the channel, after analyzing hydrographic survey charts of the outer bar area. Hence, GoB has taken a project titled "Dredging at the Outer Bar Area of Mongla Port Channel".

Monitoring of dredging is required to observe the performance, targets, and shortfalls. Thus, MPA has been tasked with the responsibility for "Monitoring the performance of the dredging in/c hydrological & morphological impacts and assessment of the effectiveness of dredging at the outer bar area in the Passur Channel of Mongla Port".

The Center for Environmental and Geographic Information Services (CEGIS), a Public Trust under

the Ministry of Water Resources (MoWR), has long experience in working with the morphological processes of the river system of Bangladesh. It has a decade-long experience in supporting Bangladesh Inland Water Transport Authority (BIWTA) for optimizing and monitoring dredging works for enhancing and maintaining important ferry and navigation routes. Considering the expertise of CEGIS in this particular field, the MPA awarded CEGIS the said consultancy services. The project is expected to be completed by the end of 2020.



Dredging location at outer bar of Mongla Port

Social Responsibilities of CEGIS during the COVID-19 Pandemic

The infection of pandemic corona virus, COVID-19 has spread out all over the world including Bangladesh. The Government of Bangladesh has taken numbers of initiatives to prevent its wide spreading. Finally, it has announced a General Holiday from 26th March 2020 throughout the country to prevent the widely spreading of the corona virus infection.

Center for Environmental and Geographic Information Services (CEGIS), a Public Trust under the Ministry of Water Resources, as a part of its corporate social responsibilities in this regard has also taken initiatives to distribute some of the most common and effective items of PPEs among the poor people working in streets. CEGIS, with the target of preventing the spread of the infection of corona virus to some extent came forward with the same. Accordingly, at the eve of the government holiday, CEGIS has decided to distribute them on Wednesday the 25 March 2020. It distributed about 5000 pieces of face masks, 70 pieces of hand sanitizers and 70 pieces of soaps to the poor at 4 distinct and heavily crowded points namely, Karwan Bazar, Mohakhali Bus Stand, Mohammadpur Krishi Market and Nilkhet of Dhaka City through 4 groups of CEGIS.

Mr. Kabir Bin Anwar, Secretary, Ministry of Water Resources and Chairperson of CEGIS Board of Trustees, inaugurated the distribution program from the Karwan Bazar point. Mr. Malik Fida Abdullah Khan, Executive Director, CEGIS was also present in the occasion. Officials and representatives from Isabela Foundation and Mojar School were also present with the CEGIS teams during these distributions.



Distribution of face mask, soap and sanitizers among the needy people

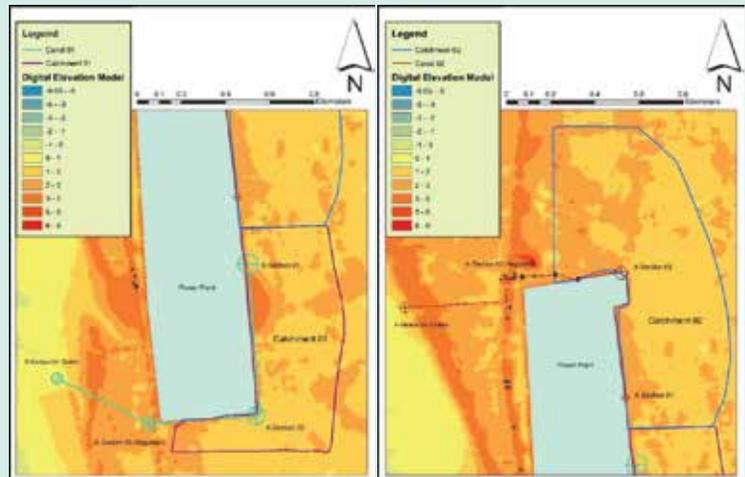
Rainstorm Flow Assessment Investigation

Gazi Md. Riasat Amin, Climate Change and Disaster Management Division

M/S S Alam Group, one of the leading industrialist groups of Bangladesh along with SEPCO III and HTG Development Group Co. Ltd. has been allowed by the Bangladesh Power Development Board to build two imported coal based thermal power plants each of 660 MW (net) capacity at Banshkhal, 40km away from Chattogram. The southwest side of the project consists of 2x660MW coal-fired power generating units which is about 6.5km to the Kutubdia Island. The construction of the plant is instigating water logging especially during the monsoon season. In order to alleviate this dilemma, construction of an intercepting at the periphery of the plant was designed preliminary to divert rainstorm flow. In this regard, the "SS Power I" engaged CEGIS to conduct a study for understanding the hydro meteorological situation of the study area which will help in construction of intercepting drain for surface runoff at the periphery of the plant to cater all storm water, diverting it away from the main plant area.

The methodology that was followed comprised of reconnaissance site visits of the concerned location for better understanding of the local issues. Prior to reconnaissance survey preliminary catchment was delineated based on the available Digital Elevation Model, canal alignment area and road alignment. Statistical analysis of meteorological and topography data was performed. Eventually detail work has been done by delineating catchment area by first using Arc-Hydro tool of ArcGIS software with the help of Digital Elevation Model, Road alignment and river/canal alignment. Catchment has been delineated for two conditions: Prior Power Plant and Post Power Plant. Statistical analysis of rainfall and flood volume involved determination of design rainfall intensity and design flood volume. The rainfall analysis has been made by developing IDF curves for which frequency analysis is performed for each set of annual maxima, one each associated with each rain duration. The basic objective of

each frequency analysis was to determine the exceedance probability distribution function of rain intensity for each duration. For this study, short duration rainfall intensity of



Proposed drainage layout of Catchment 1 and 2

Cox's Bazar BMD Station has been used for IDF generation. Indian Meteorological Department (IMD) uses an empirical reduction formula for estimation of various duration like 1-hour, 2- hour, 3- hour, 5- hour, 8- hour rainfall values from annual maximum values (Chowdhury et al. 2007). The equation is:

$$P_t = P_{24} (t / 24)^{1/3}$$

Where, P_t is the required rainfall depth in mm at t -hour duration,

P_{24} is the daily rainfall in mm and t is the duration of rainfall for which the rainfall depth is required in hour.

In this study, empirical reduction formula has been used to calculate 5 min, 10 min, 15 min, 30 min, 60 min, 120 min, 240 min, 480 min, 720 min, 960 min, 1440 min annual

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Visit of Mr. Frodo van Oostveen, Region Manager Asia, NWP at CEGIS Office

Benzir Huq Mon, Water Resources Management Division

Mr. Frodo van Oostveen of Netherlands Water Partnership visited CEGIS on 23rd January, 2020. He had discussion and back to back meeting with Mr. Malik Fida A. Khan, Executive



Mr. Frodo van Oostveen is with Md. Motaleb Hossain Sarker, Director and Dr. M. A. Quassem, Senior Advisor of CEGIS

Director (In Charge), CEGIS and Member, National River Conservation Commission, Mr. Md. Motaleb Hossain Sarker, Director, Water Resources Management Division and Dr. M. A. Quassem, Senior Advisor, Water Resources Management Division. The purpose of the visit was to create cooperation between Dutch and Bangladesh Government, share regional knowledge and build capacity. Netherlands organization and CEGIS can work together to organize capacity building training related to water resource management, waste water management, shadow price of water, climate change adaptation etc. in ASIA region countries like Bangladesh, Vietnam, Cambodia, and Sri Lanka.

Our Honorable Prime Minister, Sheikh Hasina has directed

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