Issue 5
January 2005

the CEGIS NEWSLETTER

Bi-annual bulletin of the
Center for Environmental and
Geographic Information Services (CEGIS)

CEGIS receives award for stall (see page 8 for details).

Inside

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CEGIS at SoftExpo 2004

CEGIS participated in "SoftExpo2004", the biggest fair on software products, IT Enabled Services (ITES) and Information Communication Technology (ICT) systems solutions in Bangladesh. The event was held at the Bangladesh-China Friendship Conference Centre on 25 -29 November 2004. More than 120 local (government & non government) and international ICT companies took part in the event to introduce their service capabilities.

CEGIS participated in the event jointly with the Support to ICT Task Force (SICT) project of the Planning Commission, Institute of Water Modeling (IWM) and the Roads and Highways Department. CEGIS displayed its various IT related service capabilities, especially those it offers to various government institutions. The focus was on its GIS, RS and database related services that include the National Water Resources Database (NWRD), Integrated Coastal Resources Database (ICRD), Aquatic

WATSURF: a new software for water surface forecasting

A GIS based flood forecasting information system software named 'WATSURF' has been developed under the project "Community based Information System (CFIS)". A joint undertaking of CEGIS and Riverside Technology inc. (RTi), USA, CFIS aims at flood risk reduction by providing flood prediction information to the community. The software has been developed in the context of a study area of 250 km^2 in Daulatpur and Nagarpur Thana of Manikganj and Tangail districts, respectively. WATSURF uses water levels of the Jamuna River at Sirajganj and the Padma River at Aricha forecasted by the Flood Forecasting and Warning Center (FFWC). The purpose is to estimate 48

Figure 1: Information flow under WATSURF.

A Unique Vulnerability Assessment Methodology for Agricultural Disasters

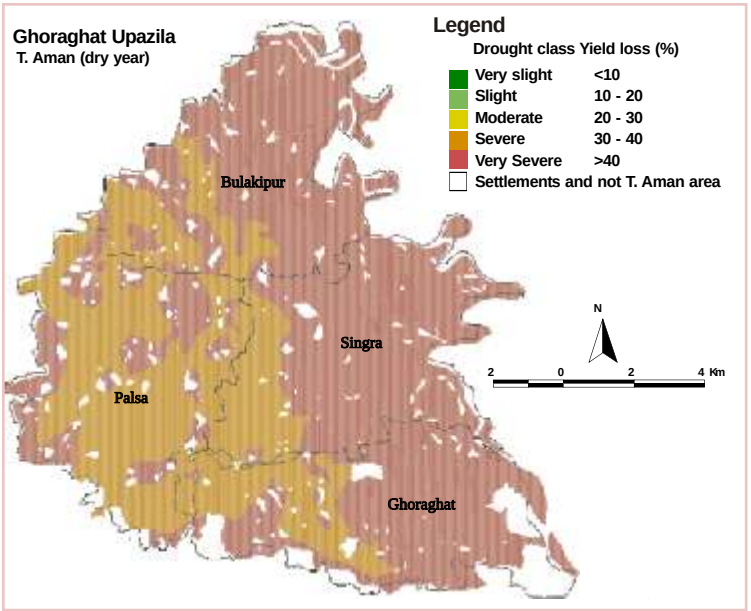
CEGIS professionals carrying out field level workshops with various livelihood group members.

Focusing on drought and flood hazards in the agricultural sector, CEGIS professionals conducted a unique vulnerability study in four pilot upazilas (including *char* lands) in the two northwestern districts (Gaibandha and Dinajpur) of the country. The study was undertaken with financial and technical support from FAO and developed closely with the Department of Agricultural Extension (DAE) project "Support to the Strengthening of Disaster Preparedness in Agricultural Sector (SSDP)".

Taking an integrated local level approach, the study looked into the multiple aspects of environment, vulnerable livelihood groups and institutional domain of the study areas. The multi-disciplinary CEGIS team comprising an anthropologist, senior hydrologist, drought expert, flood expert and field researchers, contributed to the study with specialized knowledge useful for local level agricultural vulnerability assessment. An innovative vulnerability assessment methodology, which has great potential for use in other areas of the country as well, has been derived from the study. Under the overall supervision of the anthropologist and vulnerable group-profiling expert of CEGIS, the study team also carried out more than seventeen local level workshops which involved both local community stakeholders and institutional professionals.

The study, with its multidimensional approach that integrated issues of environment, livelihoods and institutions, can also be replicated or utilized in other areas of disaster management. Future adoption of this integrated vulnerability assessment method in other wider initiatives, such as comprehensive disaster management, sustainable livelihoods development, and adaptation to climate change, could prove useful. The method has potential for use in both micro and meso level vulnerability reduction initiatives.

Some of the concrete outputs of this study included development of an innovative methodology for vulnerability assessment at local level, micro level hazard maps (drought and flood), vulnerable group profiling and so forth. Findings of the study are expected to contribute to the overall capacity building process of the DAE and disaster preparedness initiatives in the agricultural sector.



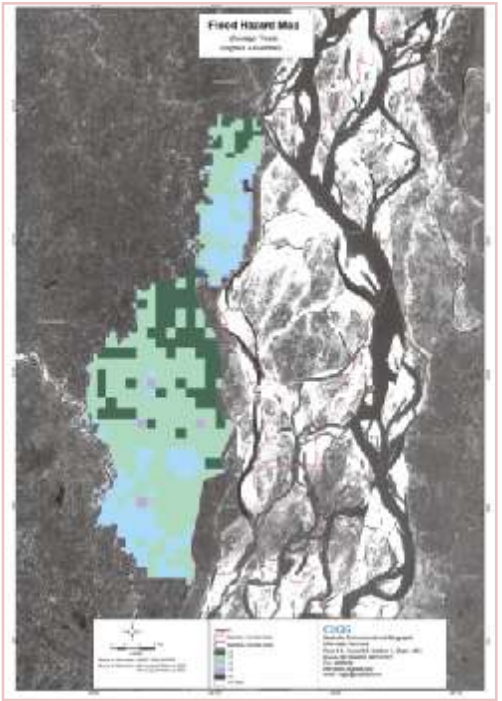


Figure 2: Hazard maps produced under the study.

Community Participation in Flood Management

CEGIS, in cooperation with the Flood Forcasting and Warning Center (FFWC), Riverside Technology inc. (RTI), RADARSAT Inaternational (RSI) and national agencies, has started work on flood risk management under the Environmental Monitoring Information Network for Water Resources Project (EMIN). The overall objectives of the project are to gather and disseminate information on monsoon floods in floodplains and to reduce vulnerability and risk through a community-based system.

A study was conducted in a flood prone zone along the left bank of the Jamuna River. The study revealed that to fully assess flood information need, an initial task is to identify community stakeholders and determine their information needs at three different stages: prior, during and after the flood event. A preliminary needs assessment indicated that community members need appropriate and timely information about where to obtain assistance in preparing for probable floods, availability of shelter, food, transportation, etc. After the event, flood-victims require information on what assistance is available and where. Rehabilitation of homesteads as well as public infrastructure like roads, bridges and market places become essential along with measures for agricultural rehabilitation.

Possible Modes of Information Dissemination: Currently, there is no effective process or system for flood information collection and dissemination at community level. For flood warning, the study showed radio to be the main source of information on the rise and fall of water levels in major rivers. To a much lesser degree, community members were found to be the information source with regard to crop damage, and television with regard to flood intensity and areas affected. According to the community in the study area the modes of information dissemination can be: use of post-mail, written and verbal messages, existing intra as well as inter-linkages between stakeholders to transfer information from national level institutions to community level stakeholders, gatherings at mosques and marketplaces, radio, television, national and local newspapers (for dissemination of daily information during flood events), and fax and e-mail if available.

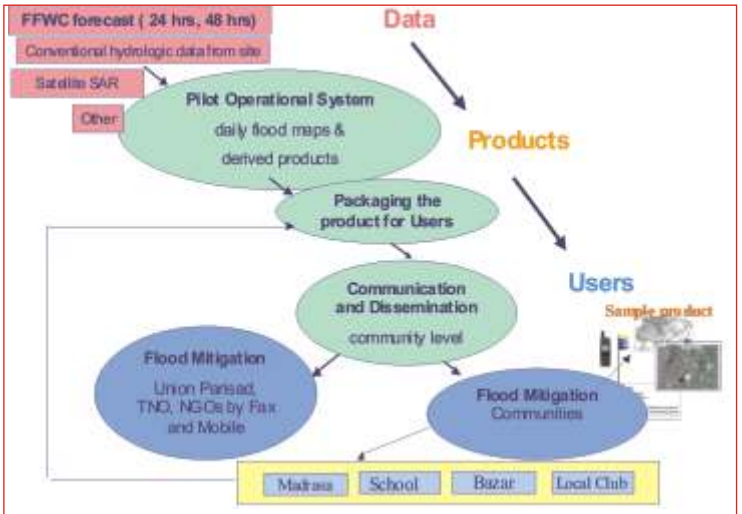


Figure 3: Community based flood information Dissemination

Community Based Flood Management: CEGIS, together with national agencies, has started the dissemination of flood forecasting at the national and community levels. Using FFWC information, water level gauge data from the project area and remote sensing data, CEGIS produces packages of daily flood maps, daily bulletins, inundation maps etc., for communities. The media is an important factor also in disseminating information at the community level. E-mail, fax, SMS are the means to disseminate flood information.

Recommendations: The existing flood warning dissemination procedure is not appropriate in the local context. People do not understand the official languages of weather forecasts on radio and television. Therefore, the flood warning and forecasting procedure should be area specific and people oriented and dissemination should be in local dialects.

Easy to read maps are also helpful for identifying flood extent. Local people have extensive indigenous knowledge which need to be incorporated into the national and regional policies. A community action plan is also needed for the future.

Conclusions: Community based flood risk management can reduce vulnerabilities and strengthen people's capacity to cope with hazards. Community participation generally means that the community takes responsibility for all stages of program planning and implementation. National agencies should engage communities in the implementation of projects and should know what they want, how they want it and when they want it. Community based flood risk management can improve public safety and community disaster resilience and should contribute to equitable and sustainable community development in the long run.

This is an abstract from the paper jointly authored by Dr. Riaz Khan, Ahmadul Hassan and S.H.M.Fakhruddin of CEGIS, and presented by Dr. Riaz Khan at the national workshop on "Options for Flood Risk and Damage Reduction in Bangladesh" held on 7th September 2004.

Workshop News

CEGIS at the Third South Asia Water Forum (SAWAF III)

CEGIS participated at the Third South Asia Water Forum (SAWAF III) held in Dhaka in July 2004. Organized by the Bangladesh Water Partnership in collaboration with GWP-South Asia, the event was held on the theme 'Achieving the WSSD Targets and Meeting MDGs: Role of GWP-South Asia'. In the context of Bangladesh, 'Flood Management' was also considered as a focus theme at the Forum. CEGIS presented its activities by displaying its products at the event.

Over 200 water professionals from South Asian countries participated in the Forum and about 70 technical papers were presented on various themes.

National workshop on "Options for Flood Risk and Damage Reduction in Bangladesh."

CEGIS participated in a national workshop on "Options for Flood Risk and Damage Reduction in Bangladesh", which was inaugurated by the Prime Minister Begum Khaleda Zia on 7th September 2004. The objective of the workshop was to develop a context based set of recommendations on policy and action plans for flood management in Bangladesh through evaluating the experiences of flooding, flood and disaster management initiatives and lessons learnt from different floodplain interventions and flood disaster management. The workshop also evaluated the socio-economic dimensions of the problem. Policymakers, water experts, environmentalists, economists, development partners, civil and military officials, media and NGO representatives, and members of law enforcing agencies took part in the workshop.

Fifty-two thematic papers were presented on the different sectors and fields relating to flood. Dr. Riaz Khan, Executive Director CEGIS, presented a paper on "Community Participation in Flood Management".

A number of recommendations emerged from the workshop in terms of improving risk reduction efforts through the strengthening of key stakeholders' abilities to mitigate, prepare for and respond to disasters.

Workshop on " Monitoring and Prediction of Erosion"

On 18th September 2004 WARPO and CEGIS, under the framework of the Environmental Monitoring Information Network for Water Resources Project (EMIN), jointly organized a workshop on "Monitoring and Prediction of Erosion". Mr. Hafiz Uddin Ahmed, Bir Bikram, Hon'ble Minister, Ministry of Water Resources, was Chief Guest on the occasion. The objectives of the workshop were: (i) to inform national organizations of the EMIN information products designed for monitoring and predicting river bank erosion based on dry season satellite images; and (ii) to receive feedback on the form, content and efficacy of the products.

Morphological changes are predicted using tools such as physical modeling, numerical modeling and

Left to right: Mr. Maminul Haque Sarker, CEGIS, Dr. Md. Omar Faruque Khan, Former Secretary, MoWR, Mr. Hafiz Uddin Ahmed, Bir Bikram, Hon'ble Minister, MoWR, Mr. H.S. Mozaddad Faruque, DG, WARPO, and Dr. Riaz Khan, Executive Director, CEGIS

empirical modeling. CEGIS has improved the existing empirical modeling tools and has introduced the use of particular shapes of sedimentary features, thereby significantly improving prediction capability. Furthermore, CEGIS has improved bank erosion prediction tools through the EMIN project, which makes use of CEGIS' technological expertise to support national organizations and NGOs working in erosion vulnerable areas. In phase II of the project, the focus is mainly on bank erosion in the Jamuna River, and on preparing a set of information products for monitoring and predicting bank erosion over the period of one year. These products, the first of their kind, were presented in the workshop for feedback from the participating national organizations.

CEGIS had applied the method for predicting morphological changes in the Jamuna River at the Pabna Irrigation & Rural Development Project (PIRDP) site for the years 2002, 2003 and 2004 and at Kamarjani and Bahadurabad for the year 2004. The CEGIS experience suggests that in spite of the complex and chaotic behavior of the Jamuna River, the probabilistic method of predicting bank erosion can be reasonably used for operational purposes. One of the limitations is that the prediction of scour depth or velocity is not possible using this method. The advantages are that (i) it is the cheapest among all other available tools for predicting bank erosion, and (ii) minimum time is required for making predictions.

Methodology to Compute Inundation Dynamics for Identification of Potential Fisheries Area and Habitat Restoration Planning

CEGIS is currently working on the establishment of an Aquatic Biodiversity Database in a Geographic Information System (GIS) environment. The task has been initiated under the Aquatic Resources Development, Management and Conservation Studies (ARDMCS) of the Fourth Fisheries Project (FFP). Development of a feasible and sustainable methodology to compute the inundation dynamics of floodplain beels is one of the major activities of this project. Inundation dynamics (water extent, depth and volume) need to be understood in order to monitor aquatic biodiversity and to study the impact of interventions (stocking, sanctuary development and habitat restoration planning, etc.).

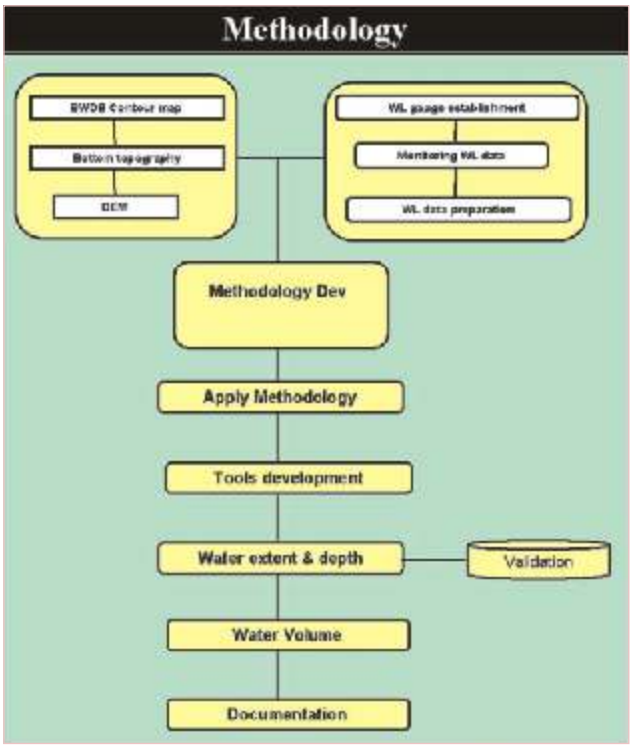


Figure 4: Methodology to compute water dynamics

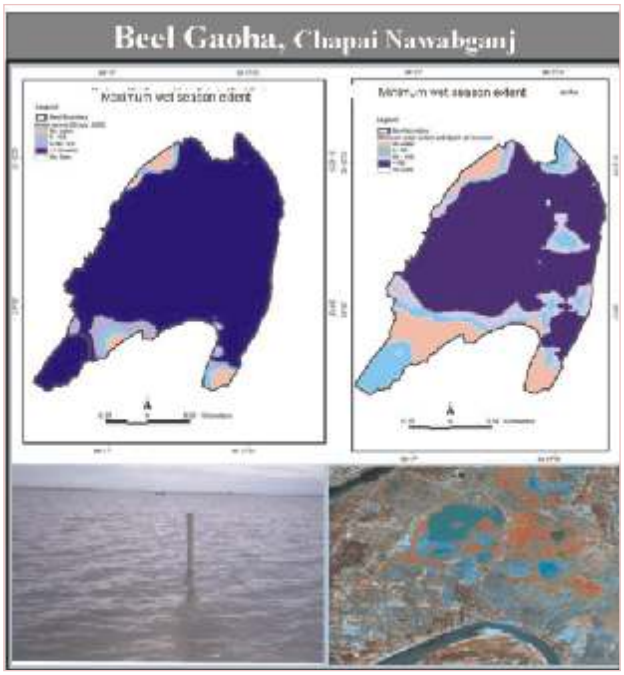


Figure 5: Sample beel of the study

Identification of potential fish cultivation areas is a crucial aspect for fisheries resources development. Identification of further potential of fish cultivation areas is pre-requisite for habitat restoration planning. The potential for areas to cultivate fish is interrelated with the depth of inundation. The areas where the depth of inundation is at least one meter is considered to be a potential area.

CEGIS has developed a sustainable and user-friendly methodology (Figure - 4) to compute water dynamics or inundation dynamics using topography data (DEM) and observed water level. It has validated the methodology through DGPS surveys. Using the derived methodology, potential fish cultivation areas can easily be identified along with possible places of sanctuary development for the future growth of fisheries resources. Beel Gaoha (Figure - 5) at Chapai Nawabganj was one of the sample beels of this study. The sample output of the development methodology is presented in Figure 6.

A computerized tool has also been developed to compute water depth, water extent and volume dynamics. The methodology could be useful for monitoring the seasonal trend of fish production or yield estimation for any waterbody. The methodology can also be used to compute inundation dynamics for any water level data of any year using observed water level data.

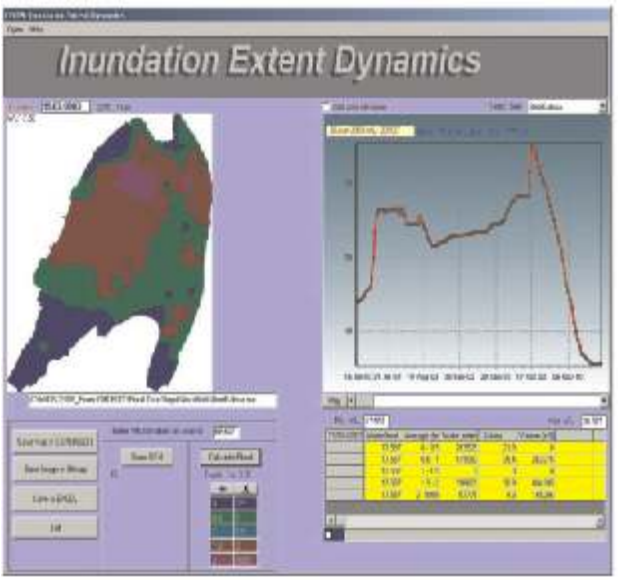
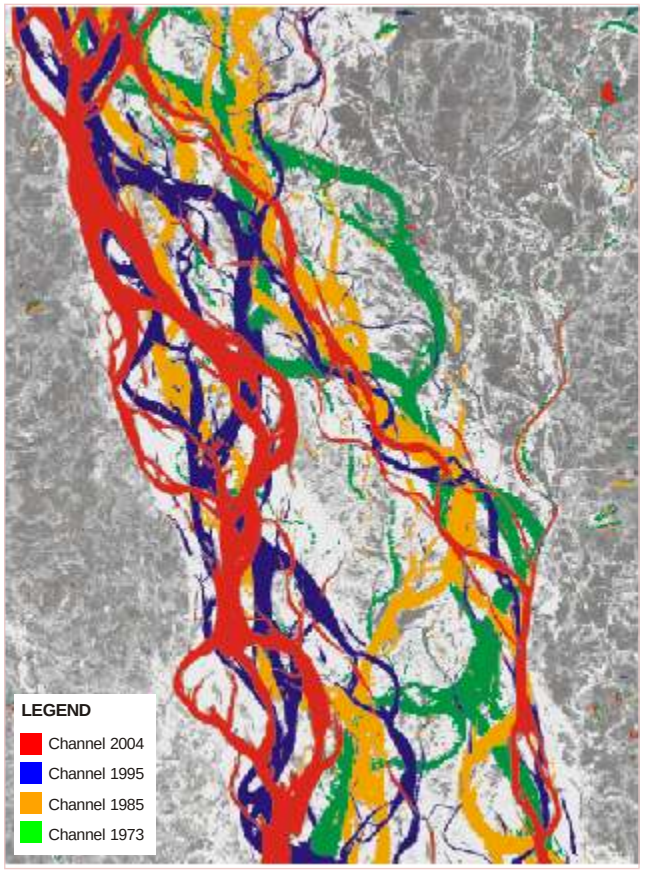
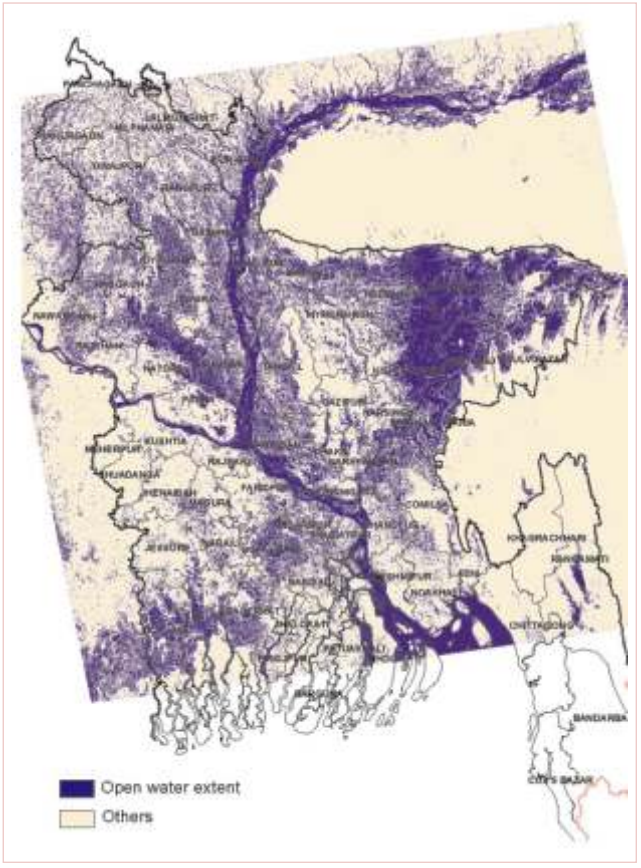


Figure 6: Sample output of the methodology

Satellite Images Processed By CEGIS

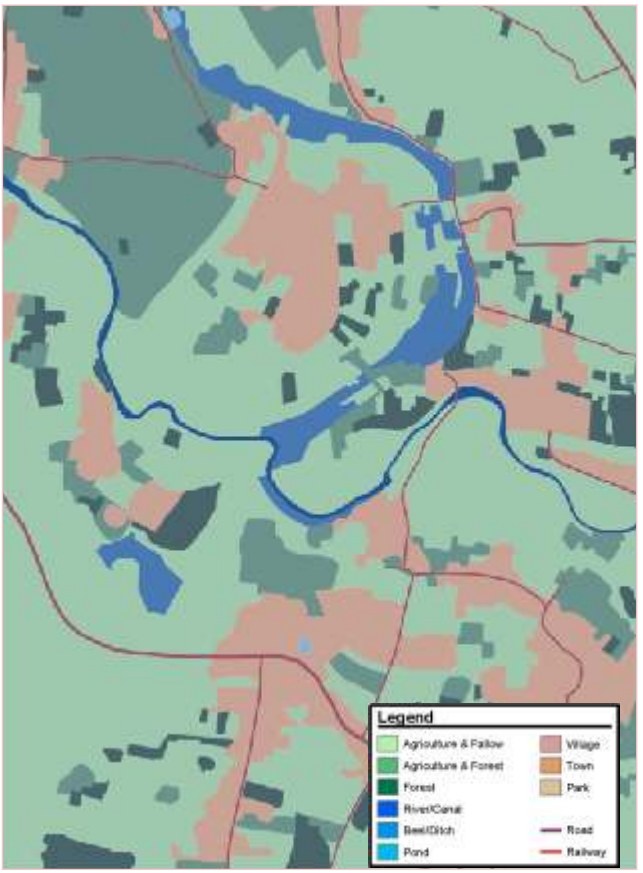


Satellite image showing channel shifting in the dynamic Jamuna River.



Open water extent derived from RADARSAT ScanSAR Wide Beam image acquired on 23rd July 2004.

IKONOS 1m color satellite image of a part of Nawabganj Thana, Dinajpur. Acquisition date: 3rd February 2004.



Data for the landuse/landcover map extracted from the IKONOS image (left).

Flood Monitoring 2004

CEGIS has been regularly monitoring the flood situation in Bangladesh since 2000. The monitoring of monsoon floods is presently focused on extreme events and on providing information to support relief and rehabilitation. River situation maps were derived from daily water level data of FFWC of BWDB and open water extent maps along with inundation statistics were derived from radar satellite images. CEGIS supplies these products on an emergency basis to government agencies, NGOs, foreign missions, international organizations and national daily newspapers. These results also help raise general awareness about the flood situation.

In 2004, RADARSAT ScanSAR Wide Beam images were acquired at different time junctures representative of the onset (June/July), peak (August/September) and recession (September/October) phases of monsoon floods. Images of 100 m resolution were analyzed to delineate open water extent. Hydro-meteorological data on water level and rainfall were collected from the Flood Forecasting and Warning Centre (FFWC) from May to September. Field data were collected on each image acquisition date on various land use/land cover type parameters.

Continuous heavy upstream rainfall and inflow caused flash flooding in different parts of the country. Although remarkably low rainfall was observed in early monsoon, the northern and eastern parts of the country experienced a high intensity of rainfall (10 days of consecutive rainfall above 300 mm) especially at the end of June and July. During this period Lourergarh, Sunamganj, Habiganj, Kurigram, Kanaighat and Durgapur experienced more than 300 mm (10 days consecutive) rainfall. All hydrological regions except for the northeast region experienced relatively low rainfall in August. The southern part of the country observed high intensity of rainfall in mid September.

In the north-east region, the water level of the Surma, Kushiyara, Khowai and Manu rivers rose sharply during the 2nd decade of June and all the rivers crossed the danger level in the 3rd decade causing severe flooding in the districts of Sunamganj, Sylhet and Habiganj. Other parts of the country, especially Manikganj, Kishoreganj, Netrokona, Dhaka, Mymensingh, Jamalpur, Serajganj, Gaibandha, Pabna, Madaripur and Chandpur, observed moderate to severe flooding during the month of July. The Ganges at Hardinge Bridge and the Gorai at Gorai Railway Bridge flowed below the danger level throughout the monsoon period. However, other major rivers such as the Jamuna, Padma, Old Brahmaputra, Surma and the Kushiyara flowed above their respective danger levels in intervals varying from 1 to 88 days. The Jamuna River at Bahadurabad crossed the danger level on 11th July and attained a maximum peak of 20.18 m remaining above danger level for 15 days. The Kushiyara at Amalshid attained the highest peak of 209 cm above the danger level on 22nd July remaining above the danger level for 45 days. The Meghna at Chandpur was found to be above the 1998 level and remained above the danger level throughout July. This high water level at Chandpur delayed the drainage of floodwaters to the sea.

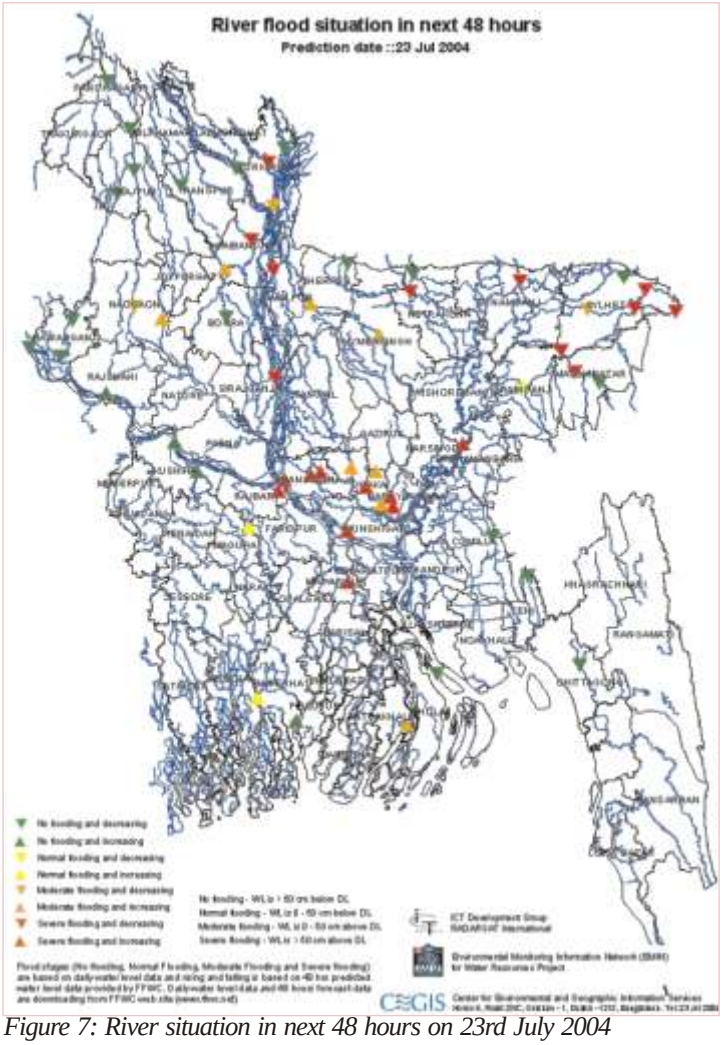


Figure 7: River situation in next 48 hours on 23rd July 2004

A river situation map was derived from the 24 and 48 hour water level prediction data that was posted daily on the FFWC website. The map in Figure 7 showing the 48-hour river situation was produced daily during the monitoring period and sent to different ministries and NGOs. (Flood stages such as no flooding, normal flooding, moderate flooding, and severe flooding are based on daily water level. The rise and fall of flood waters are based on the 48-hour predicted water level data.)

Open water extent maps and district wise inundation statistics produced using RADARSAT images (classified as Open Water Extent and Others) were sent to the same organizations within 48 hours after image acquisition.

Flood Monitoring…cont'd

The extent of open water was extracted from the image acquired on 23rd July (see top right map, page 6), which covers the peak period of the 2004 floods. About 35% of the area covered by the image was inundated by open water flood on that date. An analysis of time series data reveals that the country observed a recession in the month of August. The open water extent in Sherpur, Jamalpur, Gaibanda and Bogra was significantly reduced between 23rd of July and 16th of August.

During the monitoring period a monthly flood bulletin was brought out for July and August focusing on the current flood situation and sent to different ministries and NGOs. The monthly rainfall and water level data were analyzed and compared with that of normal year and extreme flood year situations.

CEGIS Receives Award for Stall at International Conference

The CEGIS stall received the second best award at the "International Conference on Regional Cooperation on Trans boundary Rivers: Impact of the Indian River Linking Project". The conference, organized by Bangladesh Poribesh Andolon (BAPA), Bangladesh Environment Network (BEN), Bangladesh Economic Association (BEA), Institution of Engineers Bangladesh (IEB), Bangladesh University of Engineering & Technology (BUET) & University of Dhaka (DU), was held at the IEB premises from 17th to 19th December 2004. CEGIS, Institute of Water Management (IWM), Local Government Engineering Department (LGED), BAPA, Dusthya Shasthya Kendra (DSK), and other organizations opened stalls at the IEB premises to present their activities. The theme of the CEGIS stall was Water and Environment.

The objective of the conference was to bring together experts and activists from the South Asian region as well as from other parts of the world to examine the impact of the Indian River-linking Project. Mr. Hafiz Uddin Ahmed, Hon'ble Minister for Water Resources, and Mr. AM Abdul Muhith, Former Minister for Finance & Planning, attended the inaugural session as Chief Guest and Special Guest, respectively.

CEGIS Publications in 2004

1. Vulnerability Analysis of Major Livelihood Groups in the Coastal Zone of Bangladesh. May, 2004
2. Report on Environmental and Social Baseline of Re-excavation of Kapotaksha River Project. June, 2004
3. Environmental and Social Impact Assessment of Halda Parallel Khal Project. June, 2004
4. Environmental and Social Impact Assessment of Flood Control Embankment on the right bank of Karatoa River at Amarkhan under Saldanga Union of Debiganj. June, 2004
5. Environmental and Social Impact Assessment of rehabilitation of Flood Control Embankment (Submersible) on right bank of Gumti River From Puniatong to Gouripur-Homna Road. June, 2004
6. Environmental and Social Impact Assessment of Banchanagar-Hasandi Flood Control, Drainage and Irrigation Project. June, 2004
7. Environmental and Social Impact Assessment of Panchanala-Koya beel Drainage and Irrigation Project. June, 2004
8. Environmental and Social Impact Assessment of Removal of Drainage Congestion in Comilla town and adjoining area and excavation of Chandpur Drainage Khal Project. June, 2004
9. Environmental and Social Impact Assessment of Construction of 2 regulators in Polder 64/1A and 64/2A. June, 2004
10. Monitoring and Prediction of Bank Erosion along the Right Bank of The Jamuna River, 2004. June, 2004
11. Kapataksha Nad Pun:Khanan Prokalpe Sthanio Janamot Jarip, Tathya Procharona O Motbinimoy Shover Protibedon. July 2004 (Information Campaign and Opinion Survey on Kapotaksha River Re-excavation Project. July, 2004)
12. Inception report on Environmental and Social Studies along with Stakeholders' Consultation under Haor Rehabilitation Scheme. November, 2004

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