

Center for Environmental and Geographic Information Services



Piyan River, Jafflong

CEGIS' mission as a scientifically independent center of excellence is to support the management of natural resources for sustainable socio-economic development using integrated environmental analysis, geographic information systems, remote sensing, database and information technology.

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CEGIS

providing local solutions to local problems:
Digital solutions towards digital Bangladesh

About CEGIS

The Government of the People's Republic of Bangladesh established the Center for Environmental and Geographic Information Services (CEGIS) as a Public Trust in 2002. The Center functions under the aegis of the Ministry of Water Resources and a Board of Trustees. Its main focus is integrated environmental analysis using modern information technologies that are suitable for socio-economic and institutional realities. Its expertise extends to various sectors such as water, land, agriculture, fisheries, environment, engineering, power, energy, transportation, climate change, etc. CEGIS' strength lies in its multidisciplinary group of more than 60 highly qualified scientists and technical professionals who bring a wide range of skills to the organisation. The Center also has a very sophisticated and up-to-date network system equipped with the latest

Services

The services and products of CEGIS relate to advice and consultancy, research and development and training to assist in enhancing the quality of planning, implementation and monitoring of projects/ programmes in both public and private sectors. CEGIS provides specialised services in river morphology; agriculture; fisheries; forestry; ecology and in other relevant sectors.

- ▲ Environmental Impact Assessment
- ▲ Social Impact Assessment
- ▲ Feasibility studies
- ▲ Environmental and social monitoring
- ▲ Integrated planning and management of water resources
- ▲ Socio-economic and institutional analysis
- ▲ Remote sensing and image processing
- ▲ Natural resources assessment and landuse monitoring
- ▲ Disaster monitoring and damage assessment
- ▲ Land information management
- ▲ Climate change and adaptation
- ▲ Development of GIS databases
- ▲ GIS based software and Web GIS
- ▲ Spatial modeling
- ▲ Design and development of Spatial Decision Support Systems
- ▲ Mapping and GPS/DGPS/Total Station Survey
- ▲ Assistance for setting up GIS and RS labs
- ▲ Design and development of databases, MIS and IT solutions
- ▲ Development of web portals
- ▲ Training in EIA, river morphology, IWRM, GIS and RS



Community-based flood warning & dissemination

Erosion vulnerability: prediction at national level

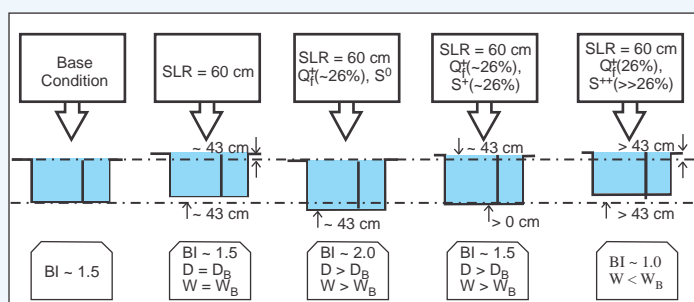


At the beginning of every year CEGIS disseminates erosion prediction products through a seminar

In Bangladesh, dynamic rivers such as the Jamuna, the Ganges, the Padma and the Lower Meghna annually erode about six thousand hectares of floodplain leaving damage and destruction in its wake. Since 2004, CEGIS has been predicting riverbank erosion of the Jamuna, the Padma and the Ganges under different projects of the BWDB, WARPO, UNDP, ADB and UNICEF. It predicts vulnerability of different infrastructures such as land, embankments, settlements, roads, government and non-government institutions, etc. CEGIS' prediction of erosion is a non-structural support to the structural measures of the BWDB for protecting land, infrastructure and people's lives against erosion.

Morphological response due to climate change

Since June 2009 CEGIS is conducting a study for the ADB to assess the probable impacts of climate change on river morphology. The Jamuna, the Ganges and the Padma may become disturbed and require long periods of adjustment in morphological processes due to changed sediment and flood regimes caused by global warming, high rainfall and relative sea level rise. The interim findings of the study show the adjustment of bed level and braiding intensity/sinuosity adjustment of the Jamuna, the Padma and the Ganges for 60 cm sea level rise. An increase in bank erosion is predicted, as the maximum discharge in major rivers is likely to increase.

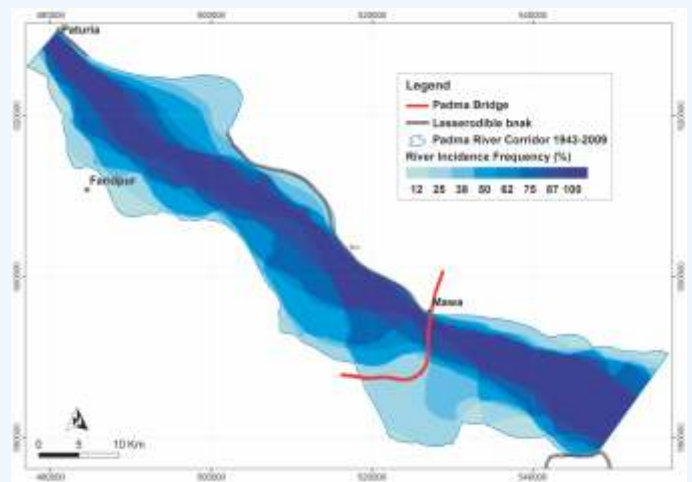


Note: BI = Braiding Intensity, D_B = Base depth, W_B = Base width

Projected responses of the river morphology under different scenarios of climate change for the Padma River

Morphological study to assist in Padma Bridge design

The study 'Morphological analysis of Padma River' has been completed under the Detailed Design of Padma Multipurpose Bridge Project. The study was conducted to assist in the detailed design of the bridge and bank protection works, assess the impact of severe seismic events and human interventions at the upstream as well as climate change, and assess the impact of the bridge and associated structures on the morphological processes of the river. Mainly old maps, aerial photographs, satellite images, available cross-section as well as bathymetry and sediment data were used for the analysis. The study findings are expected to be helpful for planning, designing and constructing the Padma Bridge and river training works.



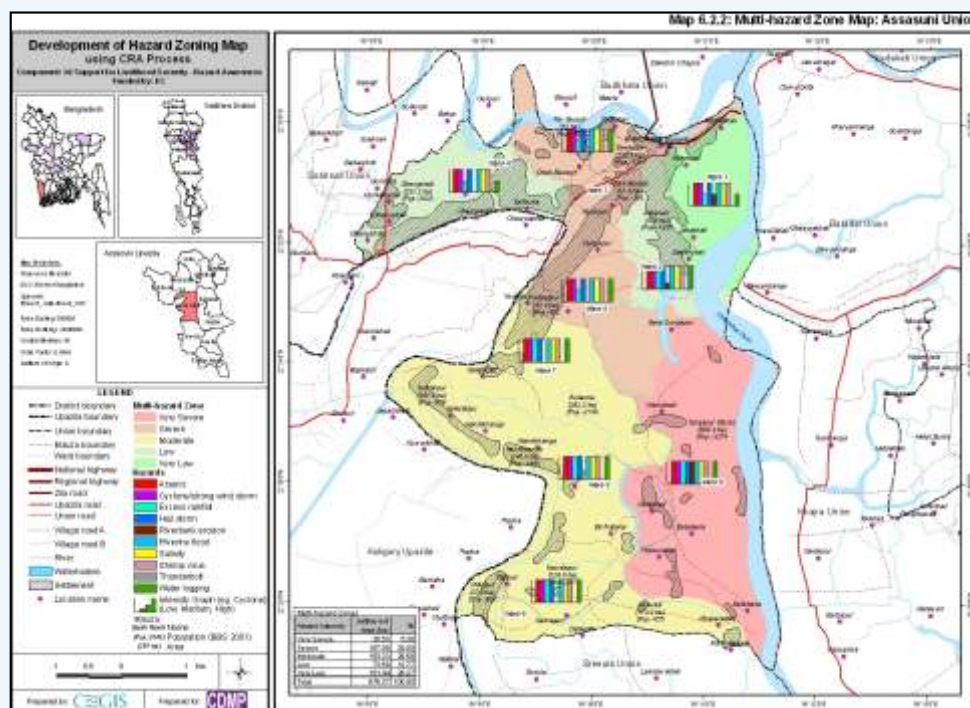
Climate change considerations in the design of Padma Bridge

CEGIS has done the parameterisation of coarse resolution climate data for generating hydro-morphological information pertinent to the detailed design of the Padma Bridge. CEGIS' professionals have transformed the coarse resolution climate data to local scales from scientifically sound and acceptable sources to suggest adequate adaptation options needed in the detailed design. The effect of climate variability and sea level rise on hydrology in terms of peak and low flow situations has also been investigated. The recommendations of the Center will facilitate the designers and EIA professionals to adapt climate change considerations in the various components of the Padma Multipurpose Bridge Project.



Developing hazard zone maps using CRA process

Multi-hazard Zone Maps have been developed for all natural events using the Community Risk Assessment (CRA) outputs of the Comprehensive Disaster Management Programme (CDMP). These maps, developed by CEGIS for the EC funded Component 3d: Support for Livelihood Security- Hazard Awareness, cover 64 union and three paurashavas of the upazilas Hatibandha, Godagari, Chauhali, Dharampasha, Moheshkhali, Sadarpur, Assasuni. The maps include base maps, multi-hazard zone maps, livelihood maps and flood maps. The maps are easy, meaningful, scientific, user-friendly, value added outputs of the CRA process and should be helpful to local communities, planners, managers, and decision makers for disaster and risk management.



Economic modeling of climate change adaptation needs for physical infrastructures in Bangladesh

An economic model has been developed which can assess sector-wise economic damage due to climate change and suggest economically viable adaptation mechanisms through comparing the cost of proposed adaptation options along with the expected benefits. The principle focus of the study was to develop a standard methodology to facilitate econometric computations related to climate change impact and adaptation needs assessment. The model has been pilot-tested for adaptations of water management infrastructure needs for the coast of Bangladesh, which is especially vulnerable to the predicted sea level rise. Adaptations for the transportation sector against possible increase in the magnitude and extent of monsoon flooding, and structural and non-structural adaptation options for the health sector against increased incidence of water and vector borne diseases have also been simulated for different climate change scenarios.

Technical and environmental auditing of water management schemes

For the project 'Screening and Technical & Environmental Auditing of BWDB Schemes' under the Water Management Improvement Project (WMIP), CEGIS will assist in preliminary and confirmatory screening of FCD/I schemes and individual rehabilitation/O&M schemes with an option that considers a participatory approach. The Center will also conduct EIA/SIA of selected schemes and enhance the capacity of Water Management Organisations through multi-disciplinary training.

Water security challenges for natural springs in the CHT

A detailed assessment has been made of the condition of natural springs in the Chittagong Hill Tracts. These springs are largely used by the indigenous people as source of water for drinking and other purposes. It has been found that the flow of the springs have deteriorated due to degradation of natural dense forests, extensive changes in land use and climate as well as physical interventions implemented without understanding their effects on the surrounding environment. The most significant cause behind flow deterioration is drastic reduction of dense forests in the recent years. Between 1989 and 2003, an estimated 170,000 hectares of dense forest (approximately 50%) were lost from the CHT area. There has been an overall decrease in rainfall pattern and increase in the trend of evaporation and sunshine hours as observed under the study in six out of seven stations at the CHT. The major impacts of these climatic changes include reduced spring flow leading to water insecurity and social conflicts over water; difficult access to safe drinking water; and increased water-borne diseases.



Assessment of environmental impact of the Ganges Barrage

An Environmental Impact Assessment and Social Impact Assessment of the proposed Ganges Barrage is being conducted to select a suitable location for constructing the barrage. The study is looking into the environmental feasibility, social acceptability and benefit sustainability of the barrage. For this purpose CEGIS is assessing the effects of the proposed barrage and its components on the environmental and socio-economic aspects of the river at both the upstream and downstream reaches and formulating recommendations for mitigation measures. The study is using GIS tools and environmental management considerations to find out how to minimise the possible adverse impacts of the Ganges Barrage.



Climate change risk to wetlands

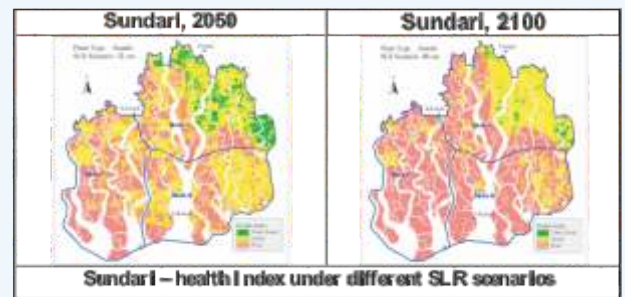
It is foreseen that the haor region will be severely affected due to adverse impacts of climate change. A recent research of CEGIS shows that riverbed and the Meghna Estuary will respond very rapidly to the changes in sea level. As a result, the flooding and inundation patterns will be different from what is shown presently using different models. Riverbed response to the Sea Level Rise (SLR) would cause much higher water level at Chandpur, which may lead to increased inundation/flooding in the haor areas. It is assumed that one meter SLR during the next hundred years would cause at least 50 cm rise of water level in haor areas. This will inundate a large tract of land and may lead to displacement of a large number of people from the haor region.



Climate change risk to the Sundarbans

Risk to forestry

Climate change will have a detrimental impact on forest ecosystems. CEGIS conducted a study that considered dominant species in the Sundarbans (Sundri, Gewa and Goran) to analyse the health index of the forest. According to the analysis, Sundri and Gewa suitable areas will reduce drastically with increase in the SLR. In the northeast part, the growth of Sundri will reduce up to 70% over the years but the suitable area for Goran will be increased, as saline environment is more favorable for its growth. The well-diversified areas of different plant species will be reduced from 60% to 30% due to the SLR. As a consequence, the Sundarbans will be dominated by mono species, which will be detrimental for the ecosystem and its dependent livelihoods.



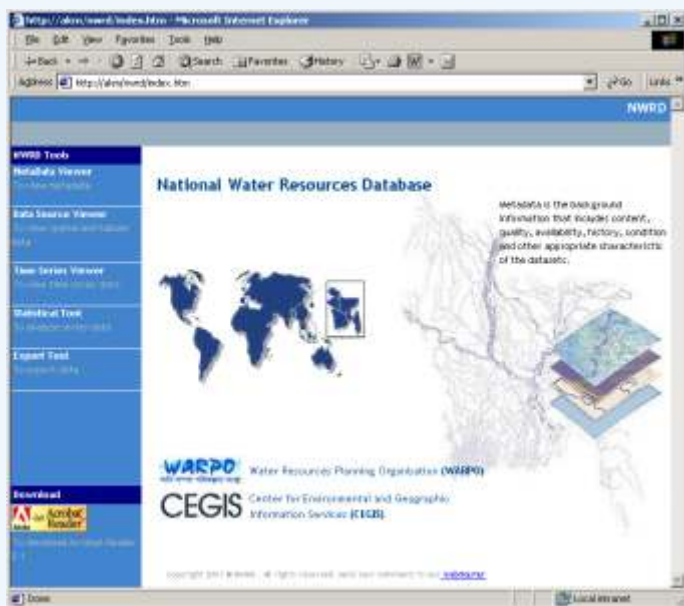
Risk to biodiversity

Among all the sectors sensitive to climate change, ecosystems and biodiversity may be at the greatest risk. Climate change induced SLR will cause a major threat to mangrove ecosystems through sediment erosion, inundation stress and increased salinity. As a result, many mangrove species may be threatened. CEGIS conducted a research on the impact of the SLR on the southwest region of Bangladesh. A portion of the Sundarbans will be submerged resulting in habitat loss. Consequently, a wide range of mammals, birds, amphibians, reptiles, crustaceans, and above all the Royal Bengal Tiger will face extinction. Increased soil salinity will also cause loss of many floras in the coastal area. The fish species sensitive to particular salt and freshwater conditions will be affected by increasing saline intrusion into the freshwater rivers associated with climate change. The present climate change impacts indicate that the future of flora and faunal resources of Bangladesh is dismal and will bring immense loss to the ecology and economy of the country.



NWRD: the largest geo-spatial database

CEGIS is engaged in updating the National Water Resources Database for Water Resources Planning Organisation under the WMIP project. It is being updated with state-of-the-art GIS and RS technology. The database will be enriched with new data layers of water resources, environment, socio-economic and climate change. Spatial data are being extracted from the latest high-resolution satellite images and non-spatial data are being collated from 38 primary data agencies throughout the country. The NWRD was established primarily to meet the demand of water resource planners for updated data and to enhance the database with more information for transforming it to a knowledgebase.



Cyclone shelter information system for tsunami and storm surge preparedness

For this task, CEGIS is collecting cyclone shelter information including the spatial locations of shelters through surveys; preparing spatial distribution maps of cyclone shelters and their attributes; analysing the structural strength of cyclone shelters for assessing their vulnerability to cyclones and tsunamis; mapping evacuation routes from settlements to cyclone shelters; and preparing shelter vulnerability and evacuation route maps for



Geo spatial radio network planning

Grameenphone Limited, which currently has the largest mobile network and highest number of users in the country, plans to enhance the quality of their customer services. This can be achieved through efficient radio planning and by optimising frequency with up-to-date relevant technology and highly precise data for the whole country. CEGIS is therefore preparing data layers that include i) orthorectified satellite images for the whole country; ii) three dimensional digital city models of Dhaka, Chittagong and Rajshahi from single high resolution satellite images using inclination and shadow length of buildings; iii) clutter mapping (specialised landuse/landcover for radio planning) for 76 cities and the whole country using high and medium resolution satellite images respectively; and iv) Digital Terrain Model (DTM) for the entire country using existing spot heights from various sources, such as BWDB maps, SOB 1:5000 map, FINNMAP, etc. Grameen phone will use these data layers in their radio propagation models for calibrating radio frequency and planning the location of Base Transceiver Stations (BTS).



Livelihood risk reduction through erosion prediction and social safety nets

In 2009 CEGIS, in association with UNDP, disseminated early warning of erosion to communities and management committees at district, upazila and union levels in Faridpur, Bogra and Sirajganj. A framework for Social Safety Net Programmes (SSNP) has also been developed for addressing the needs of erosion vulnerable people/victims to reduce their sufferings, loss of properties and level of poverty incidence.



Dissemination of erosion prediction through maps and flags

Environmental Threats

Gradual filling of wetlands of River Buriganga

IKONOS Satellite Image 2001

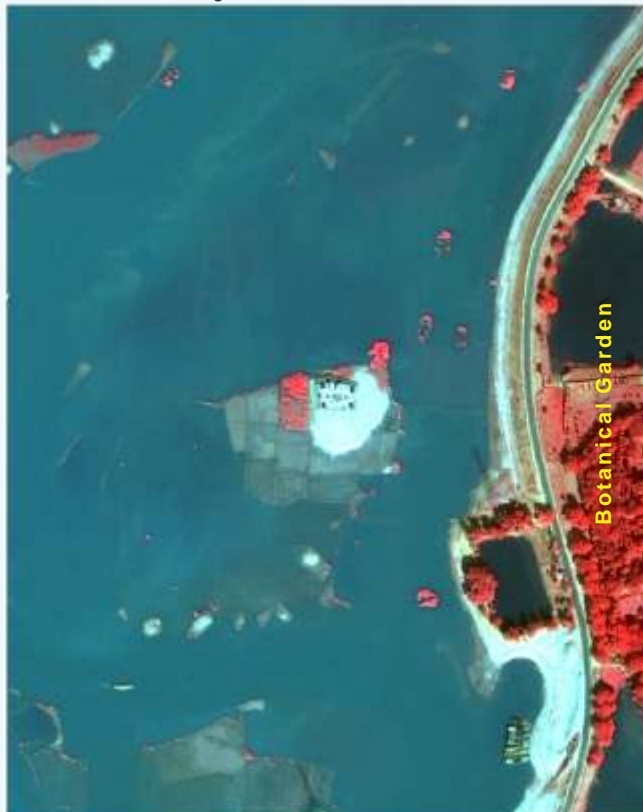


Quickbird Satellite Image 2006



Gradual filling of flood plain of River Turag

QuickBird Satellite Image 2004



Quickbird Satellite Image 2007



Agro Ecological Zone (AEZ) database

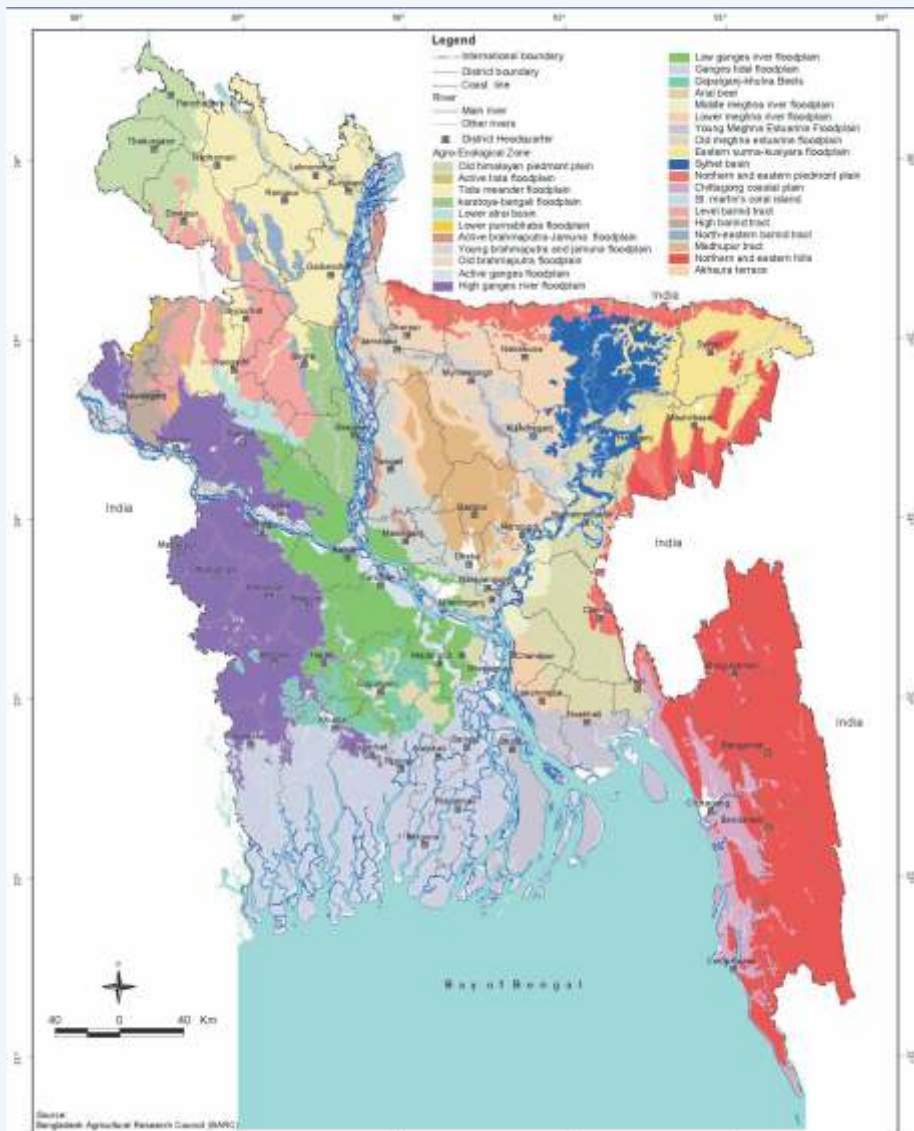


Photo: Sourav mahmud

CEGIS has updated the agro climatic parameters of the AEZ Database to meet the challenges of climate change. An updated AEZ database will help to meet the challenges of climate change through updating of agro climatic parameters. Farmers of the coastal areas will be benefited greatly with updated information on soil salinity and cropping pattern and their socio-economic demand will be met by updated data on land suitability. Updating data on soils, landform and hydrology will also ensure effective utilisation of land resources database for crop production planning.