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FAP 16

ISPAN
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST
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1. Introduction

PROCEEDINGS OF THE SEMINAR SERIES ON ENVIRONMENT
FAP 16 / FPCO / DOE / USAID

1.1 Introduction

The Environmental Study (FAP 16) and The Geographic Information System (FAP 19) in conjunction with the Flood Plan Coordination Organization (FPCO) and the Department of Environment (DOE) organized a seminar series on environmental issues on the 24th, 25th, and the 26th of April at the Purbani Hotel in Dhaka, Bangladesh. The seminars were sponsored by the United States Agency for International Development (USAID).

The purpose of the seminar series was to bring together planners, policy makers, scientists, and academics from key government and private sector organizations to discuss and exchange ideas on environmental issues so that they would have a better appreciation of policy direction, and a greater sense of the issues concerning policy articulation and implementation relating to the charlands, EIA methodologies, and the institutionalization of EIA in Bangladesh.

1.2 Seminar Series Focus

The seminars focussed on the following topics:

- The Charland Study conducted by FAP 16 and FAP 19 which covered the main river systems in Bangladesh.
- EIA methodologies used in the various resource sectors in Bangladesh.
- Strengthening EIA capability and institutionalizing EIA in the country.

The seminar on the Charland Study presented an inventory of char resources, the problems of the char people, and the extent to which these problems are related to the diverse and dynamic nature of the chars.

The methodologies seminar involved discussion of EIA methodologies in use in different sectors in Bangladesh and addressed the common problems which hinder their full and successful implementation.

Seminar III focussed on how training can help in establishing a basis for institutionalizing EIA in Bangladesh. The seminar brought together all the trainees of EIA skills workshops conducted by FAP 16 in order to determine how they had used their training in their work, and the future needs for training and institutionalization of EIA.

The seminars clearly indicate that the study of environment from different perspectives is essential to stimulate interest, generate ideas, and create national consciousness so that people are made aware of critical policy issues affecting their lives.

This paper is a record of the seminar proceedings and is meant to capture some of the intellectual excitement around the advances that have occurred in environmental studies and the application of these advances to the practical issues confronting planners and policy makers. It frames some critical environmental issues, demonstrates the application of diverse methods of research, and provides the basis for finding solutions to some of the critical problems in the area.

This paper has four main sections. The first section, the introduction, introduces the seminar and the inaugural session. The other three sections cover three main issues that were addressed during the seminars.

The introductory section is followed by the proceedings of the seminar on the Charland Study which includes overviews of the major theoretical and applied issues in the study of the charlands in the major river systems of Bangladesh. The presentations focus on the objectives of the study, provides a description of the study area, explains the methodology used, discusses the socio-economic aspects of char life, and indicates the policy initiatives needed for the char people.

Seminar II presents five EIA methods in use in different sectors in Bangladesh. It focuses on EIAs in the context of the water sector, rural infrastructure, the industrial sector, and the Jamuna Multi-purpose Bridge Project. It examines the research processes involved in undertaking EIAs and reflected the current ideas and approaches of professionals working with it.

Seminar III examined the effect of EIA training to assess the success of the FAP 16 training program, and to determine how training can help formulate future training programs and institutionalize EIA. The seminar also explored ways of strengthening the EIA process in Bangladesh.

1.3 Inaugural Ceremony

The seminars were formally inaugurated by the Secretary of Water Resources, Secretary of Environment and Forest, USAID Project Officer, and ISPAN officials. Mr. Md. Nazrul Islam, Secretary, Ministry of Water Resources, in his inaugural speech stressed the current and the future importance of EIA and GIS tools in water sector planning. Supporting speeches were given by Syed Amir-ul-Mulk, Secretary, Ministry of Environment and Forest who was the special guest, Dr. Craig Anderson, Project Officer, Department of Food and Agriculture, USAID; Kazi Fazlur Rahman, Principal Advisor, ISPAN; Mr. Darrell Leppert, Chief of Party, ISPAN, and Mr. Haroun Er Rashid, Advisor, FAP 16. Mr. M.H. Siddiqi (BU), Chief Engineer, FPCO, chaired the session. Asgari Ahmad facilitated the session. The program is provided in Annexure 1, Table 1.

2. Seminar I

THE CHARLAND STUDY

2.1 Charland Seminar Format

The principal aim of the Charland Study seminar was to present the major findings of the study to a cross-section of policy makers, planners, scientists, donors, and other professionals to create an awareness of the critical issues affecting the lives of 4.3 million people living in the riverine charlands of Bangladesh. The seminar addressed important policy issues relating to the socio-economic aspects of char life, developed a constructive dialogue on the complex problems associated with char development, and sought solutions to these problems. The specific objectives of the seminar were to:

- Present the findings of the Charland Study.
- Appreciate the diverse and dynamic nature of the charlands.
- Understand the socio-economic aspects of char life.
- Help formulate programs for reducing the vulnerability of char people to erosion and flooding events.

A.M.Shafi, Superintending Engineer at FPCO, chaired the technical sessions on the Charland Study. Government officials, academics, members of the donor community, and professionals from consultancy firms and NGOs attended the seminar. The participant list is provided in Annexure 2B.

The program was divided into three sessions. During the first session, four presentations were made which were followed by a discussion session. The discussion session was followed by two additional presentations. A second discussion period followed. In the third session, the study conclusions and recommendations were made. (The program is provided in Annexure 2A, Table 2).

This part of the proceeding is divided into two sections. Section 2.2 summarizes the presentations made on the Charland Study. Section 2.3 presents the questions raised during the seminar and the responses to them.

2.2 Presentations

The presentations focussed on the study objectives, the study area, the field inventory system, the socio-economic aspects of char life, flood proofing measures, and the policy recommendations made for the development of the chars. The presentations were made by Mr. A.M. Shafi of FPCO, Mr. Darrell Deppert of ISPAN, and members of the study team, who included Mr. Timothy C. Martin and Ms. Iffat Huque of FAP 19, Dr. Paul Thompson, Dr. Mustafa Alam and Dr. Ian Tod of FAP 16.

2.2.1 Introduction to the Study

In introducing the Charland Study, Mr. Shafi said that in 1992, ISPAN, in coordination with the FPCO and through the joint efforts of the Environmental Study (FAP 16) and the Geographic Information System (FAP 19), undertook an inventory of resources and people in the chars of the Brahmaputra-Jamuna, Ganges, Meghna, and Padma rivers. The study showed that the chars are prone to flood and erosion, which destroy crops and homesteads, and displace people, causing untold suffering and even deaths. Using GIS and advanced image

processing, the study generated information about river bank shift, land erosion and accretion. RRAs in six different locations of the study area provided socio-economic information about the char people, whose life patterns often differed from those of the people in the mainland. The RRAs produced valuable information which have important policy implications and provide a basis on which planners can design better flood proofing and mitigation measures.

Mr. Shafi added that one component of the study examined the advantages of flood proofing on the chars of the Jamuna river system. The findings of the different components have provided insights into char issues that so far have been largely neglected in the past. The study makes policy recommendations that call for the implementation of more effective measures aimed at improved channeling of assistance to affected people, greater participation of concerned groups, and creation of mechanisms to update the database.

2.2.2 Study Objectives

ISPAN's Chief of Party Darrell Deppert described the importance of the charland study. He explained that most regional studies under FAP used the main rivers as their study area boundary and focussed on flooding on the mainland. However, the inhabitants of the chars are among the most hazard-prone people of Bangladesh. First, the chars are inundated during the monsoons, and second, flood control structures implemented on the mainland are likely to adversely affect char resources and people. Hence, the study objectives included the development of databases and to use geographic information systems (GIS) as a planning tool for (1) determining direct interventions in the charlands, and (2) a determination of the impact of other interventions on the mainland on the char areas. The data would help the planners assess char resources, build understanding of the socio-economic conditions of the char people, and provide the basis for general policy recommendations to address the hazards associated with the charlands.

Deppert noted that the Charland Study produced an extensive database from the field inventory returns and the satellite imagery analysis. The data is archived both digitally and in thirteen hardcopy reports, four of which are inventories of the chars on four major river systems. In addition, the methodology developed during the study could also be used for data generation and analysis in other areas. Finally, the study made policy suggestions and recommendations for future action in the charlands that would improve the living condition of the char people.

2.2.3 Description of the Study Area

To explain the regional and historical morphological setting of the study area, Timothy Martin, Team Leader of the Geographic Information System (FAP 19), described the tools used to better understand the context and physical environment of the chars. The study area covered the Brahmaputra-Jamuna, Ganges, Padma and Meghna catchments and included different types of watersheds. The rivers differed in volume and discharge, and in sediment load during monsoon and dry season flows. GIS was used to collect information about the morphology of all the main rivers.

Martin explained that comparison of the 1992 satellite imagery with the Rennel's map of late 1700s (which mapped the details of rivers, islands and water features) shows that there has been a substantial westward shift of the Brahmaputra-Jamuna. The old maps were converted to a digital format and used with new maps and satellite images using GIS to derive information that was not possible a few years ago.

Martin said that the Brahmaputra-Jamuna was a classic example of a braided river which is characterized by unstable banklines with an

average westward migration of 30 meters a year for the last 160 years. He summarized the morphology of the other rivers, explaining that the Ganges is in a state of dynamic equilibrium characterized by rapid bank erosion within its active corridor, while the Padma channel is stable, though the mainland is being lost to the river. The Upper Meghna is migrating eastward, while the west bank is stable, and the lower Meghna is experiencing high rates of erosion.

Martin showed time series images of a single char for the period of 1973-1992, explaining its evolution and morphology. He showed a rare view of a high resolution image of a major flood (1987), showing other uses of image processing and GIS tools. He explained how valuable information can be derived about the behavior of a large flood, the extent of flooding of the charland, breaches in existing embankments, and areas of drainage congestion.

Iffat Huque extended the description of the study area and explained how GIS was used to study the various morphological features of the Jamuna, Ganges, Padma, and Meghna. She showed how historic changes in the river morphology were documented and quantified to understand and predict river behavior. Satellite images were used to study river dynamics, charland geometry and vegetation distribution. Geo-referencing of the images provided information about location on changes in the areas during different time spans.

Using the Padma as an example, Huque stated that banklines were digitized and GIS was used to determine bankline erosion. Bankline analysis provided information on the center line migration of the river, while the relative position of the banklines provided information on the extent of erosion, accretion, length and widening of the river. Satellite image analysis produced maps that showed changes occurring in the river channels. Huque added that GIS studies showed that all the rivers, with the exception of the Upper Meghna, have steadily widened over the last ten years. However, the bank erosion rates were highest for the Padma and the right bank of the Jamuna.

Huque pointed out that an extensive database was developed for the study. Mouzas of all ten charlands of the major rivers were digitized. GIS generated some data on the area of mouzas, the areas under cultivation and the areas that were eroded. Large volumes of digitized data on population, migration of the char people, infrastructure, effects of floods on housing etc., on mouza basis were linked to the mouza database. As a result of the linkage, GIS was able to map themes of information on the riverine char areas (i.e. population, migration etc.).

2.2.4 Charland Inventory

Dr. Paul Thompson, one of the lead investigators on the charland inventory study, described the inventory information collected on population, resources and hazards for the riverine charlands. The study area covered islands and attached chars and unprotected mainland. Data was collected for each mouza using a questionnaire and mixture of information sources. Mouzas were chosen as the geographical units because they have spatially defined boundaries which could be used in analyzing data from the inventory with satellite image data using the GIS developed for the study. He added that all 3,306 mouzas in the study area were covered. These included some that were not available in published maps. The study had to reconcile ambiguities over charland mouza boundaries for the purpose of mapping.

Thompson explained that the charlands cover 8,444 sq km of area with a population of 4.3 million (of which 22 percent are in island chars and 22 percent in attached chars). Population densities in the unprotected mainland areas are above the national average while in the island chars they are much below the national average. He showed maps based on the inventory to

illustrate: changes in population density associated with bank and island char erosion, the relatively extensive cultivation found in chars, and variations in the proportions of houses flooded and destroyed in the different reaches of the Padma river in 1988. Thompson also talked about the severity of hazards in the charlands. In particular, he pointed out that the chars frequently erode and that all four rivers have widened during the last ten years. In this period, 87,000 hectares of land eroded along the river banks covered by the study and on an average 64,000 people were displaced annually. The 50,000 hectares of charland which emerged in this period cannot support the displaced population, and so some 12 percent of the population (461,000) were estimated to have migrated out of the charlands. The process is expected to continue, and about 570,000 people may be made homeless by river bank erosion of the Jamuna alone during 1992-2011.

2.2.5 Socio-Economic RRAs

Dr. Mustafa Alam continued the discussion on the charlands by describing the socio-economic aspects of the char people. He explained that the socio-economic RRAs were conducted in six different locations representing variations in age and stability, accessibility, size and population, occupation pattern, agricultural practices, and degree of flooding and erosion hazards. He stated that the majority of char people are involved in agriculture, fishing and cattle rearing. However, most chars are extremely vulnerable to flooding and/or erosion, which cause widespread damage and population displacement. Consequently, char people are often forced to change their occupation from farming to becoming agricultural wage laborers, petty traders, rickshaw pullers, or porters. Alam added that the cycle of erosion and accretion often created land ownership problems. There is a need for re-examining the existing laws on alluvion and diluvion and the problems in implementing such laws to achieve greater equity of land ownership in the chars. More coordination is also needed among the government, NGOs and the local people to formulate and execute proper resettlement policies, more effective flood warning systems, appropriate flood proofing measures, and better health and education services.

2.2.6 Flood Proofing

Dr. Ian Tod presented a summary of the flood proofing study done as part of the overall Charland Study. Dr. Tod contended that flood proofing could be effective and cost-efficient in reducing flood losses, prevented loss of life and disruption of economic activity, provided security, and created an incentive to sustain socio-economic improvements in a flood-prone environment.

To reduce loss of life, flood proofing programs should raise house plinth levels and develop community shelters. Raised house floor plinth levels has a 69 percent financial rate of return through reduced evacuation costs, livestock losses, loss of household effects, and damage to property and homes. Use of community shelters for multiple purposes has a comparable rate of return of 34 to 69 percent. Both investments were considered sound on the assumption that the plinths and the shelter would last more than four years. To limit economic loss, Tod stated that organizations should plant flood-tolerant vegetation, develop programs to protect seeds and fertilizers, create employment opportunities, protect commercial facilities, create post-flood credit programs, and improve livestock services. The study recommended that flood proofing programs aim to raise house floor plinths and provide shelters, as well as to reduce economic loss through the improvement of infrastructure and better utilization of the potential of the charlands.

2.2.7 Conclusions and Recommendations

Mustafa Alam concluded by recommending that future efforts should try to (1) implement effective flood proofing and flood warning measures, (2) target assistance to flood and erosion affected people, (3) provide miscellaneous extension services to the char people, (4) ensure the participation of government and non-government agencies in implementing an overall program of char development, and (5) create mechanisms to update the database.

2.3 Discussion on Presentations

The presentations were followed by two discussion sessions. A summary of the discussion is presented below. Questions that were raised by the participants have been grouped by presentations and by issue. The major issues discussed by the participants were related to: (1) data quality, data updating and reliability, (2) bankline shifting and definition of central line, (3) number of people living in the chars, (4) stability of the chars, (5) flood shelters, (6) power structure in the charlands, and (7) flood warning. (Participants' questions and comments are provided in Annexure 2C).

2.3.1 Data quality, data updating and reliability.

One participant enquired about the reliability of data and the need for periodic updating of the data. He wanted to know whether measures had been taken to ascertain data reliability, as data quality and accuracy were poor for almost all sectors in Bangladesh. The study team claimed that they had used different measures to ascertain data accuracy. First, the inventory was based on primary surveys which were checked by frequent field visits. The margin of error was within acceptable limits. Some of the inventory data were cross-checked during the socio-economic RRAs and confirmed the consistency and reliability of the primary data. The generated data was more than ninety percent reliable. Geo-corrections were made to the digital images. Image classifications (such as land-sand-channel) by computers were field checked extensively and were found to have classification accuracy of at least ninety percent. One problem encountered by the team was the difficulty in checking the data one year after the initial investigation, as people would often move away from their original locations by then. In addition, although accuracy of image classification of seven images could not be verified through ground truthing, it was expected that for those images assessment of image classification would yield similar accuracies since all images were recorded during the dry season and subjected to the same classification procedures. The team added that the studies amassed extensive statistical data, and agreed that because of the dynamic and diverse nature of the charlands there was a need for frequent updating of the data.

2.3.2 Bankline shifting and definition of the center line of rivers.

Several participants underscored the importance of determining the center line of the rivers and bankline shifting. One participant suggested that the deep channel line needed to be used as the center line, as the center line would otherwise be different during different times of the same year. Study team members responded that the center line used during the study was drawn by taking the locus of mid-points of distances between the two banklines. By taking the center line of different years, the general shift of the river could be quantified. Bankline positions were determined by discussions with river morphologists and engineers. In general, banklines were taken to encompass the main river channel, island chars, and sand bars, and were considered to be extended to the attached sand bars (where such sand bars existed).

Another participant extended the argument by asserting that there was a need to integrate the findings of other charland studies which looked at bankline shifts and used methodologies other than GIS. Triangulation of methodologies was needed to confirm whether the morphological aspects studied were reliable. It was noted that both FAP 16 and 19 had collaborated with FAP 21 on this issue. However, there was a need for more interaction and coordination with other organizations.

2.3.3 Number of people living in the chars.

Several participants wanted to know if the national demographic statistics included the 4.3 million people reported to be living in the chars. Given the frequent erosions and subsequent migrations of char people, updating of population statistics was necessary. It was suggested that the Union Parishads could assist this, as they had land tax records of the people living in the area. LGED had thana maps and was in the process of developing union maps. There was a need for sharing and integrating of different databases for mutual benefit.

2.3.4 Stability of chars.

One participant felt that there was a need to distinguish between the chars that were stable and those that were unstable. Those that were relatively stable were suitable for investing in infrastructure development. The team claimed that it was possible to identify the stability of the chars, because satellite images recorded the age and cumulative erosion of the chars. Data was available in the reports. As both LGED and SPARRSO were working in the same areas, the next step would be to integrate the data from various resources.

2.3.5 Flood shelters.

A participant wanted to know what the costs would be for building adequate numbers of flood shelters for the char people. He enquired about what people did during the 1988 floods. The study team claimed that building shelters at regular intervals along the bankline would not be good planning. To optimize the use of shelters, the local people needed to participate in assessing their need. Costs for shelter construction would vary according to the number of shelters built and their sizes. During 1988, the flood affected people took temporary refuge on nearby embankments, while many others moved to the mainland. In general, when disasters occur, people of the affected chars may migrate temporarily to other local chars and seek employment there. Others may seek shelter with relatives or build homes on someone else's land. Migration patterns of the char people were extensively studied. The relevant data are provided in the reports.

2.3.6 Power structure in the charlands.

A participant stated that the power structure in the charlands had significantly affected the lives of char dwellers in so far as people of one locality were not allowed access to other areas during disasters. The team described its findings on the local power structure and explained the ways in which it can influence and control land and other resources. In certain locations this control has been rather significant. The study, however, found that there was a general flexibility among char people in accommodating those driven away by natural disasters like flood and erosion.

2.3.7 Flood warning.

Another participant wanted to know whether the study had examined the question of flood warnings for the charlands. It was affirmed that flood warning practices in the chars were studied and found to be inadequate. The study enquired about the local flood warning needs and found that the usual practice of announcing river water levels at specific points over the radio was of

little value. Rather, people wanted information on how their own locality might be affected. They thought such warnings could be conveyed to them through loud speakers set up at public places like the focal market.

2.3.8 Local and central government role in char development.

The general contention was that though the central government's involvement in char development was important, the local government was required to play an important role in identifying local level problems and in involving local people to solve them. A strong local government with greater command over resources would be better able to resolve the problems created by unplanned settlements in the chars, and could provide basic services in agriculture, health, education and sanitation to the char people.

It was agreed that there was a need for the central government, local government and NGOs to assume responsibility and authority for resettling displaced people. Major improvements in policies relating to land laws were needed in developing rehabilitation and resettlement strategies. The local government and other local agencies could also play important roles in providing special assistance during disasters such as flood and erosion. They could help by providing flood warning, transport services, pure drinking water and shelter, and developing the much needed infrastructure such as schools, health and sanitation facilities, credit and agricultural extension services.

SEMINAR II
EIA METHODOLOGIES USED IN BANGLADESH

3. Seminar II

EIA METHODOLOGIES USED IN BANGLADESH

3.1. Seminar Format

The theme for the second seminar held on the 25th of April 1995, was EIA Methodologies used in Different Sectors in Bangladesh. The primary objective of the seminar was to promote discussion between the principal organizations using EIA in various sectors in Bangladesh, in order to address common problems related to the implementation of the varied methodologies and to seek constructive solutions to these problems. The specific objectives were to:

- Understand the EIA methodologies used in Bangladesh.
- Appreciate the need for data collection.
- Appreciate the need for EIA Guidelines in different sectors.

The seminar began the process of bringing together concerned groups of EIA practitioners and reviewers from the government, consulting firms, NGOs and other FAPs who are interested in sharing their experiences and views, with the hope that they can more effectively perform the task of assessing the impacts of projects. (See Participant List, Annexure 3B). This is crucial to the improvement of existing Guidelines and for the future development of EIA Guidelines in sectors that do not as yet have them (e.g. agriculture, energy, industry, fisheries etc.).

The program was divided into two sessions. During the first session five speakers spoke on EIA methods in use in Bangladesh. After the presentations the floor was opened for discussion, during which time the speakers answered questions addressed to them. The program is provided in Annexure 3A, Table 3.

Syed A.N.M. Wahed, Director General of the Department of Environment, and Haroun Er Rashid, Advisor to FAP 16, co-chaired the seminar.

This part of the proceedings has been divided into three sections. Section 3.2 presents a summary of the papers presented by the speakers. Section 3.3 presents the questions asked by the participants and the responses made to them. These have been organized according to the person to whom they were addressed. However, because of time constraints, a large number of questions could not be dealt with during the allotted time period. As a result, many questions were not addressed. The third section (3.4) provides the concluding remarks made by Syed A.N.M. Wahed.

3.2 Presentations

The presentations focussed on EIA methods used in water development projects, rural infrastructure development and planning, industrial projects, and the Jamuna Multi-purpose Bridge Project. The presentations were made by Dara Shamsuddin, Geographer and Ecologist Environmental Study FAP 16, Monowar Hossain Chowdhury, Additional Chief Engineer, Local Government Engineering Department (LGED), Mamunul Hoque Khan, Environmental System Analyst, CARE-Bangladesh, Akhtar Hossain, Managing Director, Envirocare, and Feroze Ahmad, Professor, Department of Environmental Engineering, Bangladesh University of Engineering and Technology.

3.2.1 Water Sector EIA

FAP 16's Dara Shamsuddin started the session by describing the EIA Guidelines developed by FAP 16 and approved by FPCO in 1992 for the water sector in Bangladesh. He said that the Guidelines addressed development interventions under the FAP and conformed to the Government of Bangladesh Environmental Policy of 1992.

Shamsuddin said that according to the FPCO Quarterly Report of June 1994, EIAs and IEEs were undertaken by FAP 2, FAP 3, FAP 3.1, FAP 4, FAP 5, FAP 6, FAP 8A, FAP 9A, FAP 9B, FAP 12 FCD/I, FAP 20, and FAP 21/22. The EIA methodology involved eleven steps. Their purpose and scope are to assist EIA practitioners to identify, quantify and evaluate potential environmental consequences of water sector projects so as to ensure that all water sector projects are economically and environmentally sound. Shamsuddin added that a multi-disciplinary team of specialists of all major resources are needed to undertake EIAs, which should occur at the pre feasibility and regional study level and at the feasibility level of a project cycle. A full EIA for a proposed project requires three to twelve months.

In addition, the methodology of assigning "scores" and "weights" that is used in the Guidelines to evaluate impacts has been found to be problematic. Numerical values used for "scoring" and "weighting", if used for mathematical manipulation, give a false sense of exactness. The "scores" and "weights" represent only the best professional judgement of specialists and experts and are made on the basis of available information and is subject to personal opinion and biases. Moreover, it is sometimes confusing as to whether "scoring" and "weighting" are mutually exclusive concepts, and whether it is appropriate to multiply the two in obtaining impact values. Therefore, this particular step in the Guidelines may need to be reconsidered and possibly restructured. A possible option is to use alternative impact an analysis system as is commonly used in the United States.

There is also a need to upgrade the Guidelines to incorporate the benefits of experience gained from environmental studies and EIAs undertaken in the country. Shamsuddin suggested that changes needed to be made in the approach used to conduct EIA, in the steps outlined in the EIA process, and in the methodology used to evaluate impacts. Some of the more important modifications that need to be made are:

- The Guidelines for Preliminary Environmental Review (PER) and Initial Environmental Evaluation (IEE) need to be incorporated into the document specifying their place and role in project formulation

- The role of the IEE in regional planning and development needs to be more clearly identified and distinguished from the role of the IEE at the pre-feasibility level of an individual project

- The concept of trade-offs need to be reviewed. It is not clear whether the trade-off is between positive and negative impacts, or between negative impacts and the cost of mitigation. The Guidelines seem to suggest the first alternative, but the second alternative merits serious consideration. (For more details, see Shamsuddin's paper in Annexure 3C)

Shamsuddin stressed the need for data collection and storage, for setting up national standards, for Guidelines in other sectors, and for institutionalization of EIA in the country. He added that different sectors need to develop a common approach to developing guidelines in order to eliminate contradictions that occur.

3.2.2 Rural Infrastructure EIA I

Manowar Hossain Chowdhury of LGED discussed the LGED Guidelines developed for physical infrastructure planning of rural areas in Bangladesh. He said that the LGED Guidelines help to mitigate the environmental impacts of thana road projects, thana irrigation schemes, and thana drainage and embankment projects. The Guidelines are published in Bengali and English and have been distributed to all thana engineers, while the Bengali version has been distributed to all the Union Parishads in Bangladesh.

Chowdhury claimed that the LGED Guidelines incorporate both IEE and EIA. For small projects which have minimal environmental consequences, EIA is not needed. In such instances "IEE serves for the EIA of that project." When a full scale EIA is needed, IEE identifies issues that merit detailed analysis and issues that merit only a cursory discussion. Chowdhury explained that a simple methodology has been developed for EIA of infrastructure projects. It is based on the Environmental Evaluation System (EES) developed by Mattelle Columbus Laboratories in the USA. The environmental impacts are assessed by Environmental Impact Values (EIVs). The computation of EIA of a project needs determining the value of the magnitude of change of environmental parameters and the value of the relative weight or importance of the parameter. The relative importance of the parameter varies from country to country. In Bangladesh, agriculture and fisheries carry more importance than others. (See Annexure 3C for description of the methodology). The methodology was found to be useful and adequate.

The development and distribution of the Guidelines were not alone sufficient, according to Chowdhury. Skilled manpower was needed to implement the Guidelines. Training was essential and was considered to be an integral part of the institutionalization of EIA in rural infrastructure development. Consequently, LGED's future plans include environmental training for thana engineers and for district-level sub-assistant engineers. The process has already begun, as EIA training is part of LGED's long-term training program.

3.2.3 Rural Infrastructure EIA II. CARE-Bangladesh

CARE's Mamunul Hoque Khan stated that CARE's Environment Management Unit (EMU) used the LGED Guidelines to review more than fifteen hundred proposed rural road reconstruction schemes. However, CARE found that there were problems with the methodology, as IEE and EIA were done for projects for which design dimensions were not known. Khan argued that IEEs/EIAs need to be carried out on the basis of specific project proposals. He further added that the IEE checklist provided in the Guidelines was too general and needed to be more specific and consistent in its approach. In addition, there were problems in the impact assessment methodology; assigning relative importance value to environmental parameters based on the importance of different sectors was inherently vague and ambiguous because it was not specific and lent itself to biases during quantification. Khan added that qualitative descriptions needed to be used where it was not possible to quantify impact value.

Khan talked in great detail about the lack of reliable baseline data, the poor quality of the data, and the lengthy process involved in accessing available data. He claimed that most data were outdated and unreliable, and that lengthy bureaucratic formalities, red tape and unnecessary restrictions on release of data created problems for EIA practitioners who need baseline data to meet specific deadlines. In addition, data storage was a problem, as there was lack of a national database. Khan said that there was an urgent need for a service-oriented data center which has archived sector-specific

data that is easily available. A national level data coordination cell is needed to coordinate data storage and updating and data duplication. Khan also argued for a national EIA institution which could organize training and workshops, and provide a general forum for discussion of EIA-related issues. (See Annexure 3C for details).

3.2.4 Industrial Sector EIA

Envirocare's Akhtar Hossain spoke about the EIA methodologies used in the industrial sector. He underscored the need for the guidelines, and stated that ADB has offered to fund the development of guidelines for the sector. Hossain claimed that industrial activities in Bangladesh involved a huge increase in the use of chemicals, discharge of solid waste into the river systems, and use of land for industries in non-compatible zones. Consequently, it has become imperative that the DOE urgently act to develop and implement EIA. The absence of legislation and EIAs has caused colossal and irreversible environmental damage, according to Hossain.

Hossain further explained that identification and description of Important Environmental Components (IECs), prediction of mitigation plans, estimation of the probability of the occurrence of the impact, and evaluation of impacts were critical for conducting EIA. He said that each of the elements requires different methods of assessment suitable for the industrial sector. These methods included use of checklists, scaling, and measurement. For impact evaluation, multi-criteria analysis and cost-benefit analysis were needed. Matrices, overlays, networks, cost-benefit analysis, and simulation modelling were other techniques used for impact assessment.

Hossain asserted that South East Asian countries used different EIA Guidelines and explained that in Bangladesh both the Asian Development Bank and World Bank Guidelines are followed in the industrial sector; which guidelines were used depended upon the donor agency. He contended that EIA methodology needed to be adapted to the specific needs of each country, as countries differ in the environmental problems they face. Industrialized nations, for instance, were involved in pollution cleaning-up processes whereas developing countries were more concerned with achieving sustainable development. Because of the socio-economic condition and institutional arrangement in Bangladesh, EIA techniques that are expensive and time consuming are impractical and inappropriate.

Like Shamsuddin, Hossain also recommended the need for training of EIA professionals in the private and public sectors. Awareness training on environmental issues, creation of environmental units/cells in agencies engaged in development activities, and allocation of funds for EIA in feasibility studies were some of his recommendations. He further suggested that inter-ministerial cooperation and strong laws are needed to implement EIA in the industrial sector. Environmental Quality Standards (EQS) and legislation to protect industries need to be established. He added that the National Board of Revenue together with DOE should issue environmental permits and inspect and monitor industries to achieve national standards.

3.2.5 Jamuna Multi-Purpose Bridge Project EIA

BUET's Feroze Ahmad described the EIA methodology used in the Jamuna Multipurpose Bridge Project (JMBP). He briefly described the project and explained that the environmental parameters studied for the feasibility study involved the physical, physio-chemical, ecological, and socio-economic changes expected from the construction of the bridge. The construction of the bridge will cause a back water effect, erosion, scour, siltation and accretion in the river, and will adversely affect the stability of the river banks and flood control embankments, agricultural activities, fisheries,

and ground water replenishment. It will also disrupt communication and navigation in the area. The feasibility study of the bank envisaged the complete closure of the north intake of the Dhaleswari river by the approach road at the east end of the bridge.

Ahmad explained that EIA uses different methodologies to evaluate impacts. Checklists, matrices, networks, environment evaluation systems, overlays, environmental impact indices, simulation modeling workshops, cost-benefit analysis and expert systems were some methods used for EIA. He explained that it was important to remember that the methodology used for impact assessment of any project be suited to the project and that it be objective, comprehensive and replicable. Data, time, and resources available were important considerations in undertaking an EIA. Inadequate time, data, resources or tools meant inadequate EIAs.

Of the methodologies listed, Ahmad stated that a cost-benefit analysis was used for the JMBP project. The analysis found that the benefits from the project outweighed the adverse impacts. He argued that the advantages of cost-benefit analysis were many. First it was one of the best methods to use because it allowed for environmental costs and benefits of the bridge to be incorporated in the analysis. Moreover, results of the analysis were easy to communicate to others, so that experts who reviewed the project could weigh their advantages and disadvantages. Mitigation measures recommended could also be more easily understood. One of the disadvantages of the methodology is that it did not lend itself well to precise impact quantification. Additionally, costs of some environmental resources could not be ascertained or estimated.

Ahmad concluded by stating that all methods were not suitable for all projects. In fact, use of different methods for impact analysis for similar projects can lead to different results. It is important to keep in mind that lack of replicability and uncertainties are inherent in all methodologies. He emphasized that resource constraints and profit motive often lead to incomplete and inadequate EIAs. Hence there is an urgent need for the development of sectoral guidelines to avoid some of the pitfalls that occur in using the different methodologies to assess project impacts (See Annexure 3C for details).

3.3 Discussion

Following the presentations, the participants asked questions and commented on issues of concern to them. In doing so, they tried to reach a common understanding of basic problems that are related to EIA methods used in the country. Their comments, questions, and answers are presented below.

3.3.1 Questions And Comments Addressed To Dara Shamsuddin

Saleemul Huq, BCAS

Comments: Congratulations on taking the initiatives to hold this meeting to bring together EIA practitioners from different sectors. This is a very good idea and should be continued.

In future meetings other sectors, e.g. agriculture, fisheries, major industrial projects (e.g. KAFCO) or industrial sectors (e.g. tanneries) may be included.

We would therefore suggest that today's meeting becomes the first in a series to be continued at regular intervals. Such an exercise should legitimately be co-ordinated by the Department of Environment as they have the overall mandate for EIA reviews etc. ISPAN/USAID may be able to help DOE with support and resources for such a continuing network of EIA practitioners.

On the issue of data gathering and compilation, storage etc., we would suggest that all the organizations and institutions including government agencies, universities, consultants NGOs etc. be identified and share whatever they have and make it available to others.

At a later stage a publication or even a series of publications may be considered which would incorporate inputs from different sectors and practitioners on their current practices.

The recent NEMAP exercise highlighted the need for EIA Guidelines in different sectors. This should be a major impetus for the effort started here today to develop a network of EIA activities with regular meetings and workshops.

A first task from today's meeting may be to form an EIA network with an organizing committee who would chalk out future programs and activities which may include evaluation of EIA done so far to learn lessons, organize future meetings, and raise resources to support activities. BCAS will be willing to participate in any such effort if everyone agrees.

S.M. Mansur, FAP 21/22

Question: Should EIA be conducted for only new projects? What about projects that are already in place?

Answer: According to the definition of EIA, EIA is undertaken for proposed projects only. However, there is also a need to examine the impacts of projects that have been already implemented. The methodology used for post-project EIAs may have to be renamed and called Environmental Evaluation.

Dilruba Akhtar, LGED

Question: When will we accept a project without doing an EIA? How high will the negative impacts of a project have to be for us to reject a project?

Answer: The water sector Guidelines does not specify when a project can be accepted without an EIA. EIAs are not mandatory for all projects. Projects that are complex need EIA. For instance, raising of plinths of individual homes in areas that are inundated do not need EIAs. However, if the project involved raising the ground for a large area, then EIA might be necessary. IEE at the pre-feasibility stage may be mandatory for most projects. EIA needs to be done at the feasibility stage of projects that are large, complex etc.

N.A. Gazi, DPC

Question: How can we develop national standards and how can we ensure compliance?

Answer: With the exception of the water quality EQS, there are no standards for water or for any other sector. This is a major problem in Bangladesh as in the absence of standards, there are no set criteria against which impacts can be measured. The Department of Environment needs to develop national standards. By doing so, it will assign the much needed importance value to national resources. FAP 16 does not have the mandate to do so. However, this is a very important question and needs to be addressed in future discussions.

Question: Do the Guidelines provide procedures to decide on tradeoffs between alternative solutions?

Answer: Yes. The problem is in the concept. It is a question of deciding between one alternative and another, or between an alternative and the cost of

mitigation. The Guidelines takes the first approach. However, some people suggest that we should take the second approach. The question is if we increase agricultural production at the cost of fisheries, is that acceptable? The Guidelines talks about tradeoffs.

Mr. Shafi said that we have to look at different scenarios. We have to look at the present condition, without project situation, with project condition and find alternative ways.

Ashraful Alam, DPC

Question: Bangladesh is an agriculture based country. Should there not be EIA for national fertilizer use?

Answer: There may be a need to do so. Agro-chemicals leach and contaminate soils. It may be useful to examine the leaching process. The responsibility for doing such EIAs would lie with relevant agencies.

Some participants suggested that Bangladesh Agricultural University should have the responsibility. Others argued that the department responsible for plant protection should be held responsible, while still others suggested that it is the responsibility of the Fisheries Department to do so. It was pointed out that modifications may be needed in the Guidelines if it does not specify or include an action plan for fertilizer pollution.

Akhtar Hossain, Envirocare

Question: In the future, do we need an approved Guidelines for the forest sector?

Answer: If there is a project we need an EIA. Think about rubber plantations. If the plantations adversely effect exotic plant species then we have to think about it. If a project has serious environmental impacts, then we need to develop Guidelines for doing EIA in that particular sector.

Atiq Rahman, BCAS

Question: Different variations of EIA were undertaken by almost all the components of the FAP. This presumably was reported in the FPCO Quarterly report of June 1994. Since then:

a. What has FAP 16 done to evaluate all these to see how useful they were?
b. What was the scope of each and was FAP 16 Guidelines used?
c. How effective was it?
d. How did they follow the (10+1) step methodology?
e. What lessons, if any, were learnt?
f. When and how can such an evaluation of EIA application be available for public scrutiny?

Answer: FAP 16 submitted the Guidelines to FPCO, and as the latter was the coordinating organization it was up to them to send the reports to FAP 16 for review. FPCO Superintending Engineer, A.M. Shafi, responded by explaining the review process. He said that the EIA Guidelines and Manuals were sent to all the FAPS. The FAPs write the EIA reports and send them to FPCO. FPCO gives the reports to their EIA specialists and to the Panel of Experts for review. The reports are also sent to DOE for their comments.

S.M. Kamal, POE

Comments: It is a widely accepted fact that EIA alone cannot save the environment. In the U.S. they are using a new idea called "watershed analysis."

Comments: The EIA Guidelines was originally prepared by FAP 16. The 3rd

version, which incorporated the comments of FPCO, POE and DOE was finally accepted by FPCO in October 1992. It is important to remember that only one of the case studies was carried out before October 1992. The other two case studies were carried out using the FPCO Guidelines.

Jahiruddin Chowdhury, BUET

Question: Does the water sector EIA Guidelines have provisions for accounting of impacts during the project construction period? Does it have provisions for project failure? Sometimes the long construction period in Bangladesh creates temporary but severe adverse impacts like the Dhaka City Flood Control Project. Hazards due to failure of flood control embankments are also common in Bangladesh. It should be recognized that complete prevention of the failure of earthen embankments is possible due to geo-morphology and the difficult socio-economic factors in Bangladesh?

Answer: EIA is used to ensure that projects are planned, constructed and operated in an environmentally sound manner.

Jahiruddin Chowdhury, BUET

Comment: Under the section on potential impacts of thana drainage and embankment projects, the sub-section 2.4.3 in the LGED Guidelines on impact on human interest should include places of local festivals, of historical importance and interests. Construction of embankments obstructs the water-way communication to such places. A glaring example is the Hazrat Khan Jahan Ali Mazaar and the Shaat Gomaj Masjeed at Bagherhat affected by the polder of the BWDB.

Shariatullah, CIDA

Question: There is a need to print and distribute the water sector EIA Guidelines in Bengali to make people's participation more effective.

Answer: This is a good idea. We need to ask for whom we are developing the Guidelines. The beneficiaries must know for what advantage it is to them. People at the grassroots level must understand how to use the Guidelines if they are going to be doing the field work. We have translated the LGED Guidelines into Bengali and have distributed it to all the Union Parishads. This has created a great impact.

M.A.Nur, EPC

Comment: In order to develop public awareness, education campaign is necessary for EIA. Environmental impact, education, monitoring and campaign activities should be practiced throughout the project lifetime.

3.3.2 Questions And Comments Addressed To Monowar Hossain Chowdhury

N.A.Gazi, DPC

Question: LGED and BWDB often initiate projects independently in a particular area. Often conflicts arise due to differences in project approach, creating a third dimension in addition to environmental issues. Is there any mechanism or set procedure to resolve such conflicts?

Answer: BWDB looks into all the projects that are proposed in the irrigation sector by any department. We avoid duplication as best as we can.

Nazim Uddin, BCL

Question: People are affected all over Bangladesh due to the implementation of a series of Rural Development Projects.

Compensation is one of the most important components of EMP. As far as we know there is no arrangement for compensation in your department. Will this continue or have you any plans to deal with this problem?

Answer: The schemes that we take up are very small. They are not intensive or complex. Compensation is not our concern. In only a very few urban areas we have had a problem with compensation. In the present setup we have no provision for it.

3.3.3 Questions Addressed To Mamunul Hoque Khan

Mohir Uddin Ahmed, HCL

Question: You have mentioned that the project will decrease captive fisheries and increase the culture fisheries. (a) How will culture fisheries increase? Please explain.

Answer: At the moment we have no activities that will help culture fisheries. We do not want to confine the open waters which are accessible to the poor. We favor capture fisheries.

Golam Monowar Kamal, ISPAN

Question: How many EIA reports has CARE produced for the 1500 EIAs that they claim to have done?

Answer: We do not construct new roads. Our programs deal with revegetation. We use the LGED Guidelines. We produce very short reports. They are usually one to two pages long. When we talk about 1500 EIAs, we are including all the projects from before.

3.3.4 Questions Addressed To Akhtar Hossain

Mesbahuddin Ahmad,

Question: DIT and RAJUK have agreements which categorically differentiate between residential and commercial and residential areas. Currently garment industries are coming up in residential areas which means that relevant government agencies for one reason or another are failing to take action.

Answer: There is a mushroom growth of garment industries in residential areas. However, effective land zoning laws would deter and prevent industries developing in residential areas. Such a law has been passed recently and it is up to the DOE and the implementing agency to ensure that it is effective. However, sector studies need to be undertaken to delimit and zone areas so that industries are confined to areas delineated to them. EIAs need to be done for large industries. For many industries, it is too late to mitigate the adverse impacts of industrial development in non-industrial areas.

Reazur Rahman, EPC

Question: Doing an Environmental Impact Assessment, and examining the negative impacts, are preconditions to having an environmental standard. To your knowledge is there any set standard for land and biological resources (Land includes soil and earth surface; biological resources include species of flora and fauna) in Bangladesh?

Answer: This is an important issue. We follow the international Guidelines for weighting.

Dilruba Akhtar, LGED

Question: The Department of Environment has divided the industrial

sector into three different categories. Have these divisions been done on the basis of the quality of pollution or on the quantity of pollution?

Answer: They are divided on the basis of the quality and quantity of the standard of the parameter. The quantity of pollution is more important than the quality of pollution. There are three types of pollution and three types of impacts. We categorize them as low, medium and high. We labelled these as green, amber and red. When the impact of an industry is high and is in the red category, then it needs a comprehensive EIA. For industries that have low impacts we recommend rapid IEEs. An EIA is undertaken depending upon the size of the industry (how large it is), where it is located, and how much resource is allocated to it.

S.M.Faruque, BWDB

Question: Should an EIA report be an integral part of the feasibility study report or a separate independent report?

Answer: Yes. EIA is an integral part of the feasibility study.

Rahmani, AQUA Consultants

Question: Is there any change in the approved environmental law for environmental auditing of industries?

Answer: We have asked for environmental auditing in this sector. Whether this will happen will depend on the environmental policy that DOE implements. Perhaps Mr. Wahed of DOE can answer this question.

3.3.5 Questions Addressed To Feroze Ahmad

Mohir Uddin Ahmad, HCL

Question: Due to the construction of the Dhaleswari Closure, the flow in the Pungli, Lohaganj and Elangari will decrease by a significant percentage. What will be the impact on FAP 20? What mitigation measures do you think should be taken?

Answer: There will be a substantial reduction of water in the rivers systems, and additional siltation will result from the closure. As FAP 20 lies within the project area there will be reduction of water in the FAP 20 project area also. The objective of compartmentalization was also to control water flow. The World Bank wants to negotiate on these issues. We will mitigate the problems by constructing spill channels for supplying water. There is a conflict between fisheries and agriculture regarding water availability. These are important issues that are being discussed and examined.

M.K. Farooque, DOE

Question: Is there an EIA Guidelines for conducting EIA in the communication sector?

Answer: The only two Guidelines available are the ones in the water sector and one for rural infrastructure. The LGED Guidelines provide information about conducting EIAs for roads, embankments and small irrigation projects in rural areas. In some respects they cover communication. CARE is using the LGED Guidelines for conducting EIAs for rural infrastructure.

Iftekhar Uddin, LGED

Question: As far as I have understood there is no one EIA methodology that can be used for all projects. Moreover, use of different methods for different projects may lead to different results. What I am interested in knowing is whether there is a criteria for selecting a particular EIA methodology for a particular project?

Answer: No one EIA methodology is appropriate or sufficient for every

project. There is a need for specific criteria for selecting a particular methodology for different projects. Project planners need to understand that the Guidelines for one particular sector cannot be used for other sectors. For instance, the methodology discussed in the LGED Guidelines differs from the methodology used for the JMBP. Although for similar projects a common methodology may be appropriate, it is necessary to develop EIA Guidelines for different sectors. Only then we can hope that methodologies proposed for different sectors will be appropriate. DOE needs to take the initiative to develop the Guidelines, but if it lacks the capability to do so, the private sector should be encouraged to take the initiative to develop them.

Bilquis Ahmad Huque, Environmental Health Program, ICDDR,B

Question: Which project/projects studied impacts of projects on the chemical and biological properties of surface and ground water used for domestic purposes by project area, project design and performance?

Answer: Not much has been done in any of the areas. However I have been involved in a study on ground water depth and water quality. My paper has been published in Malaysia. Dr. Fazlul Bari of the University of Texas had also done some work on ground water quality. In the area of Jamuna Multi Purpose Bridge the ground water quality will be monitored for five years.

Bilquis Ahmad Huque, Environmental Health Program, ICDDR,B

Question: How do you use the Guidelines if we do not have standards?

Answer: There is a major problem because there are no established standards in Bangladesh. After relevant environmental laws are legislated, it is hoped that DOE will assume the responsibility for developing the EQS for the different resource components.

- There is a need to assign "weighted values to different resource components." Some work in this area has been done by LGED and is published in their Guidelines, but these are not comprehensive.

3.4 Closing Comments by Syed A.N.M. Wahed, Director General, DOE

In his concluding statement, Syed A.N.M. Wahed stated that the seminar had provided a unique opportunity for government officials, consultants, and academics to discuss key issues related to EIA methodology to better understand the consequences of development choices. EIA was still a new subject in Bangladesh. Hence the initiative taken by ISPAN and USAID needs to be continued.

Wahed elaborated on the issues raised during the discussions. He stated that inadequate inventories on soils, water, flora and fauna have presented a serious void in the country which has hindered the implementation of EIA. There was a critical need to establish a national database for primary data.

On the question of whether EIA should be conducted for existing projects, Wahed suggested that a few studies needed to be undertaken to learn about the mistakes that had been made in the past in order to understand how they could have been avoided. However, for future projects, the Environmental Protection ACT will provide long-term protection against environmental problems. He added that non-compliance problems need to be addressed at two levels. First an effective implementing agency is needed to ensure that project proponents comply, and second, the legislation has to be linked to the decision-making process so that projects cannot be implemented without

compliance to the ACT. Wahed added that there was an urgent need for intensive and sustained training of EIA professionals so that there was overall recognition of the importance of EIA as a planning tool. On the issue of need for environmental standards, he said that DOE needs to develop EQS for different resources. EIA Guidelines should be produced for different sectors by agencies which have the capability to do so. However, the Guidelines would have to have government approval.

Wahed agreed that industries had mushroomed in residential areas and need to be relocated. For garment industries, relocation would involve finding suitable transport for the female workers as in EPZ in Chittagong. Similar types of industries need to be located in one area to make solid waste removal easier. The tanneries were a major environmental problem. Relocating them was extremely costly. One solution would be to develop waste treatment facilities. Wahed claimed that industries in both the private and public sectors were interested in pollution control, but did not have the funds to do so. Providing soft loans to them may help solve the problems.

He concluded by stating that the DOE and everyone else were obligated to conserve the environment. As illiteracy was a major problem, public awareness and environmental education were needed to change personal attitudes and practice, enabling people to make their own decisions for sustainable living.

4. Seminar III

STRENGTHENING THE EIA PROCESS IN BANGLADESH

4.1 Seminar Format

The third seminar held on April 26, 1995 brought together more than 100 trained EIA reviewers from FAP 16's EIA skills workshops, which took place in 1993 and 1994. In addition, professionals interested in discussing the strengthening of the EIA process in Bangladesh attended the seminar. The seminar also provided an occasion to validate the effectiveness of ISPAN FAP 16's training program, and to verify the participants' ability to use their EIA skills on the job. It was the first public attempt to discover whether the skills workshops produced the results intended and whether the participants were able to use their training on the job.

The seminar provided a forum for the Secretary of Environment and Forest, for officials from the Flood Plan Coordination Organization (FPCO), Department of Environment (DOE), other government agencies, and private organizations to interact with the participants of the EIA skills workshops, and to participate in professional discussions with them. Syed Amir-ul-Mulk, Secretary, Ministry of Environment and Forest chaired the seminar. Annexure 4B provides a list of the seminar participants.

The program was divided into three sessions. The first session provided an overview and current status of the training program. It spelled out the objectives of the meeting and set the stage for the day's activities. During the second session, participants worked in groups and prepared flipcharts. In the third session they made their presentations which were followed by discussions. The program can be seen on Annexure 4A, Table 4.

In order to give the presentations and discussions a coherent structure, the participants were given a list of five questions designed to determine the effectiveness of the training, to elicit information related to on-the-job activities, and to determine future needs for strengthening the EIA process and institutionalizing it in Bangladesh.

The participants were divided into four groups and were requested to discuss the questions among themselves and to write their responses on flipcharts. Each group was requested to choose a discussion leader and two rapporteurs to present its findings. To conserve time, questions were categorized into two groups to facilitate discussions after each of the group presentations.

The room was arranged to facilitate interaction. During the introductory session, participants sat theater style. During group work, participants moved to different sections of the room and sat around tables for discussion. They moved back to the original theater arrangement for presentation and discussion. This dual approach was particularly successful and conducive to group interaction.

4.2 Seminar Objectives

The presentations and the discussion that followed were based on the five questions that were given to the participants. Their objectives were to:

- Determine how the participants used their EIA training in their jobs.
- Ascertain the problems they encountered in using what they learned and how they overcame these problems.

- Understand how an EIA network can be established and how EIA can be institutionalized in Bangladesh.

4.3 Outcome

Feedback received from the trainees was meaningful and useful, and provide the basis for directions of future action that need to be taken for institutionalizing EIA. A summary of their responses is presented below.

4.3.1 How Participants Used their EIA Training

The predominant response to the first question was that most participants had applied their knowledge of EIA directly or indirectly on the job. Although the majority noted that under the current system there was little or no provision for conducting an EIA, it was recognized that their knowledge of EIA was used at different stages in project development.

Group 1 participants claimed that their training had helped them to review reports and the EIA Guidelines, and to understand the need for solid waste recycling in environmental management. Some participants added that their knowledge of EIA was also useful in the preparation of the *Operation and Monitoring Manual* of BWDB. Only four of the twenty-five members of the group said that they had used their knowledge effectively on the job.

Group 2, on the other hand, affirmed that after the training they were more aware of environmental issues and project impacts when they did field work for development of baseline data. They attested that they were more focussed and systematic in their work. They affirmed that they used their knowledge of EIA more specifically to prepare better mitigation plans for proposed projects, and to make more in-depth evaluations of proposed fisheries projects. One member of the group stated that he had used his EIA training to train others in EM and EIA. Others claimed that they used their training to "build awareness of environmental issues" by teaching others about EIA.

Group 3 participants affirmed that they used their training to ensure greater public participation at the planning stage of proposed projects, and to develop greater public awareness of environmental issues and sustainable development. They claimed that the training had helped them to make more informed decisions in developing environmental management plans for water sectors projects.

Group 4 stated that EIA training not only changed their attitude and deepened their understanding of environmental issues, but also helped them to develop better TORs, understand problems of drainage congestion resulting from the Jamuna Multi Purpose Bridge Project and to develop a better methodology for it. Their EIA knowledge also assisted them in developing more practical solutions to the water logging problems created by the Teesta Barrage Project. One member of the group stated that she used the modular approach used to teach EIA in the skills workshop to develop similar modules for her organization's training program. Participant responses are provided in Annexure 4C.

There was general consensus that some members of each group had used their training and knowledge of EIA to review EIA documents more thoroughly and systematically, to review feasibility study reports of different projects, to prepare Project Concept Papers (PCP) and Project proposals (PP) for different types of projects, and to develop Environmental Management Plans (EMP) for water sector projects. There was also general recognition that the training had brought about changed attitudes to environmental issues and problems.

4.3.2 Problems Encountered in the Use of EIA Skills and Solutions Proposed to Resolve Them

All groups unanimously stated that lack of political will and legislative support were the major problems hindering effective implementation of environmental assessment during project planning. The groups concurred that EIA was an involved, complex methodology and that lack of trained multi-disciplinary teams and lack of awareness of environmental issues at both policy and grassroots levels meant that local people who often know best how to resolve their problems were not involved in the decision making process. There was general agreement that policy makers frequently made decisions that do not serve the interests of the people. In the absence of a lead organization and coordination among concerned organizations, environmental initiatives were often wasted. There was a greater need to develop an integrated approach to implementing EIA at the feasibility level. To do so it was suggested that:

- Engineers coordinate their activities with environmentalists.
- Operational decisions be guided by environmental considerations.
- Environmental cells be developed in institutions for continuous monitoring of projects.
- Funds be allocated during the project planning stage for conducting EIA when necessary and for developing better monitoring systems and mitigation plans.

Group 1 also pointed to some of the problems with the existing review process. It claimed that organizations were often unaware of the need to balance development needs against goals for environmental protection. As a result the existing system of project planning and approval had no provision for addressing environmental concerns. Additionally, institutions lacked trained personnel capable of reviewing EIA documents.

Group 3 extended the same argument. They observed that even when there were trained professionals they were posted "inappropriately" so that project proposals were reviewed by persons who lacked experience and expertise. Such a system was counterproductive and wasteful. There was a need to ensure appropriate placement of trained personnel to review the EIA documents, to conduct EIA and to make policy decisions. Members of the group argued that there was no structured format for project review, and lack of environmental quality standards (EQS) meant there was no objective measure against which they could assess the impacts of proposed projects on different resources. Group 3 also contended that the data that was available was not only inadequate, but also unreliable. It was stated that for effective implementation of EIA, the government of Bangladesh needs to make EIA mandatory and build it into the PCP and PP, and develop a national data bank in order that reliable and standardized data are available. The group thought that a "bottom up approach" in decision making for project planning was critical for the success of projects.

Group 2 argued for a different approach to resolve the problems. They contended that there was a need to simplify the EIA Guidelines and to develop a more appropriate methodology for assessing impacts. Lack of funds for EIA in the feasibility study, in addition to lack of awareness and trained personnel provided little or no opportunity to implement EIA or to propose improvements to projects during the planning process. Group 2 claimed that the solution to these problems could be found only if there was an inter- ministerial planning cell that would be responsible for monitoring and implementing EIA. This would entail change in the national service structure in order that trained

multidisciplinary teams could be involved in the feasibility studies of proposed projects.

Group 4 suggested that problems could be best resolved through education and training. They argued that environmental studies should be introduced in educational institutions so that university graduates would be "environment literate". More extensive awareness training and EIA and EM training were needed at each level to increase the knowledge base of everyone involved in project planning. As this could not be executed without policy level commitment, decision makers needed training as much as people at the grassroots level.

4.3.3 Development of an EIA Network and Institutionalization of EIA

The participants made a number of concrete proposals to institutionalize EIA in Bangladesh. All four groups underscored the importance of political commitment to improve the capability of the government to integrate EIA at the feasibility level of project planning. In this connection participants of Group I observed that there was a need to develop clear policies and legislation which would ensure that project proponents conducted an IEE or EIA when they were needed. Group 2 was of the opinion that policy by itself was no guarantee for ensuring the implementation of EIA. Existing laws do not ensure environmental protection, and policies already in place tend not to be used. There was need for an accountable administrative system within the government that would be responsible for law enforcement. Members of Group 4 felt that much depended on the DOE. It needed strengthening so that it could not only act as the enforcement agency but also oversee inter-ministerial decisions and the implementation of EIA and EM process. As the lead agency in environment, the strengthening of its managerial and professional capability would facilitate the institutionalization process. Its inadequacy has been a major obstacle in implementing environmental laws.

All four groups emphasized the importance of networking among EIA proponents. They suggested that there was an urgent need for:

- Establishment of an association of EIA professionals to maintain an EIA network, to exchange ideas, and to arrange annual conventions of EIA experts
- Establishment of a national institution that would be responsible for training, organizing seminars and symposiums, and developing booklets and using the media for publicizing EIA
- Formation of practitioners groups for extending the EIA network to the grassroots level
- Establishment of an environmental cell in different ministries
- Interaction between local government agencies, universities, and NGOs
- Incorporation of EIA in all sectors
- Establishment of a professional journal
- Maintenance of a hardcopy library and an EIA database as part of the documentation center in the DOE.

4.4 Conclusion

No training system can be validated unless the program truly meets the trainees' on-the-job needs. Validation determines whether the training was effective and the trainees can apply the knowledge and skills that they have learned.

The seminar demonstrated very clearly that trainees' learning did not end when the formal training sessions ended. Given the fact that the first workshop was conducted in July and August 1993 and the last workshop in January 1995, the trainees showed that they had not only internalized the EIA process but could critically evaluate the problems in the current system which helped or hindered them from using their skills.

4.4.1 Training Evaluation

During the seminar, the trainees demonstrated two types of learning. First, they were able to form groups very easily, actively interact and participate in the groups even when they did not know each other. They could honestly assess how they had used their knowledge and skills, and effectively present the materials that they wrote on the flipcharts. Second, they raised very important questions critical to implementing EIA, used intelligent arguments to support their statements, and made wise and rational recommendations for developing an action plan for the future needs of the country. Keeping in mind that training benefits are both tangible and intangible, the trainees demonstrated very clearly that they gained tangibly in individual knowledge and skills related to EIA, and intangibly in changed attitudes and high morale that were attested by their informed arguments and positive behavior. These validate the success of the training program.

More specifically, the seminar made apparent that:

- The trainers were successful in helping the trainees learn EIA concepts and processes.
- The adult learning methodology was extremely successful in the workshops as trainee recall was very high.
- The reviewer training program can be standardized. However, it will need upgrading after every training experience.
- It is important to identify other programs that will supplement and reinforce the learning process that has been initiated.

4.4.2 Concluding Statements

In general, the sense of the presentations and discussion was that successful implementation of EIA involved political will, efficient governance and enforcement of policy. Equally important was the need for better coordination between agencies both in the public and private sectors. Also important is more effective management and placement of a trained cadre to prevent systems loss. In addition, there existed an urgent need for vesting the responsibility of research and training in a national institute that would maintain close liaison between different organizations, and build a national database and maintain a network of EIA experts. The pace of change could be accelerated if EIA was made mandatory and was built into the feasibility study of projects.

The Secretary of Environment and Forest, Syed Amir-ul-Mulk, who chaired the session and actively participated in group activities, concluded the session by stating that he was pleased to see that FAP 16 and FPCO had taken the initiative for EIA training, as his Ministry was not organized to do so. He added that the recommendations made in the seminar would be taken seriously by the Ministry and given strong consideration. He addressed the problem of the lack of an environmental database and the need to establish a national data bank by declaring that the Ministry would recommend policy declarations for developing an EIA data library and for making EIA mandatory. He agreed with the participants that the PCP and the PP format need to include an EIA element and that

environmental concerns need to be properly addressed on a continuous basis. Mechanisms need to be developed for better networking among participants and other professionals who are interested in the environment. Although there was a need to promote EIA as an important planning tool, he cautioned that development activities were for the people, and that public participation in EIA was critically important. Environmental issues should consider people's interests and not be bound by theory. He suggested that environmental considerations and human development had to go hand in hand. Syed Amir-ul-Mulk concluded by stating that the seminar was a unique experience for him and that he had greatly benefitted from it.

ANNEXURE 1: Inaugural Ceremony Program

PROGRAM

FAP 16
ENVIRONMENTAL SEMINAR SERIES

Inaugural Ceremony
April 24, 1995

Welcome Address	Asgari Ahmad	09:00 - 09:05
Introduction	M.H. Siddiqi (BU)	09:05 - 09:20
Inaugural Speeches		09:20 - 10:15

Haroun Er Rashid
Kazi Fazlur Rahman
M.H. Siddiqi (BU)
Secretary, Environment and Forests
Secretary, Water Resources (Chairperson)
Minister, Environment and Forests (Special Guest)
Minister, Water Resources (Chief Guest)

ANNEXURE 2: The Charland Study

A. Program

B. Participant List

C. List of Questions

Table 2 Program: The Charland Study

A: PROGRAM

April 24, 1995

SEMINAR ON
THE CHARLAND STUDY

Facilitator	Asgari Ahmad	
Chairperson	A.M.Shafi	
Welcome Address	Asgari Ahmad	10:30 - 10:45
Introduction to the Study	A.M. Shafi	10:45 - 11:00
Study Objectives	Darrell Deppert	11:00 - 11:10
Study Area & Description	Tim Martin Iffat Huque	11:10 - 11:40
Field Inventory	Paul Thompson	11:40 - 12:00
DISCUSSION	A.M. Shafi	12:00 - 12:40
Socio-Economic Aspects	Mustafa Alam	12:40 - 13:00
Flood Proofing	Ian Tod	13:00 - 13:20
DISCUSSION	A.M. Shafi	13:20 - 14:00
Conclusions and Recommendations	Mustafa Alam	14:00 - 14:15
Closing Remarks	A.M. Shafi	14:15 -14:25
Vote of Thanks	Asgari Ahmad	14:25 - 14:30
LUNCH		

B. PARTICIPANT LIST
The Charland Study

BANGLADESH GOVERNMENT

BWDB

Syed Moazzem Hossain, Director Training
M.S. Islam
S. Nurul Islam

DOE

Mostafa Farooque, Joint Director
Syed A.N.M. Wahed, Director General

Flood Plan Coordination Organization

Abdun Noor, Executive Engineer
Hatimur Rahman, Superintending Engineer
Mukhlesur Rahman, Executive Engineer
A.M. Shafi, Superintending Engineer
M.H. Siddiqi (BU), Chief Engineer

IMED

M. Hossian, Director General
Q.A. Quabir, Director

LGED

Rukun Uddin Ahmad
Dilruba Akhtar
Md. Monowar Hossain Chowdhury
Md. Tarik-ul Islam
Md. G.H. Patak
Q.I. Siddiqi, Chief Engineer
Iftikar Uddin Sikder

Ministry of Environment and Forests

Syed Amir-ul-Mulk, Secretary

Ministry of Water Resources

S.M. Afazuddin. Additional Secretary
Emdadul Haque, Joint Chief
Mr. Nazrul Islam, Secretary

Panel of Experts

Mesbauddin Ahmed
M.N. Huda, Chairman
S.M. Kamal

SPARRSO

A.M. Chowdhury, Director
A. Quadir, Chief Scientific Officer

WARPO

Md. Mohsin, Additional Chief Engineer

CONSULTANCY FIRMS

AQUA

Md. Nurul Haque
Khan Mesbauddin
Md. Mohsin
G.A. Rahman

BCL

Nazim Uddin Ahmad

CDSP

Md. Shawkat Ali Bhuiya

DPC

Nazir Ahmad Gazi
Asraful Alam Sarkar

EPC

Bazlur Rahman

Halcrow

Paul Thompson

HCL

Mohiruddin Ahmad
D.S.S. Abedin

JCDP

Majubul Huq Dulu
Fazlul Huq Ripon

<u>FLOOD ACTION PLAN</u>

FAP 6

Raguib Uddin Ahmed

FAP 16

Asgari Ahmad
Mustafa Alam
Darrell Deppert. Chief of Party, ISPAN
Md. Farouque
Abu Md. Ibrahim
Md. Jakariya
Monowar Kamal
Kurshida Khandakar
Subrata K. Mondal
K.F. Rahman
Mokhlesur Rahman
Haroun Er-Rashid, Co-Team Leader
Qazi Salimullah
Dara Shamsuddin
Ian Tod

FAP 17

Md. Monzurul Huq

FAP 19

Pia Afreena
Dilruba Aziz
Iffat Huque
I.G. Chowdhury
G.M. Kamal
Nasreen Islam Khan
Syed Iqbal Khosru
Timothy C. Martin, Team Leader
M.A.M. Faruq
Md. Mominul Huq

FAP 21/22

S.M. Mansur

FAP 24

Dilup Kamar Barua
Zahirul Haque Khan
Van der Wal

<u>OTHER NON-GOVERNMENT ORGANIZATIONS</u>

BCAS

Iqbal Ali, Senior Fellow
Saleemul Huq, Director
Atiq Rahman, Director

BJSL

Meharun Nahar
B. Nizam
Lutfur Rahman
A. Rahman

CARE

S.A. Hossain
Mamunul Huq Khan, Environmental Specialist
M.B. Rahma

CONCERN

Pradip Samad

CNRS

Aminul Islam

IUCN

Anwarul Islam, National Project Coordinator

Proshika

Kazi Khaze Alam

USAID

Craig Anderson, Project Officer, Dept. of Food and Agriculture
John Swanson, Office of Food and Agriculture

<u>UNIVERSITIES</u>

BUET

M.F. Bari
J.U. Chowdhury
A. Hannan, Professor, Department of Civil Engineering
M. Mozzamel Haque, Professor, Department of Civil Engineering
Manowar Hossain, Head, Department of Water Resource Engineering

Independent University

B.M. Chowdhury, Vice Rector
Md. Shahriar Kabir

(Organisations and their members have been listed alphabetically).

C. LIST OF QUESTIONS
Charland Study

Mr. Chowdhury, SPARRSO

1. Are the millions of people reported to be living in the chars included in the national demographic statistics?

2. Given that part of the geographical area covered by the study is categorized as 'unprotected', is it proper to assume that the rest is protected?

Monowar Hossain Chowdhury, Water Resource Engineering, BUET

1. Bankline shifting is only one kind of parameter in a river morphology study. What other morphological aspects did the study consider? There exist other studies which have investigated bankline shifts although not necessarily through remote sensing outputs. One would benefit from comparison of the results of these studies with those of the current study.

2. How was the central line of a river defined while analyzing central line migration? Graphical or statistical analyses would help in understanding trends.

Nurul Huda, POE, FPCO

1. It would be useful to define the central line as the deep channel line. Other wise the central would be different during different times of the same year.

Aminul Islam, CNRS

1. Was the development potential of the charland studied? With regard to geological formation, aspects other than land formation also need to be studied.

Van der Wal, FAP 24

1. Lot of data has been collected by the study. What guarantee can you give about the quality of this data?

Q.I. Siddiqe, LGED

1. The presentations were interesting. It would be useful for LGED to know which of the char areas in Noakhali and Rajshahi would be relatively stable and amenable to infrastructure development there.

2. Along the Ganges, chars have increasingly been forming during the last twenty years or so. Which of these chars are stable and good for investment in infrastructure?

3. The Jamuna merging with the Bangalee would bring about great consequences.

4. It is a pity that such a large number of people living in the chars are not properly recorded yet. this may have been caused by the frequent erosions and the subsequent migration of the people. However, the Union Parishad could be of assistance in updating such information.

5. Although the people in the chars do not feel obligated to pay taxes on their land which in any case is erosion-prone, the Union Parishad in many cases keep track of the char people.

6. LGED has done the thana maps. It now intends to do the union maps. It is time to think how local government data base can be prepared. LGED would be interested in sharing the work of developing the much needed local level data generation.

Nurul Huda, POE, FPCO

1. It will be quite dangerous if the Jamuna meets the Bangalee.

Tarik-ul Islam, LGED

1. Very useful information has been made available through this study. Are there recommendations for data updating?

N.A. Gazi, DPC

1. Has the study looked at the historical trend in silt movement along the rivers which would have an impact on char formation and morphological changes there?

Jahiruddin Chowdhury, BUET

1. What were the criteria used for defining bankline?

2. How was the duration of flood calculated?

Monowar Hossain Chowdhury, LGED

1. Will there be blockages in the Jamuna affecting free movement of ferries?

2. The central government has to play a big role in char development.

3. Structural measures are also needed in the chars for infrastructure development.

Mr. Saleemul Huq, BCAS

1. Did the study look at the possible impacts of the Jamuna bridge on the study area?

Mr. Chowdhury, SPARRSO

1. It would be useful to find out how many flood shelters one would require to build for the char people and what would be the cost of building them. Not all char people would require to go to these shelters. What did people do during the flood of 1988, for instance?

Mr. Rokun Uddin, LGED

1. The power structure in the charlands affects the life of char dwellers quite significantly. At times people of one locality would not be allowed access to another locality.

2. In the flood proofing study, was the possibility of obtaining contribution from beneficiaries factored in?

Nazim Uddin, BCL

1. In what way did the study look at flood warning?

2. In flood proofing what specific measures could help the flood affected people of the chars?

Qumrul Islam Siddiqe, LGED

1. Have not the unplanned settlements in chars created problems in delivering basic services on agriculture, health, education and sanitation to char people. To be able to provide these basic services to them, one needs a strong local government with better command over resources and revenues.

ANNEXURE 3: Seminar II: EIA Methodologies Used in Bangladesh

A. Program

B. Participant List

C. Technical Papers

Table 3 Program: EIA Methodologies used in Bangladesh

A: Program

April 25, 1995

SEMINAR ON EIA METHODOLOGIES BEING USED IN BANGLADESH

Facilitator	Asgari Ahmad	
Chairperson	Syed A.N.M. Wahed	
Welcome	Asgari Ahmad	09:00 - 09:05
Introduction	Syed A.N.M. Wahed	09:05 - 09:15
Introduction to the Guidelines	A.M. Shafi	09:15 - 09:30
Seminar Agenda	Asgari Ahmad	09:30 - 09:45
Presentations	Dara Shamsuddin FAP 16, *Water Sector EIA*	09:45 - 10:05
	Monowar Hossain Chowdhury LGED, *Rural Infrastructure EIA*	10:05 - 10:25
	Mamunul Hoque Khan CARE-Bangladesh, *LGED Guidelines*	10:25 - 10:40
	Akhtar Hossain Envirocare, *Industries EIA*	10:40 - 11:00
	Feroze Ahmad BUET, *JMBP EIA*	11:00 - 11:20
Summary and Questions	Haroun Er Rashid	11:20 - 11:40
Tea		11:40 - 11:55
Answers and Discussion	Syed A.N.M. Wahed Haroun Er Rashid	11:55 - 12:55
Seminar Summary	Haroun Er Rashid	12:55 - 13:10
Closing Remarks	Syed A.N.M. Wahed	13:10 - 13:20
Vote of Thanks	Asgari Ahmad	13:20 - 13:30
Lunch		

B. PARTICIPANT LIST
EIA Methodologies used in Bangladesh

BANGLADESH GOVERNMENT

BWDB

H.S.M. Faruque

DOE

Mostafa K. Farooque, Joint Director
Syed A.N.M. Wahed, Director General

Flood Plan Coordination Organization

Mahbubul Ahmed
Abdun Noor, Executive Engineer
A.M. Shafi, Superintending Engineer

IMED

M. Hossain, Director General
Q.A. Quadir, Director
Md. Nurul Islam Mollah, Rural Development & Cooperative Division

LGED

Rukun Uddin Ahmad
T. Ahmed
Dilruba Akhter
Shahana Akhter
M.A. Bhuiyan
Md. Monowar Hossain Chowdhury
Md. Tarik-ul Islam
Fahima Shahadat
Iftikar Uddin Sikder

Ministry of Environment and Forests

Syed Amir-ul-Mulk, Secretary

Ministry of Water Resources

S.M. Afazuddin, Additional Secretary
Emdadul Haque, Joint Chief

Panel of Experts

Mesbauddin Ahmed
M.N. Huda, Chairman
S.M. Kamal

SPARRSO

D.A. Chowdhury
A.M. Chowdhury, Director

WARPO

Md. Mohsin, Additional Chief Engineer

CONSULTANCY FIRMS

AQUA

G.A. Rahman
J.C. Shaha

BCL

Nazim Uddin Ahmad
Syed Sardar Ahmed
Nazim Uddin

CDSP

Md. Shawkat Ali Bhuiya

DPC

Ashraful Alam
N.A. Gazi
S.R. Hawlader

EPC

M.A. Nur

HCL

Mohir Uddin Ahmad
E.H. Chowdhury
Anas Mahmoud
D.S.S. Abedin

JCDP

Majubul Huq Dulu
Fazlul Huq Ripon

FLOOD ACTION PLAN

FAP 6

Mujibul Huque, Co-Team Leader
Raguib Uddin Ahmed

FAP 16

Asgari Ahmad
Mustafa Alam
Darrell Deppert, Chief of Party
M.A.M. Faruq
A.M. Ibrahim
Md. Jakariya
Khurshida Khandakar
Subrata Kumar Mondal
Moklesur Rahman
Haroun Er Rashid, Co-Team Leader, FAP 16
Dara Shamsuddin

FAP 17

Md. Monzurul Huq

FAP 19

Md. Mominul Huq

FAP 21/22

S.M. Mansur

FAP 24

Dilup Kamar Barua
Zahirul Haque Khan

OTHER NON-GOVERNMENT ORGANIZATIONS

BCAS

Saleemul Huq, Director
Atiq Rahman, Director

BIWTA

Md. Taslim Uddin Khan

CARE

Mamunul Huq Khan, Environmental Specialist

CIDA/CHC

Sara Brenault
Sariatullah

Dainik Dinkal

Ruhul Quddus Kazal

Envirocare

Akhter Hossain
S.A. Hossain

ICDDR/B

Mr. Hoque

JICA

Zulfiker Ali
S.K. Sarkar

JMBA

Nazrul Islam

NERP

Mujibul Huq

POUSH

A. Sadal

SRDI, Dhaka

M.S. Islam

UCEP, Bangladesh

Ahmadullah Mia

World Bank

A. Saeed Rana

PRESS

Daily Khaber

Helal Uddin

Morning Sun

Mostafa Kamal Majumder

Weekly Holiday

Sadeque Khan

UNIVERSITIES

BUET

M. Ahmed
M.F. Bari
J.U. Chowdhury
M. Mozzamel Haque

Dhaka University

Khurshida Alam

Independent University

Md. Shahriar Kabir

Jahangirnagar University

Sultana Hajera
Md. Aziz Uddin

(Organisations and their members are listed alphabetically).

C. TECHNICAL PAPERS

(The technical papers were not edited because of time constraints)

EIA GUIDELINES FOR WATER SECTOR IN BANGLADESH

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EIA GUIDELINES FOR WATER SECTOR IN BANGLADESH

FAP 16 Environmental Study
Dara Shamsuddin

The purpose of this presentation is to give a brief description of the EIA methodologies adopted for EIA Guidelines for water sector in Bangladesh and also to indicate some major points for improvements in the Guidelines.It is intended that the presentation will prepare ground for the participants to raise issues and contribute to resolve those issues.

1. Background

1.1. What led to the development of the Guidelines

Following the devastating floods of 1987 and 1988, there were a series of activities by the Govt of Bangladesh and the donor countries and the agencies which culminated into preparing an Action Plan Flood Control by the World Bank in 1989 in consultation with the Government of Bangladesh. At the outset, it was agreed that all projects identified under FAP must not only be technically and Economically sound, but also environmentally sustainable and acceptable.In addition to the 11 main components, there were 15 Supporting Studies, of which FAP 16, Environmental Study was one. Among other responsibilities of FAP 16, developing EIA Guidelines for FAP projects was one of the most important.

1.2. How it was Developed

An initial draft was developed from similar Guidelines used in industrialized and developing countries on a variety of water resources project and by various government and donor agencies.
The Guidelines were tailored to address likely development interventions under the FAP and also conform to the Environmental Policy 1992 adopted by the Government of Bangladesh.

This initial draft was field tested through three case studies carried out for three proposed projects in the water sector.The first is located in the Upper Kusyiara.The Tangail Compartmentalization Pilot Project of FAP 20 was selected for the second case study. The third case study was carried out in the Bhelumia-Bheduria project of the Early implementation (EIP) in Bhola.The findings of the case studies were used to improve the Guidelines. The final version, as approved by the FPCO came out in October 1992.

1.3 EIAs/IEEs done

A number of EIA/IEE/Environmental studies have been completed by various FAP components.(FPCO Quarterly Progress Report,June 1994) These are:

(1) FAP 2 North West Regional study: Report on EIA on the Gaibandha Improvement Project.

(2) FAP 3 North Central Regional Study: Multicriteria Impact Assessment in addition to a separate report on Environment.

(3) FAP 3.1 Jamalpur Priority Project:Report on EIA.

(4) FAP 4 South West Area Water Resources Management Study: volume on Impact Studies.

(5) FAP 5 South East Regional Study : volume on EIA studies.

(6) FAP 6: Report on IEE studies.

(7) FAP 8A Greater Dhaka Protection Project: Report on Living Environment and Ecology.

(8) FAP 9A Secondary Towns Integrated Flood Protection Project: Report on EIA.

(9) FAP 9B Meghna River Bank Protection Short Term Study: Report on EIA.

(10) FAP 12 FCD/I Agricultural Study: Several reports related to Impact evaluation

(11) FAP 20 Compartmentalization Pilot Project: Number of Impact and Environment related volumes, including on the Environment Management Plan

(12) FAP 21/22 Bank Protection and River Training: AFPM Pilot Project: Report on Ecological Assessment

2. The EIA Process

2.1. Purpose and Scope

* provide a consistent and common basis for the application of EIA

* assist EIA practitioners in identifying, quantifying and evaluating potential environmental consequences of water sector projects

* provide a basis for GOB and donor agency evaluation of the environmental consequences of water sector projects

* ensure that all water sector projects are economic-cum-environmentally optimal and sound.

2.2. Place of EIA the Project Development Process

At the pre-feasibility and regional study level: Initial environmental Examination/evaluation(IEE). At this level of environmental study, same types of impacts as would be assessed at the EIA level would be studied, but at more general level of detail and at larger scales of resolution. This assessment may also suggest whether a full scale EIA should be carried out at the feasibility level.

At the feasibility level: Environmental Impact Assessment(EIA) provides for a quantified assessment of the biophysical,economic and social impacts of projects.It specifies the necessary environmental protection measures, ensures that they are included in the overall project feasibility study, and also ensures that the project management will include an environmental management plan which will ensure that the prescribed protection measures are actually carried out.

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2.3 Resource Requirements

The EIA team

EIA should be undertaken by the project planning team and should have in its team or have access to specialists on all major resources and environmental components likely to be affected by the proposed action.

Level of Efforts

Depends on :

- whether the study is at IEE or EIA level
- the size of the area being studied
- the complexity of the area under study
- the amount of background information available
- the experience of the team members
- the amount of study support available
- availability of adequate budget and person months.A typical budget may involve about 10% of feasibility study or about 0.5 to 1% of the total project cost

2.5. The Procedural Steps in EIA

The Ten- plus- One Step

Step 1: Project Design and Description

This includes description of the objectives, rationale, planned activities and potential interventions of the project and alternatives including the "without project" scenario. The description should be sequential following the phases of the project as listed below:

* Preconstruction
* Construction
* Operation and Maintenance
* Abandonment/Renewal

Step 2: Environmental Baseline Description

This step includes description of the :

(1) environment of the study area likely to be impacted;
(2) nature of feedback obtained from Scoping and Bounding (Steps 3 & 4) to identify issues;
(3) Important Environmental Components (IECs) and
(4) the study area boundary.

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Step 3: Scoping

Scoping means identifying:

(1) Environmental issues of concern to the interested parties.
(2) Important Environmental Components (IECs)

Sources of knowledge about the issues and the IECs:

- Archived information
- Expert opinion
- Local community opinion

Step 4: Bounding

This step involves drawing spatial and temporal boundaries.

Spatial: Criteria for selection are:

- Watershed boundaries
- Ecological/agroecological boundaries
- Social and administrative boundaries

Step 5: Major Field Investigation

This involves filling in the gaps that are identified from review of the secondary materials.For example:

(1) At pre- feasibility level IEE: Rapid field assessment
(2) At feasibility level EIA: Detail investigation is required to collect data for various seasons.

Step 6 : Impact Assessment

Individual impacts are identified and quantified on the basis of the baseline situation, trend and environment-project linkages. Impacts should be evaluated with and without management measures.

The assessment criteria are:

(1) Role and importance of the IECs
(2) Magnitude
(3) Duration and type
(4) Area
(5) Communities impacted

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Step 7: Impact Evaluation

Evaluation is done by Scoring and Weighting.

(1) Scoring is for relative magnitude of impacts on a scale of -10 to +10 depending on whether the impacts are adverse or beneficial.

(2) Weighting is for relative importance of impacts, on a scale of 1 to 10.

Step 8: Environmental Management Planning (EMP)

The main components of EMP are:

(1) Mitigation : measures to remove, reduce or control the adverse or negative impacts.

(2) Enhancement : measures to increase the beneficial or positive impacts.

(3) Compensation: measures taken to deal with significant residual adverse impacts after implementation of mitigatory measures.

(4) Monitoring: program at the construction and the operation and maintenance phases of the project to:

a. Measure expected impacts
b. Detect unexpected impacts
c. Determine the efficacy of mitigation measures
d. Discover unforeseen secondary impacts
e. Fill-in knowledge gaps

(5) Disaster management plan: programs for:

a. Identification of risks
b. Identification of agencies
c. Identification of procedures
d. Early warning system

(6) Institutional support and others:

- institutional arrangements to carry out the mitigation, enhancement, monitoring and other components of the EMP.Institutional support should be assured at two levels:

  (a) local institutional support
  (b) central institutional support

Step 9: Feedback to improve project design

Feedback is an on-going process.The feed back loop on the diagram shows a formal situation where feedback has to take place. Informal feedback may occur right from step 2.

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Step 10: EIA reporting

Results of the EIA study are incorporated into an EIA Report to undergo review procedures before it is incorporated into the project assessment.Project assessment includes economic feasibility as well as engineering feasibility, besides EIA.

The unnumbered Step : Peoples Participation

The reason Peoples Participation is not numbered is that it is not a discreet step, but is intertwined and integrated into all the other steps in order to involve local people into the planning process as part of the "bottom-up" planning approach.

3. Shortcomings/Problems and Suggested Improvements

In the preface of the Guidelines, it was suggested that the document be not viewed as static but should be modified and updated from time to time to incorporate the benefits of experience gained from actual environmental studies and EIAs.

Since that time, the FAP 16 had conducted a series of 6 EIA Skills Training Workshops in order to transfer the Guidelines to people who would most likely be using it.The training materials for the workshop mostly came from the Guidelines and the EIA Manual, which is a companion document to the Guidelines.During the preparation of the training materials, and during the training sessions it was felt by the FAP 16 team that some sections/procedural steps and methods of the Guidelines needed to be revised and modified. Questions were also raised regarding the basic approach adopted in developing the Guidelines.An independent review by a U.S. EIA specialist also provided valuable insights into the Guidelines. Meanwhile, the FAP 16 team has conducted an Environmental Study of the Chenchuri beel area of the Southwest Region of Bangladesh. The experience of that study has also been used to identify points to enrich the Guidelines.Now that the FAP is coming to a close, the Guidelines is no longer for FAP projects only, but must be seen as a document for all future water resources development projects.

The comments may be discussed under two major heads:

* The basic approach to the Guidelines
* Procedural Steps and Methods of EIA

3.1. The basic approach to the Guidelines

* Guidelines for Preliminary Environmental Review (PER) and Initial Environmental Evaluation (IEE) should be incorporated specifying their place and role in project development. The level of detail to be covered in the PER and IEE should also be indicated, as well as the level of effort required for each of them.

* Basic questions have been raised about the purpose of EIA itself.As a management tool does EIA identify only the **environmental costs of the project benefits?** Or does it also identify the **environmental benefits accrued from a project not all of which can be identified as project benefits?** Should project benefits be considered as positive impacts when clearly it will be double counting?

* Economic valuation of all environmental costs and benefits are not simply possible.We can not honestly assign taka value to all the IECs. For example, what would be the taka value of benthic organisms,priceless to fish but of no immediate value to us? Same argument applies to endangered or threatened species of national/international importance.That raises the question whether it is at all advisable to evaluate in economic terms as suggested in the Multi Criteria Analysis (MCA).It might be more useful to evaluate only in quantitative/numeric terms where such data permits.

* The concept of trade-off may need to be reviewed. Is the trade-off to be between **positive and negative impacts** or between **negative impacts and the cost of mitigation?** The Guidelines seems to suggest the first alternative, whereas the second alternative merits serious consideration.

3.2. Procedural Steps and Methods of EIA

* **Impact mitigation:** The concept of financial mitigation of loss of personal property is well understood.However, mitigation of the loss of common property resources, and mitigation of loss of habitat of species is difficult to achieve because of severe constraint of land resources. As a result development of alternative common property resources or habitat nearly impossible. The Guidelines has to be more sensitive to this problem.

* **The methodology for assessing alternatives** is not clear in the Guidelines.Particularly, how the Impact Matrix is to be used in assessing project alternatives and alternative interventions must be more clearly indicated.

* **"Scoring" and "weighting":**In countries with comparatively long experience with EIA such as the USA,the concept of "scoring" and "weighting" have come under severe criticism and have practically been abandoned. In the absence of any national standard,"weighting" is almost an impossible/indefensible task.Numerical values used for "scoring" and "weighting", if used for mathematical manipulation gives a false sense of exactness.The "scores" and "weights" represent only the best professional judgement of specialists and experts made on the basis of available information and is subject to personal opinion and biases.Therefore, this particular step in the Guidelines may need serious reconsideration and possible restructuring.

4. Future Needs

* **Need for data collection and storage**

EIA Studies require environmental data of the kind which is not either available or in an useable format. The data is not always accessible. Therefore there is a need to identify data needs, define data format, to collect the data and store in an easily accessible system.

* **Need for common approach**

At present, the Water sector and the Rural Infrastructure sector have their own Guidelines. It is expected that the Industries sector will soon have its Guidelines as well.Other sectors will eventually have their Guidelines also. This is the time to decide on a common approach to developing these Guidelines in order to reduce the contradictions between sectors.

* **Need for setting national standard**

At present there is no national standard, except for the Environmental Quality Standard of the DOE. This EQS mainly refers to water quality. We have to have national standard for other resources as well so that Impact Evaluation relies less on the best professional judgement of the EIA expert.

* **Need for Guidelines in other sectors**

Water is a resource which touches almost all other sectors of national development.Fisheries,Energy and Industries are the sectors which are particularly sensitive to development in water sector, just as water sector is sensitive to development in those sectors.Therefore there is scope for cross-sectoral benefits if EIA Guidelines are developed for other sectors as well.

* **Need for institutionalization of the EIA Process**

If EIA is to be used successfully as a planning tool, it has to be incorporated into the project development process. In order to do that, EIA process needs to be institutionalized in different sectors. This can be done by way of opening EIA cells or incorporating EIA functions into the existing planning cell where possible.

5. Conclusion and Recommendations

The EIA methodology in the water sector is only few years old. Our brief experiences have shown that even at this early stage, the Guidelines may benefit from a careful review.The FAP components using the Guidelines will have their own suggestions for improving it.It would be worthwhile to identify those and develop a program for incorporating them into the Guidelines.

EIA GUIDELINES FOR PHYSICAL INFRASTRUCTURE PLANNING OF RURAL AREAS IN BANGLADESH

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EIA GUIDELINES FOR PHYSICAL INFRASTRUCTURE PLANNING OF RURAL AREAS IN BANGLADESH

APRIL 1995

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Annex - I Checklist of Environmental Parameters of Thana Road project
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EIA GUIDELINES FOR PHYSICAL INFRASTRUCTURE PLANNING OF RURAL AREAS IN BANGLADESH

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1. Introduction

All infrastructural development activities use and interact with diverse natural resources and components of the environment in a complex manner. The schemes formulated and assessed without adequate attention to environment and social aspects have resulted in unforeseen harmful consequences affecting desired benefits and sustainability of the schemes. Such undesirable consequences envisage the need for systematic analysis of environmental issues focusing attention upon interactions between developmental actions and their environmental implications. The process helps to delineate the adverse environmental impacts and incorporate environmental protection measures in the preparation and implementation of schemes. The incorporation of environmental dimensions in the schemes enhances net benefit and ensures environmentally sound and sustainable project.

The Local Government Engineering Department has been entrusted with the Planning, design, and implementation of rural Infrastructures throughout the country through its technical staff set-up at each thana level. The task has been gradually increasing during the past decade to meet the ever increasing demand of rural physical infrastructure sectors such as Roads, Drainage and Embankment, Irrigation, Land Use development etc. As the developmental efforts went on, LGED introduced Thana and Union Plan Books and distributed these documents throughout the country to ensure a systematic developmental approach. As the days passed by, LGED noticed with great concern that the developmental activities on one hand bringing in some benefits which are very much visible and quantifiable while their adverse effects on environment was not taken care of properly.

The paper is presented in the EAP - 16 seminar series on Environmental Assessment (EA) Methodologies in use in Bangladesh organized by EPCO, DOE and USAID
April 25, 1995

2. Awareness within LGED

Although the schemes undertaken by LGED are generally small in nature, the total impact on environment due to these small diversified schemes are quite substantial. This, on one hand, raises the issue c' negating the 'development', incur separate cost and upset the developmental sustainability in the long run.

LGED quickly recognized that needs and limitations make it more difficult to deal with rural infrastructure development. Needs vary from sector to sector, place to place while limitations of resources, knowledge and skills imposed by our present state of technology and social organization do not make the physical infrastructure development environmentally friendly. As a result LGED thought that the Plan Books for thanas and Unions were not enough to handle the situation. Timely and appropriate approach must be devised and institutionalized.

3. Process of Institutionalization

The principal tool that is used by the technical staff of LGED for considering environmental aspects of rural infrastructural development is the "Guidelines on Environmental issues related to Physical Planning".

In an attempt to permanently institutionalize the environmental issues in relation to rural Physical Infrastructure development, LGED published the Guidelines in 1992. *The Guidelines deals with Thana Road Project, Thana Irrigation schemes and Thana Drainage and Embankment Projects. The Guidelines were distributed to all the Thana Engineers in the country. Moreover it's Bengali Version were also distributed to all the Union Parishads of Bangladesh.

The purpose of the guidelines is to facilitate the Thana Engineers and other technical staff to better appreciate the issues related to selected infrastructural development and enable them to carry out Environmental Impact Assessment (EIA) and incorporate the environmental protection parameters in the project preparation process. The guidelines are planned to enable the Thana Engineers to analyze the adverse environmental consequences of the project and adopt appropriate measures to eliminate, or reduce to acceptable levels or offset such adverse consequences through proper planning and design and thus to optimize overall socio-economic benefits.

The infrastructural development in Bangladesh is closely related to a considerable number of parameters or components of the environment which may be grouped under three mutually interacting major components; ecological, physio-chemical and human interest.

*The Guidelines were reprinted during 1994 to meet the increasing demand from other agencies

Before stepping into full scale EIA, LGED follows the Initial Environmental Examination (IEE) process. The IEE provides first hand information to the project planners about the environmental parameters likely to be influenced by the project and the magnitude of the adverse impacts in order to ascertain whether detailed EIA is needed. The objective is to decide whether detailed evaluation of environmental parameters are required. The IEE process simply examines all potential environmental parameters likely to be influenced by the project, identifies the parameters adversely affected and makes statements about the degree of adverse impacts to help the decision making process in project planning.

Many of the projects are so small and of low environmental consequences that conducting full scale EIA for these projects will only delay in the implementation. If a completed IEE concludes that a detailed EIA is not needed, then, in effect, the IEE will serve as the EIA of the project.

In case a full scale EIA is needed, IEE can definitely identify issues that merit full analysis and delineate these that deserve only cursory discussion. The IEE is, therefore, a means of preparing the most feasible environmental management plan with or without a full scale EIA.

3.1 Initial Environmental Examination (IEE)

IEE procedures includes :

Step 1 : project Location (locational map with all features).

Step 2 : Check list (significant environmental parameters) (Annex - I).

Step 3 : Initial screening (concentrate on significant effects).

Step 4 : Completion of IEE (field assessment for degree of adverse effect).

Step 5 : Follow-up activities (identify mitigating measures).

3.1.1 IEE Report :

Section 1 : General Information.

Section 2 : Adverse effects (adverse effects of higher magnitude).

Section 3 : Mitigating Measures (scaling down adverse effects).

Section 4 : Conclusion (a full scale EIA needed or not).

Section 5 : Comments (the person preparing IEE report).

3.2 Environmental Impact Assessment (EIA)

The EIA process in the LGED Guidelines follows three sequential elements.

(i) Identification of all positive and negative impacts

(ii) Quantification of identified impacts

(iii) Preparation of a mitigating plan.

It may also include Monitoring plan.

3.2.1 Methodology

All the available methods are not suitable for every type of projects nor adoptable in all developing countries without modification. However considering our prevailing situation, a simple methodology has been developed for EIA of infrastructure projects. It is based on Environmental Evaluation System (EES) developed by Battelle Columbus Laboratories in USA.

The environmental impacts are assessed by Environmental Impact Values (EIVs). The computation of EIV of a project needs determination of the value representing the magnitude of alteration of environmental parameters and the value representing relative weight or importance of the respective parameter.

The beneficial and adverse changes in environmental parameters of a project are usually expressed in qualitative terms. Those have been plotted in figure 1 in a scale to quantify environmental alterations. The figure shows correlation between qualitative statement and proposed quantitative values of environmental changes resulting from a project.

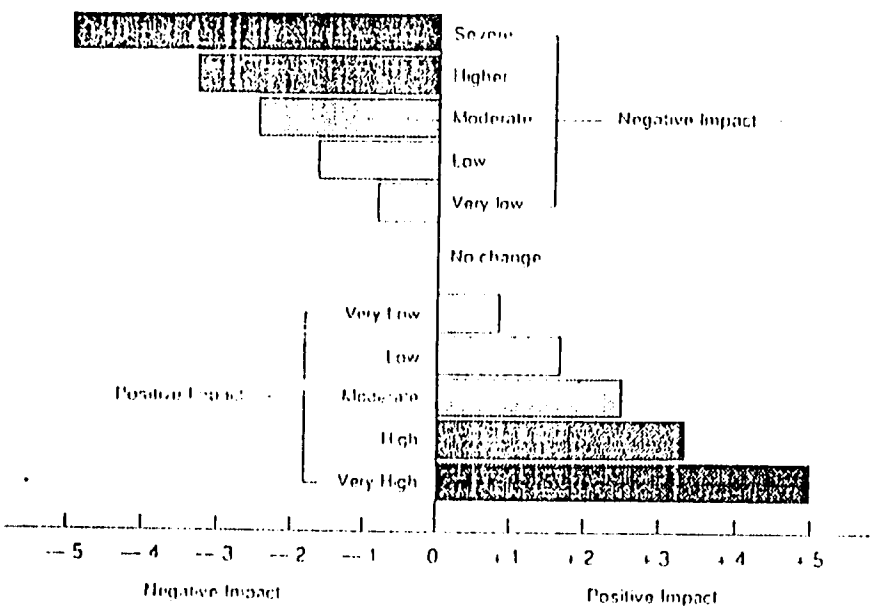


Figure - 1

The changes in environmental parameters are measured with respect to existing condition, no change has O value. The adverse changes have values -1, -2, -3, -4 and -5 to represent very low, low, moderate, high and severe negative impacts respectively. Similarly +1, +2, +3, +4 and +5 represent very low, low, moderate, high and very high positive impacts respectively. A value from the scale representing effect of the project on individual parameter will be taken to compute EIV of the project.

Relative Importance of a parameter varies from country to country depending on the environmental concern of the country. In Bangladesh, flood, employment, agriculture, fisheries, etc. carry more importance than many others. The parameters related to infrastructure projects have been given different values based on prevailing environmental concern in Bangladesh (Annex II).

3.2.2 EIA Procedure

The activities involved in conducting EIA of a proposed project are diverse and intensive efforts including field surveying are needed to prepare successful EIAs. The procedure for conducting EIA as followed in LGED may be described in the following steps.

Step 1 : Preparatory Works

To study the IEE report of the project carefully. Identify the area of influence of the project, delineate the major environmental parameters requiring in-depth study and identify the criteria for measurement of environmental alternations.

Step 2 : Data Collection

To collect information related to the project from all possible secondary sources and conduct field survey to collect primary data regarding existing physical, ecological and socio-economic conditions. Measure the potential changes in all related environmental parameters with special emphasis on key issues.

Step 3 : Data Analysis

To convert qualitative and quantitative field assessment to values indicating magnitude of environmental changes using the scale shown in Fig. 1. Make independent quantification, if EIA team consists of more than one member then take the average value.

Step 4 : Impact Evaluation

To put the values indicating magnitude of environmental changes from Fig. 1 and corresponding importance or weight of environmental parameters influenced by the project from Fig. 2 (Annex - II) in the appropriate columns in Tables 1, 2, and 3 (Annex - III, IV & V respectively) depending on the type of projects and multiply them to obtain positive and negative impact of the parameters. Sum up all these impacts as illustrated in Table 1 (Annex - III) to obtain the EIVs of major components or of the total project.

Step 5 : Mitigating and Monitoring Plans

To put more attention to parameters producing negative EIVs and identify the mitigating measures to be incorporated in the planning and implementation stages of the project to eliminate, reduce and offset negative impacts and thereby enhance net positive EIV i.e. benefit of the project.

Step 6 : Preparation of the Report

To prepare the EIA report in a simple format which is easily understood by the Thana technical staff and the decision makers in the local level and can be used as a planning tool in project preparation exercise.

3.2.3 EIA Reports

EIA reports should be concise and limited to significant environmental issues. The depth and extensiveness of analysis should commensurate with potential impacts. The following is the standard format for EIA report used in LGED.

Section 1 : Introduction

This describes the purpose of the report, extent of EIA study made and gives a brief outline of the content and the methodology adopted.

Section 2 : Description of the Project

The location, size, target population, area and the context of the project are described in this section.

Section 3 : Description of Existing Environment

The important environmental resources within the area of influence of the project are described in this section.

Section 4 : Environmental Impact and Plans for Protection

The positive and negative impacts likely to result from the proposed project are identified and assessed. A plan is presented to eliminate, reduce or offset significant adverse impacts and to enhance the positive impacts. The residual and irreversible impacts are also identified and described.

Section 5 : Monitoring Programme

A programme if required, may be made to monitor the implementation of the project specially to monitor the implementation and performance of environmental protection plan prepared for the project.

Section 6 : Summary and Conclusions

The summary and conclusion section present a short review and major findings of the EIA.

4. Skill Development

The introduction of guidelines was not enough. More skilled manpower were needed for LGED to ensure proper environmental management and monitoring system. Training became essential and has been considered by LGED as an integral part of institutionalization process of EIA in rural infrastructure development.

4.1 Training

The process within LGED began by introducing training on environmental issues in its regular training programmes for Thana Engineers which are centrally organized at Dhaka. The training materials discuss the environment in general and likely impacts on environment due to human intervention with special reference to physical infrastructure development. This were appreciated by the trainees and the training process went on as a routine basis. The decentralized training for Sub-Assistant Engineers at district level who are LGED's field work force were also exposed to the idea of environmental impact of rural infrastructural development. The concept thus gradually spread over to the ground level. Till now 1380 training hours have been utilized for the environmental topic in LGED's regular Physical Planning Training programme.

4.2 Environmental Workshop

A two day separate workshops on regular basis to deal exclusively with the environmental issues has been also introduced on routine basis. The Thana Engineers from different areas are brought in to Dhaka to discuss and work on the environmental the issues. This gives a chance of mutual interaction, exchange of views and ideas and further inputs from Resource persons. So far 150 trainee days have been utilized for this purpose.

4.3 Environmental promotion Course

Later on it was felt that the district based LGED Executive Engineers should also be introduced to topic so as to ensure environmentally friendly schemes. This leads to increased capability to understand and appreciate the environmental problems that might arise out of rural physical Infrastructure development. The two day training workshops are meant for higher level officials and hence provides a wider vision of environment and it impact assessment. The participants are exposed to various aspects of environment like environmental legislative measures, tools for environmental assessment and LGED's "Guidelines on Environmental Issues Related to Physical Planning". These provides appropriate environmental background to focus on issues at different levels. It also foresees the frame work of sustainable development with special reference to LGED's involvement of Physical Infrastructure Development Programmes.

So far 25 XEN's of LGED have been trained through extensive two day workshop assisted by Internal and External Resource persons and utilized 50 trainee days.

4.4 Foreign Training

LGED in collaboration with SIDA sends it's professionals to U.K. for post-graduate training programme on environment. Short training programmes are also being undertaken by LGED officials. This gives an added advantages to develop a core professional staff.

5. Constraints

The common constraints that have so far been encountered in the field are; value judgement for single environmental parameter differs considerably, lack of co-ordination, different line ministries address the environmental problems from their own point of view, irregular fund flow delay the implementation sometimes at the cost of environmental degradation, absence of local participation, lack of appropriate data base and so forth.

6. Future need

The rural infrastructural development schemes need regular monitoring and evaluation while LGED Guidelines should be revised to incorporate the changing circumstances covering other sectors as well. Awareness building among the practitioners and beneficiaries seen to be a pre-requisite for an environmentally sustainable scheme. Moreover Institutional strengthening from national to local level will be a very important step. On the other hand people's participation will have to be ensured having a common aim and out-look for a friendly environment.

7. Conclusions

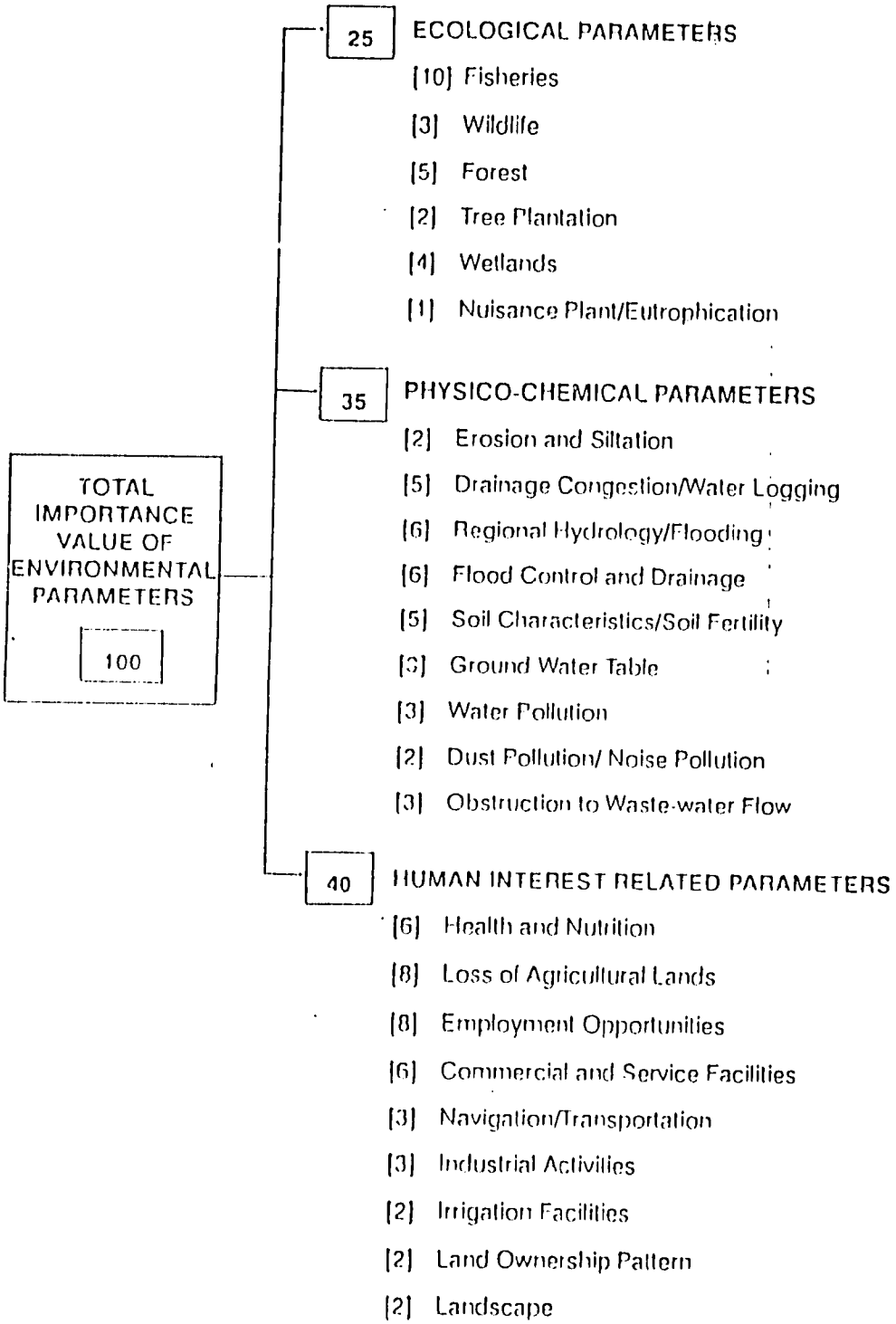
Rural Infrastructure development is a very important activity in Bangladesh which boosts up her stagnant economy to get necessary momentum. LGED in this respect not only play a pioneering role but also tries to safeguard the after effect of the activities undertaken. We are happy to see that our development partners like CARE is working with us in IFFD project where environmental considerations are part of each single scheme. However the most demanding and challenging issue for LGED is to protect the environment while continuing the implementation of rural infrastructure development along with other developmental activities.

Checklist of Environmental Parameters of Thana Road Project

Name of the Project. _____

ENVIRONMENTAL PARAMETERS	INITIAL ENVIRONMENTAL EXAMINATION				
	Positive Impact	No Impact	Adverse Impact		
			Low	Mode-rate	Severe
I. ECOLOGICAL					
Fisheries					
Forest					
Tree Plantation					
Wetland/Wetland Habitat					
Nuisance Plant/Eutrophication					
II. PHYSICO-CHEMICAL					
Erosion and Siltation					
Regional Hydrology/Flooding					
Drainage Congestion/Water logging					
Obstruction to Waste water Flow					
Dust Pollution/Noise Pollution					
III. HUMAN INTEREST					
Loss of Agricultural Lands					
Employment Opportunities					
Navigation Boat Communication					
Commercial and Service Facilities					
Industrial Activities					
Recreation Facilities					
Land Use					

Source : Guidelines on Environmental issues related to Physical Planning, LGED, 1992.



[ ] Parameter Values
[ ] Total and Component Values

Figure 4.2 Relative Importance Values of Environmental Parameters Related to Infrfastructure Projects.

Source : Guidelines on Environmental Issues related to Physical Planning, LGED, 1992.

Table - 1

EIA of Thana Road Project

Name of the Project: _____

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	Relative Impact Positive	Relative Impact Negative	EIV
I. ECOLOGICAL					-19
Fisheries	10	-2		-20	
Forest	5	0			
Tree Plantation	2	+ 1	+ 2		
Wetland/Wetland Habitat	4	0			
Nuisance Plant/Eutrophication	1	-1		-1	
II. PHYSICO-CHEMICAL					-13
Erosion and Siltation	2	-1		-2	
Regional Hydrology/Flooding	6	-1		-6	
Drainage Congestion/Water logging	5	-1		-5	
Obstruction to Waste Water Flow	3	0			
Dust Pollution/Noise Pollution	2	0			
III. HUMAN INTEREST					+ 27
Loss of Agricultural Lands	8	+ 3		-24	
Employment Opportunities	8	+ 4	+ 32		
Navigation/Boat Communication	3	-3		-9	
Commercial and Service Facilites	6	+ 3	+ 18		
Industrial Activities	3	+ 2	+ 6		
Irrigation Facilities	2	+ 3	+ 6		
Landscape	2	-1		-2	
Total Environmental Impact Value			+ 64	-69	+ -5

Source : Guidelines on Environmental issues related to Physical Planning, LGED, 1992.

Table - 2

EIA of Thana Irrigtion Scheme

Name of the Project: _____

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
I. ECOLOGICAL					
Fisheries	10				
Wildlife	3				
Nuisance Plant/Eutrophication	1				
II. PHYSICO-CHEMICAL					
Water Pollution	3				
Ground Water Table	3				
Drainage Congestion/Water logging	5				
Soil Characteristics	5				
III. HUMAN INTEREST					
Health and Nutrition	6				
Employment Opportunities	8				
Land Ownership Pattern	2				
Commercial and Service Facilites	6				
Industrial Activities	3				
Total Environmental Impact Value					

Source : Guidelines on Environmental issues related to Physical Planning, LGED, 1992.

Table - 3

EIA of Thana Drainage and Embankment Project

Name of the Project: _____

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
I. ECOLOGICAL					
Fisheries	10				
Tree Plantation	2				
Wetland/Wetland Habitat	4				
II. PHYSICO-CHEMICAL					
Flood Control and Drainage	6				
Erosion and Siltation	2				
Drainage Congestion/Water Logging	5				
Obstruction to Waste Water Flow	3				
Soil Fertility	5				
Early Flooding	6				
III. HUMAN INTEREST					
Loss of Agricultural Lands	8				
Employment Opportunities	8				
Nagivation/Boat Communication	3				
Irrigation Facilities	2				
Landscape	2				
Total Environmental Impact Value					

Source : Guidelines on Environmental issues related to Physical Planning, LGED, 1992.

EIA METHODOLOGY UNDER THE INTEGRATED FOOD FOR DEVELOPMENT PROJECT

Environmental Impact Assessment Method under the Integrated Food for Development Project

Mamunul Hoque Khan[1]

This paper has been prepared for presenting in the seminar on "EIA Methodologies Used in Bangladesh" organized by the Irrigation Support Project for the Asia and the Near East (ISPAN) which is scheduled to be held on April 25, 1995. The paper demonstrates the environmental assessment method being used by the Integrated Food for Development (IFFD) Project, CARE-Bangladesh. A brief description on the IFFD Project has been given to provide with a synthesized overview. A brief discussion on the shortcomings/limitations of the EIA method which is being used by the project has also been presented. Some potential reforms to overcome the limitations are reviewed.

INTRODUCTION

Integrated Food for Development Project (IFFD) Overview

The IFFD is a development project that improves rural roads, through structure construction, earthwork and revegetation activities, allowing the socio-economic benefits associated with a functioning rural road networks. The IFFD Project is linked with CARE's Rural Maintenance Program (RMP) funded by Canadian International Development Agency, which provides routine rural road maintenance, to heighten the impact of both projects. The IFFD Project is comprised of the Road Improvement Unit, Environmental Management Unit, Disaster Management Unit, and the Training Unit.

In 1990 a Programmatic Environmental Assessment (PEA) was carried out to assess the Integrated food for Work (IFFW) Project which was the predecessor project of the Integrated Food For Development Project. The five year IFFW project was concluded in 1993.

The PEA identified following shortcomings of the IFFW Project

- limited socioeconomic impact due to poorly selected, designed and implemented road schemes;
- substantive environmental impacts including impeded drainage and the loss of productive land;
- inadequate routine maintenance of reconstructed roads;
- programmatic inefficiencies and resource leakages;
- unsatisfactory participation of communities in the selection, implementation and maintenance of schemes;

In response to the PEA, a new phase of the project (Integrated Food for Development Project) was initiated incorporating several reforms so that concerns raised by the PEA can be resolved.

[1] Environmental Management Analyst, Integrated Food for Development Project, CARE-Bangladesh

In many ways, the IFFD Project is radically different from its predecessor project, the Integrated Food For Work (IFFW) Project. The Integrated Food For Development (IFFD) Project is designed to alleviate poverty in rural areas through improved access to markets and services. Many studies provide strong evidence that a functional rural transport network decreases personal and material transport costs and the cost of new agriculture-related inputs and technologies while increasing agricultural productivity, farmgate prices of foodstuffs, the efficiency and intensity of private-sector pursuits, the number of on- and off-farm employment opportunities and the extent to which social and other services such as schools, health clinics and banks are utilized by the public.

On April 28, 1994, CARE International in Bangladesh and the Government of Bangladesh entered into a new agreement to implement the Integrated Food For Development Project by incorporating following reforms:

- Select a rural road network to which both the IFFD Project's and the Canadian International Development Agency's Rural Maintenance Program (RMP) interventions will be directed using LGED's road classification system combined with a methodology that enumerates the socioeconomic ***cost/benefits of*** road improvements and ranks, *thana*-wise, the individual roads comprising the network.

- Apply a ***"continuous alignment"*** approach in planning and implementing road improvement activities on selected roads so that project resources achieve the project's objective. The "continuous alignment" approach will be applied so that after implementation the alignments will be traversable by Motorized Transport (MT) during the dry season and by Non-Motorized Transport year-round under normal conditions. Every improved alignment under the "continuous alignment" approach will include the minimum necessary earthwork, revegetation, and all necessary drainage and transport structures.

- Conduct an Initial Environmental Examination of all eligible alignments, and where necessary, an Environmental Impact Assessment, to exclude alignments with unaddressable environmental impacts or to apply mitigating measures to minimize environmental impacts.

- Train CARE, BDG and NGO personnel and community leaders on environmental management issues, policies and procedures.

- Link IFFD's improved roads to the Rural Maintenance Program (RMP) to ensure that the improved roads are maintained.

- Develop and implement disaster preparedness and response plans to reduce the impact of recurrent natural disasters.

The Environmental Management Unit (EMU)

CARE-Bangladesh created the Environmental Management Unit (EMU) in Fall 1991 which was one of the principal endeavor in response to findings of Programmatic Environmental Assessment.

Objectives of the EMU

The major objectives of the EMU, inter alia, can be listed as follows:

- Formulation of sustainable environmental policy and procedures for the project
- Environmental protection
- Environmental mitigation of existing problems
- Identify major environmental constraints and research potential solutions
- Increase sensitivity for better planning within the environment.
- Increase awareness of environmental problems in Bangladesh
- Ensure the effective implementations of the environmental management procedures
- Monitoring of the effectiveness of the procedures and carrying out alterations if necessary

EIA of Rural Road Improvement Projects Accomplished to Date

September 1991 -

The project basically follows the environmental impact assessment procedures outlined in the Local Government Engineering Department (LGED)'s "Guidelines on the Environmental Issues Related to the Physical planning".

To date more than fifteen hundred proposed rural road reconstruction schemes have been reviewed through environmental assessment procedures. A list of EMU accomplishments is attached herewith under the Annexure.

IEE & EIA Procedures of the IFFD Project

The IEE and EIA method being used by the project is a synthesis of quantitative and qualitative methods. The IEE is a quantitative method integrated with a quantified features logging. EIA procedures are a combination of checklist and questionnaire methods. Environmental monitoring and evaluation procedures are being developed which will also be a mixture of quantitative and qualitative approach.

IEE & the EIA formats have been Presented at the end of this paper under Annexure.

IEE and EIA are joint exercise being carried out by trained LGED and CARE staff.

Shortcomings / Problems and Suggested Improvements

SPECIFIC SHORTCOMINGS OF THE METHOD

- **IEE's/EIA's location in the project cycle:**

Generally IEE is ideal to use in project screening to determine which projects require a full scale EIA. The IEE assesses the potential overall environmental effects of a proposed project. If the IEE findings indicate that a full-scale EIA is not necessary and necessary Environmental Management Plan is prescribed then that IEE can be regarded as the EIA for that project. So IEE is basically designed to screen or assess *proposed* project interventions.

In the IFFD project, IEE and EIA are being done before specific project proposal. People should know the design dimensions of the roads and on the basis of that assessment should be done. But the existing approach is to assess the projects (for which design dimension is not known) by incorporating mitigating measures. So people are anticipating the impacts of the mitigating measures. This way it gives positive results in the maximum cases. There is a possibility for doing mistake in this approach.

Suggestion on Potential Reform: IEEs/EIAs should carried out on the basis of specific project proposal.

- **Design of the IEE checklist:**

The IEE checklist is general and broadbased. The results of the IEE might very from person to person for different professional interests and interpretations. Although some specific guidelines have been prepared for using the checklist, there is a risk of having vague/wrong information. Tone in the wordings are not very uniform (see the checklist : annex one). Suppose fisheries, wildlife, and wetlands representing sectors while drainage congestion indicates problem. So on the basis of these words quantification might not be very sound.

Suggestions on Potential Reforms: Instead of broad sectors, specific questions might be asked in the IEE checklist. There should be a uniform approach in asking questions.

- **Relative environmental impact value importance:**

Relative importance value of environmental parameters (such as 10 for fisheries) has been adopted on the basis of the importance of different sectors. Impacts can be quantified either as positive or negative. Due to a lack in the specifity, interpretations might be different. For instance, for a proposed road improvement project, closed water culture fishery might be facilitated and in contrast ,open water capture fishery might be hampered. So there is a possibility that the quantification will be either biased, wrong or contradictory, although guidelines have been provided to minimize this problem. But, since the checklist is not self explanatory , there is always a possibility

15

of making mistakes.

Suggestions on Potential Reform: The format should be very specific and self explanatory. For instance, it can be designed in closed ended questionnaire form. Instead of asking for information on "fishery", if a question is asked whether "open water capture fishery will be impacted or not" that would be more objective.

- **Quantitative Analysis:**

  Quantitative analysis might give a misleading result with the present structure of the checklist . In fact, the scope of quantitative analysis is limited within the existing structure.

  Suggestions on potential reforms: Quantification guidelines should be specific as much as possible. Where specific Quantification guidelines is not possible there should be a qualitative information insertion option.

- **Lacking in baseline data/information**

  The IEE checklist and the EIA questionnaire are designed such a way that baseline information is necessary. For instance, to measure impact on wetland areas with precision, in response to the questions outlined in the EIA questionnaire (question no. 2 & 3 under ecological impact) is very complicated and time consuming without authentic baseline data/information.

  Very often the available baseline data/information is found to be either outdated or wrong. So baseline information based questions might give wrong answers.

  Suggestions on potential reforms: IEE/EIA formats should be revised such a way that it will not be very much dependent on baseline information.

- **Limited mitigating options**

  The EIA methodology works well when there are a variety of mitigating options. Under IFFD project mitigating options are very limited due to funding and policy constraints.

  Suggestions on potential reform: The project should examine the potentials of incorporation of various mitigating options under the project. Coordination of donors can result in carrying out different mitigating options.

GENERAL SHORTCOMINGS / LIMITATIONS

Following is a list of general shortcomings to effective field implementation of IEE/EIAs in Bangladesh.

- Lengthy process in accessing the existing data/information

In most cases, data/information collection is a long and complicated process. Therefore, people are often discouraged in using the data. As a result existing databases are not being optimumly used by the users.

- Outdated/wrong data

  Sometimes it is found that existing databases are not authentic and updated. Therefore, users cannot use the data.

- Lack of baseline data

  There is a tremendous need for baseline data. Due to this unavailability, EIAs can provide with perception based results.

- Illogical inaccessibility

  Sometimes, illogical restrictions in gathering information cause sufferings for the EIA practitioners. For instance, Definition of restricted, confidential, secret and top secret should be redefined by the concerned organizations with respect to the time and present need.

- Lengthy bureaucratic formalities

  Bureaucratic formalities often cause problems for the EIA practitioners. Normally EIA practitioners work with a specific deadline for completion. When they do not get information in time, they try to proceed with perception on the basis of RRA/PRA.

- Coordination problem in data capturing and storing

  There is a lack of coordination among the data capturing and storing organizations. Sometimes for the same data/information different organizations work which is misuse of resource and time.

- Absence of service orientated data center

  Due to the absence of service oriented data centers, EIA practitioners are not getting data timely.

- Absence of effective monitoring and evaluation on the authenticity of the collected data

  Due to the absence of organizations which monitor and evaluate the authenticity of existing databases, there is always a possibility of getting wrong results if outdated or wrong information is used.

- Absence of long term integrated landuse and infrastructure development planning at the national level.

Future Needs

- Service oriented data center / sector specific data center

  There is a great need for service oriented data center which will be sector specific such as land, water, fisheries, forest and wildlife. The centers may even be profit oriented which may enhance the efficiency of the centers.

  Data center with GIS facilities would be recommended in this respect.

- National level coordination cell

  A national level data/information coordination cell can ensure that work is not being duplicated or redundant.

- Sector specific data collection guidelines

  Some standard for data collection and storing may be fixed which will make the data more compatible due to maintaining uniform principles.

- Update the existing data

  Regular updating of data is very important for quality EIAs. There is a lack of activity in this respect.

- Data collection & storage

  Priority sectors should be identified and data / information for different sectors should be collected.

- Update Environmental Quality Standard

  The draft environmental quality standard should be finalized as soon as possible. It should be finalized by incorporating opinions of the concerned professionals such as limnologist, bio-chemist and pedologist.

- National level EIA institution

  A national level EIA institution would be very useful to establish. This institute will be responsible for preparing the sector specific EIA guidelines and manuals. It would organize training, workshop and seminars on EIA. It might be directly involved in carrying out major EIAs. Under this institution, regional forum on environmental issues can be formed.

- Community input

  More involvement of communities in planning interventions is necessary and for that there is a need for improved mechanism for collecting community input.

Conclusion

The environment and ecology of the country are being disrupted by development interventions. Implications are found in different locality/regions of the country due to the physical interventions in the locality, region or outcountry. Environmental management is crucial for all the physical infrastructure development activities specially infrastructures related to water management, communications and industries. Institutionalization of the EIA process is a basic need for the country. Without resolving the shortcoming outlined in this paper it will be very difficult to carry out very effective EIAs.

Annexure

Annex 1: IEE Format
Annex 2: EIA Format
Annex 3: Pre-survey Format
Annex 4: EMU's Accomplishments to Date

Annex-I

The Government of the People's Republic of Bangladesh
Local Government Engineering Department

INITIAL ENVIRONMENTAL EXAMINATION - CHECKLIST OF ENVIRONMENTAL PARAMETERS

FORM IEED.3001 (05/95)

SECTION I ROAD IDENTIFICATION

Road Identification Number: ROAD NUMBER: __ : __ : __ : R1: __

(Division Code: District Code: Thana Code: Road Class: Road Number)

SECTION II CHECKLIST

ENVIRONMENTAL PARAMETERS ECOLOGICAL PARAMETERS	RELATIVE VALUE IMPORTANCE	INITIAL ENVIRONMENTAL EXAMINATION											EIV
		POSITIVE IMPACT					No IMPACT	NEGATIVE IMPACT					
		Very High [5]	High [4]	Moderate [3]	Low [2]	Very Low [1]	[0]	Very Low [-1]	Low [-2]	Moderate [-3]	High [-4]	Severe [-5]	
Fisheries	10												
Wildlife	5												
Forest	6												
Tree Plantation	2												
Wetlands	6												
Aquatic Plants	1												
PHYSICO-CHEMICAL PARAMETERS													
Erosion and Sedimentation	3												
Drainage & water congestion	6												
Regional Hydrology / Flooding	6												
Soil Characteristics / Soil Fertility	6												
Ground Water Table	3												
Water Quality	3												
Obstruction to Waste Water Flow	3												
HUMAN INTEREST RELATED PARAMETERS													
Health and Nutrition	6												
Agricultural Land	6												
Employment	6												
Commercial and Services Facilities	5												
Navigation / Transportation	5												
Industrial Activities	3												
Irrigation	3												
Land Ownership Pattern	3												
Landscape	3												
TOTAL EIV													

SECTION III IEE CHECKLIST APPROVAL

Name & Title		Signature	Date
LGED Official:			
CARE Official:	#		

The Government of the People's Republic of Bangladesh
Local Government Engineering Department

INITIAL ENVIRONMENTAL EXAMINATION - REPORT

FORM IEED.3004 (05/95)

SECTION I ROAD IDENTIFICATION

Road Identification Number: *(Division Code: District Code: Thana Code: Road Class: Road Number)*	ROAD NUMBER: __ : __ : __ : R1: __

SECTION II MITIGATING MEASURES

List of Environmental Parameters with Impact Values less than -20	Problems/Reasons	Mitigating measure for scaling down the adverse effects on the parameters listed.
[1]		
[2]		
[3]		
[4]		
[5]		
[6]		
[7]		
[8]		
[9]		
[10]		

SECTION III COMMENTS/EIA DECISION

Comments:

Tick either [✓]: [ ] Follow-up detailed EIA is not required.
This IEE may be considered as EIA of the project.
[ ] Follow-up detailed EIA is required.

Please note. *If the EIV is greater or equal to 20, an EIA will not be required.*

SECTION IV SIGN-OFF

Name & Title		Signature	Date
LGED Official:			
CARE Official:	#		

Annex-2

The Government of the People's Republic of Bangladesh
Local Government Engineering Department

PRE-WORK LEVEL SURVEY SHEET

IFFD.4002 (05/95)

SECTION I ROAD IDENTIFICATION

Road Identification Number: *(Division Code: District Code: Thana Code: Road Class: Road Number)*	ROAD #: __ : __ : __ : R1: __	Page ____ of ____

SECTION II LEVEL SURVEY DATA

Instructions: Using a chain and level equipment and from the starting point (zero) proceed on foot and note all Environmental, Natural, and Socio-Economic features.

Station	Chanage of Features	Existing Features Codes					Level Data							Proposed Solutions/Comments	
		Eng#	Condition	Year	Env#	SEC#	Back	Inter	Fore	HI	RL	Soil Type	HFL	Solution Code	Comments

Signatures of PWS Team Members			

ROAD IDENTIFICATION	ROAD #: ___ : ___ : ___ : R1: ___	Page ___ of ___

LEVEL SURVEY DATA

Instructions: *Using a chain and level equipment and from the starting point (zero) proceed on foot and note all Environmental, Natural, and Socio-Economic features.*

Station	Chainage of Features	Existing Features Codes					Level Data							Proposed Solutions/Comments	
		Eng#	Condition	Year	Env#	SEC#	Back	Inter	Fore	HI	RL	Soil Type	HFL	Solution Code	Comments

Signatures of PWS Team Members			

ROAD IDENTIFICATION	ROAD #: ___ : ___ : ___ : R1: ___	Page ___ of ___

SECTION III COMMENTS

SECTION IV SURVEY TEAM SIGN-OFF

Name & Title		Signature	Date
LGED Official:			
Union Representative:			
CARE Official:	#		

NOTABLE FEATURES CODING

Engineering Structure Codes	ENG Code #	Natural Features Codes	ENV Code#	Socio-Economic Codes #	SEC Code #
START OF ROAD	0	Wetlands or water logged place: START/END	50	Village / Bazar: Point	100
Single Vent Pipe Culvert	1	Highlands or rock outcrops / natural barrier	51	Education Center: Point	101
Multiple Vent Pipe Culvert	2	Navigable Rivers or areas: START/END	52	Place of Worship: Point	102
Box Culverts	3	Small streams (Nalas) / or dry beds: Points source	53	Industry/Factory: Point	103
Open Foundation Culvert	4	Forest - Natural: START/END	54	Health Center: Point	104
Slab Bridge	5	Forest - Plantation: START/END	55	Agricultural or Horticulturtal Land: START/END	105
Tbeam Bridge	6	Erosion features - washouts, or gullies: START/END	56	Fisheries area: START/END	106
Multiple Vent Box Culvert	7	Any gaps, or prenil: START/END	57	Irrigated area: START/END	107
Rough road surface - place of foot traffic only	8	Area of road below AAHFL: START/END	58	Union Boundary (Name of Union)	108
END OF ROAD	9	Changes of direction / corners (degrees from north)	59	Other feature (ie. Bankl, NGO Office, etc.) - Name	109
Proposed end of Partial Alignment	10	Major problem noted by key informants	60	Other Project work area (ie. RDP, etc.)	110
Intersection with other road	11	Major health problem noted by key informants	61	Tube Well (Deep or Shallow)	111
Paved roads START/END	12	Fish ponds	62	Ferry ghat	112

The Government of the People's Republic of Bangladesh
Local Government Engineering Department

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FORM IFFD.5001 (05/95)

SECTION I ROAD IDENTIFICATION

Road Identification Number: *(Division Code: District Code: Thana Code: Road Class: Road Number)*	ROAD #: __ : __ : __ : R1: __

SECTION II ECOLOGICAL IMPACT

1. Does the road prevent or inhibit migration of fish? **Yes / No**
   If yes, then whether lateral or longitudinal migration affected? _____

2. Does the road isolate/disconnect/feeding/breeding ground of fish? **Yes / No**
   If yes, approximate area _____ **acres**

3. Does the road cause any alteration of wetland? **Yes / No**
   If yes, wetland area increased/decreased is _____ **acres**

4. Does the road affect habitat of animals, birds, fishes in any way? Yes/No
   Is the area inhabited by endangered or threatened wild life species (see attached list)?
   Comment (if yes)

5. Does the road cause destruction/removal of trees/bushes along the route? **Yes / No**
   If Yes, how much: _____

6. Does the road interfere/obstruct polluting discharges in any location to cause water pollution and subsequent destruction of flora and fauna? **Yes / No**

7. Does the road facilitate tree plantation? **Yes / No**

SECTION III PHYSICO-CHEMICAL IMPACT

1. Lengths of the road running through flood plain _____ km
   flood free high land _____ km
   rice fields _____ km
   wetlands excluding rice field _____ km
   erosion prone areas _____ km
   flat land: prenil _____ km

2. Length of the road damaged by erosion _____ m
   and breached in # _____ locations; damaging total road length _____ m

3. There are _____ nos. of bridges and _____ nos. of culverts.
   The approach roads of the bridges and culverts are damaged in _____ locations

4. The difference in maximum water levels across the road during the last flood was _____ m

5. Was the velocity of water flow through the opening of the bridge/culvert during last flood much higher than the other part of the river/canal? **Yes / No**

6. Does the road cause siltation in other part of the river/canal or other location(s)? **Yes / No**

7. Total _____ km of the road runs parallel to the direction of flood flow and _____ km of the road runs perpendicular to the direction of flood flow over flood plain.

8. Does the road cause drainage congestion? **Yes / No**
   If yes, area affected is _____ acres

9. Will the flood water in some area recede more slowly after the construction of the road **Yes / No**
   If yes, area affected is _____ acres.

10. Does the water remain turbid on either side of the road? **Yes / No / Occasionally**

11. Does the road change the direction of water flow? **Yes / No**

12. Does the project cause soil loss from agricultural land? **Yes / No**
If yes , the area affected is _____ acres. Temporarily _____ acres, permanently _____ acres

13. Any other physical/chemical changes notable in the area due to construction of the road?

Comment _____

SECTION IV IMPACT ON HUMAN INTERESTS

1. The road runs through agricultural land _____ km
and non-agricultural land. _____ km

2. Does the road and/or road structure interfere with boat communication in any time of the year? **Yes / No**
If yes, the period of interference is _____ month(s)

3. Did people ever cut the road for boat communication/flow of congested water/flow of excess flood water? **Yes / No**

If Yes, comment _____

4. Does the road prevent/interfere with any transportation across the road? **Yes / No**
Comment _____

5. Employment generated by the road is _____ man-months for construction/rehabilitation and _____
_____ man month for maintenance per year.

6. The road remains fully operational for _____ months
used by pedestrians for _____ months
by rickshaw/van for _____ months
by bullock carts for _____ months
and by motorized vehicles for _____ months

7. Did the road improve communication in real term? **Yes / No**
The usual traffic during use is **Light / Moderate / Heavy / Other**

8. Did the road promote the growth of local industry/growth center in the area? **Yes / No**

9. Write comments on the other benefits of the road.

_____

_____

_____

_____

SECTION V EIA APPROVAL

Name & Title		Signature	Date
Thana Engineer			
CARE Engineer	Emp #		

Annex 4

EMU's Major Accomplishments to Date
September 1991 - to date

A. Environmental Impact Assessment

To date about 1500 proposed road improvement schemes have been assessed through IEE/EIA procedures.

B. Publication & Major Documents

Date	Title of the Documents	Authors
November 1992	(i) Environmental Reference Book (ii) Case Study: A CARE Canal Re-Excavation (iii) Case Study: A road in Hatimara	Ebel Dijkstra Javed Sakhawat Reynt Sloet Arnoud Steeman
September 1993	Facilitator's Manual for the Environmental Management Training-II (3 Volumes)	Kim Martens Mamunul Hoque Steven Nakashima Cathy Gibbons
August 1994	Facilitator's Manual for the Orientation Session on Environmental Management under the Integrated Food for Development Project	Mamunul Hoque
October 1994	A Basic Guide to Understanding the Environmental Impacts of Rural Roads on the Wetlands of Bangladesh	Steven Nakashima Mamunul Hoque

C. GIS & Regional Planning

EMU has investigated potential use of Geographic Information Systems (GIS) for IFFD and developed expertise in operation and theory of ARC-INFO GIS software. Project specific needs assessment will be carried out by the unit very soon. EMU investigates potential regional planning aspects of the IFFD project.

D. Training

Summary Sheet
Environmental Management Training
Integrated Food for Development Project

Date	Title of the Training	Duration	Main Subject Areas	Participating Organizations	Designations	Total # of Trainees	Total # of Sessions	Venues
Winter 1992	Environmental Management Training - I	5 Day	a) Basic Environmental Concepts b) Environmental Assessment Procedure c) Training of Trainers	CARE, LGED	Deputy Administrator Project Engineer, Field Engineer, Technical Officer, Project Officer, Asstt. Project Officer, Asstt. Engineer	270	14	Dhaka Comilla Mymensingh Jessore Bogra Rangpur
Jan. - Feb. 93	Thana Review Session	2 Day	a) CARE's Environmental Policy & Procedures b) Environment Assessment Procedure	LGED, Ministry of Relief and Rehabilitation	District Relief & Rehabilitation Officer, Thana Nirbahi Officer, Thana Engineer, Project Implementation Officer, Sub Asstt. Engineer.	1295	44	District Head Quarters
February 17-18, 93	IFFW Environmental Management Workshop '93	2 Day	a) CARE's Environmental Policy & Procedure	CARE, USAID, DORR, LGED, WFP, PACT/PRIP, LOUIS BERGER, Ministry of Relief	Top level Officials	32	1	Dhaka Sheration
August to Dec. 1993	Environmental Management Training - II	5 Day	a) Environmental Management & Sustainable development b) Concept & importance of wetlands c) How the wetlands are being disrupted and their implications d) Environmental assessment procedure & mitigation e) General TOT	CARE, LGED DECAN, WFP, Ministry of Environment.	Deputy Administrator, Project Engineer, Field Engineer, Technical Officer, Project Officer, Asstt. Project Officer, Asstt. Engineer, Transport Planner, Joint Director.	224	13	Dhaka, Comilla, Mymensingh, Jessore, Bogra, Rangpur
April, 1994	Refresher Training on environmental management training - II	2 Day	Ditto	CARE	Assistant Project Officer	175	10	Dhaka, Comilla, Mymensingh, Bogra, Jessore, Rangpur
August 11,	Orientation session on environmental management	1 Day	Environmental Management activities under IFFD Project	LGED	Thana Engineer, Sub Asstt. Engineer	588	22	LGED District Training Centers

INDUSTRIAL SECTOR EIA IN BANGLADESH

INDUSTRIAL SECTOR

Akhtar Hossain
Enviro-care

1. Introduction

- **Development that lead to requiring EIA in the sector**

It is unfortunate that the development activities of the past were associated with rapid industrialization by increasing use of chemicals, discharging indiscriminately wastes of high pollution, land use to the non-compatible zones and collosal wastes of natural resources all these have contributed to the serious damages and changes in the environment.

It is well recognised that the development activities of the past had been in wrong direction because the environmental issues were not given due attention or the damages were noticed at a much later stage when it was irreversible. This led to the concept of Environmental Impact Assessment.

A developing country like Bangladesh is confronted with multi-economic problems such as overpopulation, extreme poverty, illiteracy and natural resource depletion and environmental degradation. (Deforestation, destruction of wetlands, inland fisheries, soil depletion, inland salinity , water pollution etc. Therefore environmental management is difficult and needs careful analysis to achieve sustainable environmental condition.

What Guidelines and Manuals are used for doing EIA in the Industrial Sector

- **What is EIA and why we need to do EIA**

Environmental impact assessment is a tool and formal study process used to predict the environmental consequences of development projects. In such study it focuses on problems ,conflicts or natural resources constraints that could affect the viability of a project. Having predicting potential problems the EIA identifies possible measures to minimize the problems and outlines and ways to improve the projects.

Since the assessments are done at the planning or feasibility stage , the room for necessary changes and alternative use of site, process or appropriate remedial measures and cost-benefit aspects can be made available at the planning level, rather later stage which may end up with unviable or costly project and more importantly an environmental damaging project.

The three most important and sequential elements are involved in EIA exercises are : identification, prediction and evaluation.

- **Identification**

  - description of the existing environmental system
  - determination of the components of the project

- **Prediction**

  - identification of the environmental modification that may be significant

  - forecasting of the quantity and or spatial dimension of change in the environment identified
  - estimation of the probability that the impact will occur

- **Evaluation**

  - determination of the incidence of cost and benefit to user group affected by the project

  - Specification and comparison of trade-off(cost or effects being balanced) between various alternatives.

  Under each of the above elements different methods of assessments are suitable for industrial sector. Such as identification

  - checklist method

  - scaling and measurement

- **Evaluation**

  - environmental evaluation system , multi-criteria analysis , cost -benefit analysis etc.

- **Methodology**

  A number of techniques have been developed for the presentation of environmental impacts results to decision -makers and the general public. These techniques can be denoted as below:

  1. adhoc
  2. checklist
  3. matrices
  4. overlays
  5. networks
  6. Cost-benefit analysis
  7. simulation modelling workshops

EIA in Developing Countries

Philippines, Thailand, Malaysia, India, Korea, Indonesia and Bangladesh.

In Philippines scope of EIA activities officially started in 1977 as a result of legal requirement. A National Environmental Protection Council (NEPD) has been established to protect the environment. Heavy industries, resource extractive industries, Infrastructure projects and critical areas are considered.

G2

In Thailand, with the NATIONAL Environmental Quality Act (1975) a new Agency National Environmental Board was established. The function of the Board was to identify requirements of industries needing IEE, EIA etc. These covered Agro-industries, coastal zone development, dams and reservoir, highways, housing estates, human settlements, industrial estates , industries, institution, nuclear power, oil-pipe lines, thermal power, swamp and wetland.

The Environmental Quality Act of 1974 provided Malaysia with a comprehensive legal instrument for environmental control. The guidelines covered the following subjects :(i) the control and prevention of erosion and siltation (ii) siting and zoning of industries (ii) Environmental Impact Assessment and (iv) selection and management of sites for the disposal of solid and hazardous wastes.

EIA in India is promoted by Department of Environment. EIA guidelines have been prepared for industrial development, mining, refineries, hydr-electric projects. Environmental protection agency , and Environmental appraisal committee of Department of Environment review or supervise the action. Environmental considerations have been ensured by licensing.

In 1977 Korea enacted the Environmental preservation Law which requires the application of EIA to major Govt. projects. With the establishment of of Office of Environment in 1981 EIA was made compulsory for ten major projects i.e dam construction energy projects and industrial projects.

Indonesia Ministry of Development , supervision and Environment has the responsibility to ensure that EIA are prepared in the planning and implementation projects.(Act no.4, 1982 concerning basic provisions for living Environment). However there is yet no legal requirement for projects to undertake EIA.

EIA In Bangladesh:

In Bangladesh, Environmental concern is comparatively new phenomenon. Late eighties and early nineties DOE and funding agencies by various Aid Agencies have initiated the process of conducting EIA's in the country for various projects of significant impact.

Department of Environment (DOE) with the assistance of various International agency have initiated the process for various development activities. DOE has classified three list red, amber and green requiring comprehensive/full-scale environmental Impact Assessment and initial Environmental Examination/Rapid Environmental Impacts Assessment and for green list no environmental impact assessment is needed. These classifications are also related to heavy, Medium, or no pollution. respectively.

What guidelines of EIA are followed?

In India, they have their own guidelines but fundamental principles of ADB and World Bank Guidelines were used.

In Philippines and Thailand both ADB, and WB guidelines are used although they are in the process of developing their own guidelines.

Guideline for EIA by the World Bank and ADB

Approaches and Methods

Sectoral and project based guidelines have been detailed by both the international lending agencies. First the projects have been classified into major categories based on the importance of the EIA. They are as follows :

Category A : Projects that rarely have significant adverse environmental impacts

Projects in this category generally include education, population and health (except the treatment of hospital wastes), credit institutions, capital markets and rehabilitation projects.

The Environment Specialists' inputs for projects within this category will invariably be minimal and may only involve providing information.

Category B: Projects with significant adverse environmental impacts but for which mitigative measures may be prescribed readily.

Projects in this category generally include agro-industries, crop intensification schemes, importation of agro-chemicals, livestock, fish farming, fisheries facilities, dendrothermal schemes, small irrigation schemes, water supply and sanitation, housing development (including slum upgrading), rehabilitation or upgrading of existing roads, communications, small-scale industrial plants and estates, underground mining, transmission lines, mini hydropower schemes and industrial development finance institution.

The Environment Specialists' inputs for projects within this category will vary according to the nature of the project. However, in most instances, the inputs would involve the specification of environmental protection measures or, in the case of development finance institutions, ensuring that loan documents stipulate appropriate safeguards to avoid or, control adverse environmental impacts. The Environment Specialists would use "codes of Practice", checklists or other suitable analytical techniques of projects within this category advising staff during their application. Only rarely would the Environment Specialists need to conduct field studies.

Category C and D: Being not under industrial sector is not discussed.

World Bank's Outline of a Project-Specific EA Report Should include :

i) Executive Summary
ii) Policy, legal, and administrative framework

iii) Project description
iv) Baseline Data
v) Environmental Impact
vi) Analysis of Alternatives
vii) Mitigation Plan
ix) Environmental Management and Training
x) Monitoring Plan

World Bank's Checklist of Potential Issues for an EA. The Bank's Polices and guidelines are identified below :

a) Agrochemicals
b) Biological Diversity
c) Coastal and Marine Resource Management
d) Cultural Properties
e) Dams and Reservoirs
f) Hazardous and Toxic Materials
g) Induced Development and Other Socio-Cultural Aspects
h) Industrial Hazards
i) International Treaties and Agreements on the Environment and Natural Resources
j) International Waterways
k) Involuntary Resettlement
l) Land Settlement
m) Natural Hazards
n) Occupational Health an Safety
o) Tribal Peoples
p) Tropical Forests
q) Watersheds
r) Wetland
s) Wildlands

Overseas Economic Corporation Fund's (OECF) Environmental Guidelines

The Guidelines consists principally of environmental checklist similar to World Bank parameters to which close attention is to be given.

Shortcomings/problems and suggested improvements

Major Constraints in EIA in Developing Countries

In Bangladesh both Asian Development Bank and World Bank guidelines are followed in industrial sector depending upon the source of funding of the donor agencies.

A meeting by and expert group on environmental impact assessment(EIA) in developing countries were held in China between 7-24 March, 1983 in order to formulate general guideline on EIA for practical application in developing countries. It was noted that there were sharp contrast between the industrialized and developing countries concerning environmental pollution. The former was involved in cleaning up process of various sector of pollution where as the later countries were concerned with achieving sustainable development.

The question was how to incorporate environmental consideration into development process. EIA being considered at planning stage to assess anticipated future impact of both beneficial and adverse affects with a view to selecting the optimal alternative which maximize beneficial affects. It is recognized that those EIAs assessed were undertaken at a proposal level for the development project has not been monitored and reviewed after the operation /implementation.

Since social and economic condition and institutional arrangement vary among different developing countries a distillation of general guidelines were expected. The techniques adopted were expensive, time consuming and impractical for developing countries presently.

Another important consequence noted is the benefits expected were either not occurring or are being negated by unanticipated impact. Therefore there is a need to carry out environmental reviews of existing activities so that the major problems can be rectified.

EIA reports should be presented in a simple form so that decision-makers can use it in making national decision. It should aim at maintaining the use on a sustainable basis. Since environmental loss and gains cannot always be evaluated in straight economic terms, the expected changes in environmental values can only be considered in subjective way.

The flow of environmental information between developing and other countries is highly unsatisfactory. Developing countries must carry out EIA to the best of their capability therefore it is necessary to train their own expert. Foreign expert is no substitute for well trained local expert in EIA because local expert will ensure that EIA are carried out more relevant to local needs and ensure a significant reduction in EIA cost.

Two important techniques can help in achieving objective, these are screening and scoping means warranting a full EIA or not. However, Bangladesh should specifically develop own expert in EIA over coming the following major constraints as noted below:

- Lack of trained manpower both in private and public sector.
- Lack of awareness and interest from project proponents.
- Lack of political will and public understanding and appreciation of the environmental issues and their consequences.
- Lack of environmental units/cells in various relevant agencies engaged in developing activities.
- Lack of environmental information and data
- Shortage of funds.

Future needs

- Need for data collection and storage

In Bangladesh, need for data collection and storage was recognised ,with the help of donor agency, this work is under progress.

- Need for common approach

A focus on this line of thinking for inter ministerial, institutional cooperation are must to reach a common goal. In this context Ministry of Environment and Forest, Fisheries, irrigation water, agriculture and others must work in harmony with a common objective for environmental protection within a strong legal binding.

- Need for setting national standards

Environmental Quality Standards (EQS) and environmental policy and law plus Industrial policy and National Board of Revenue all must agree in permitting licence for establishing industry, environmental permit from DOE and inspection ,monitoring to achieve national standards. At present EQS is geared to look after about 35% set national standards, the rest must be approached step wise.

The appropriate infrastructure, manpower, training should be provided for this.

Need for Guidelines in other sectors (which sectors need more than others?)

NEMAP has offered guidelines for all the sectors and how to proceed. The industrial sectors guidelines have been offered by ADB funded project BAN; 1769 Industrial Pollution Control and Management in Final Report submitted to DOE in April, 1995 by Dutch Consulting Engineers and Local Consultants. Suggestions include modus operandii for institutionalization of the EIA process.

Conclusion and Recommendations

The seminar is expected to recommend EIA Guidelines, which are presently practiced, improvement suggested in this paper and through discussion and understanding of International Guidelines practice in developing countries.

ADB Guidelines which is very close to World Bank Guidelines may be recommended for Bangladesh as this has been practiced without any difficulty but project should be reviewed after implementation.

Summary of Environmental Assessment in Selected Development Agencies

Summary of Environmental Assessment Procedures in Selected Development Agencies.						
Stage of the Project	Identification/ Formulation	Preappraisal	Feasibility	Appraisal	Mon .oring	Review
Danida Environmental Guideline (May 1989)	Screening		EIA			Plan of Action; Country/ Sector Environmental Profile
NORAD EIA System (1991)	Initial Screening	IEA	FEA			
Finnida	Initial Screening	Initial Identification of potential impacts; initial identification of environmental mitigation/ enhancement; final screening	EIA	Review of EIA report	Environmental Impact monitoring Environmental auditing	
UK ODA (Overseas Development Administration)	Initial Screening	Environmental Appraisal	EIA			
Dutch DGIS (Directorate General for Cooperation)	Development Screening		EIS			Environmental Profiles
ADB (Asian Development Bank)	Preliminary Environmental Screening	Secondary Environmental Review/ initial Environment Examination	EIS expanded EIA	Environmental Planning and Management		Country Environmental Profiles; Sectora Review
World Bank OD 4.01 (October 1991)	Environmental Screening (Environmental Reconnaissance)		Environmental Assessment (FA)	Environmental Mitigation Plan Environmental Management Plan		Environmental Action Plan
UNDP Handbook & Guidelines (1992)		Environmental overview of project (EOP); Environmental Screening of UNDP activities		Environmental Management Strategy (EMS)		Environmental Overview of UNDP Country Programmes (EOC)

Note : EIA= Environmental Impact Assessment, IEA= Initial Environmental Assessment, IEE= Initial Environmen Examination, EIS= Initial Environmental Impact Statements, EOP= Environmental

Asian Development Bank Checklist Methods for EIA (Guideline)

The essential elements in this guidelines are similar to World Bank guidelines for sectoral study. The checklist containing parameters with probable impacts are shown below in this table :

SlNo	Action affecting environmental resources and values	Probable Impact Score					
		n/a	non	sml	mod	maj	
A. Effects due to location							
1.	Site location						
2.	Buffer strip						
3.	Traffic & Access Road						
4.	Nuisance & hazards to neighbours						
5.	Effects on Property Value						
6.	Local Drainage						
7.	Resettlement Problem						
8.	Encroachment affecting ecology						
9.	Socio economic Impact						
10.	Water supply & Hydrology						
11.	Environmental aesthetics						
12.	Historical/cultural monuments						
Sub total: Not number of issues							
B. Effects due to design							
Due to liquid waste discharges on downstream users							
1.	Source of drinking water						
2.	Aquatic ecology						
3.	Washing and bathing						
4.	Recreation						
Due to liquid waste management system							
5.	Cooling water						
6.	Sanitary waste						
7.	Yard run-off						
8.	Final holding pond						
9.	Marine waste disposal						
10.	Municipal sewer						
11.	Joint disposal						

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SlNo	Action affecting environmental resources and values	Probable Impact Score					
		n/a	non	sml	mod	maj	
Due to solid waste disposal							
12.	Ground water sensitivity						
Due to solid waste type							
13.	Sludge from processing operation operations						
14.	Sludge from waste treatment operations						
15.	Non-hazardous refuse/trash						
16.	Hazardous solid wastes						
Due to proposed system of disposal							
17.	Own landfill						
18.	Joint landfill						
19.	Municipal landfill						
Due to gaseous waste emission							
20.	Regional air mass sensitivity						
21.	Neighbourhood community sensitivity						
Due to types of pollution emission							
22.	Point source emission						
23.	Non point emission						
24.	Dust emission						
Due to other causes							
25.	Due to noise and vibration						
26.	Due to plant drainage system						
27.	Due to affordable EQS						
Sub-total: Not number of issues							
C. Effects during construction							
1.	Run off erosion						
2.	Quarrying practices						
3.	Dredging and filling in water bodies						
4.	Pollution of ground water						
5.	Disruption of utility services						
6.	Hazard or nuisances to workers or nearby residents						
7.	Use of hazardous materials						

SlNo	Action affecting environmental resources and values	Probable Impact Score					
		n/a	non	sml	mod	maj	
8.	Disruption to local traffic						
9.	Communicable disease						
10.	Cultural hazards						
11.	Slum hazards						
12.	Inadequacy of monitoring						
Sub total : Note number of issues							
D. Due to Inadequacy of Plan Operation including O&M Practices							
1.	Pollution from liquid waste						
2.	Pollution from solid wastes						
3.	Pollution from gaseous wastes						
4.	Nuisance from & vibrations						
5.	Nuisance from dust & fumes						
6.	Spills of hazardous matter						
7.	Traffic congestion on access road						
8.	Depreciation of environmental aesthetics						
9.	Emergency care system						
10.	Routine health check-up						
11.	In-plant sanitation						
12.	Storing & handling of hazardous materials						
13.	Compensation for injured personnel						
14.	Disaster management						
15.	Insurance against occupational health						
16.	Compensation from accidents/disasters						
17.	Damage to historical monuments						
Grand Total : Note No. of issues							

JAMUNA MULTIPURPOSE BRIDGE PROJECT EIA

JAMUNA MULTIPURPOSE BRIDGE PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT

A CASE STUDY

DR. M. FEROZE AHMED
November, 1992

I. INTRODUCTION

The river Jamuna is a natural physical barrier between the north-western and eastern parts of Bangladesh.This physical barrier is seen as an impediment to economic development and social unity. As a result, there has long been a national desire to establish a permanent link between the east and the north-west. The construction of Jamuna Multipurpose Bridge has been proposed to establish this permanent link between the two parts of the country. The proposed bridge would be located about 8 km downstream of the existing ferryghat near Bhuapur and provide for the transfer across the Jamuna river of road and rail traffic and energy. The energy transfer to the west would be achieved by means of a second electricity interconnector and a gas pipeline over the bridge.

The major components of the proposed Jamuna Multipurpose Bridge Project (JMBP) are as follows:

- The main bridge, a 4,800 m long multispan box girder type structure with concrete deck on 90 m long steel tubular piles.

- The bridge end facilities, about 6000 m in total length to be built on reclaimed land within the Jamuna floodplain at both ends of the bridge.

- The approach roads, about 25 km in total length, to be built on both sides of the bridge to connect the existing road network of the country.

- The river training works

All these involve massive activities which have both positive and negative effects on components of the environment. In order to minimize adverse effects it became essential to identify all possible environmental impacts of project and determine the most significant adverse effects and their possible remedies. It was also essential to identify which further studies would be required to determine the most feasible remedial actions to prevent environmental damages.

II. ENVIRONMENTAL IMPACTS OF JMBP

2.1 The Environmental Parameters

The environmental impact area of the JMBP is defined as all areas where physical, phisico-chemical, ecological, and socio-economic changes were expected due to construction of the bridge. The parameters involved and the possible environmental impacts have been shown in Fig. 1.

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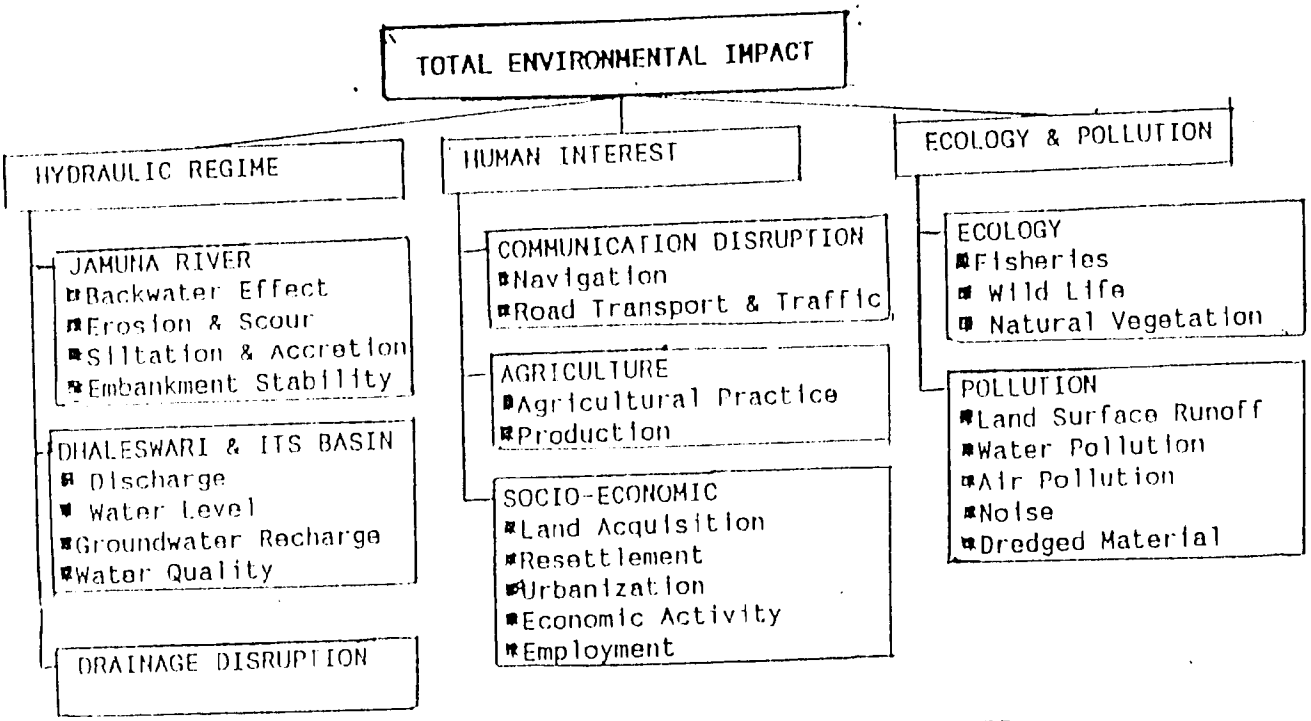


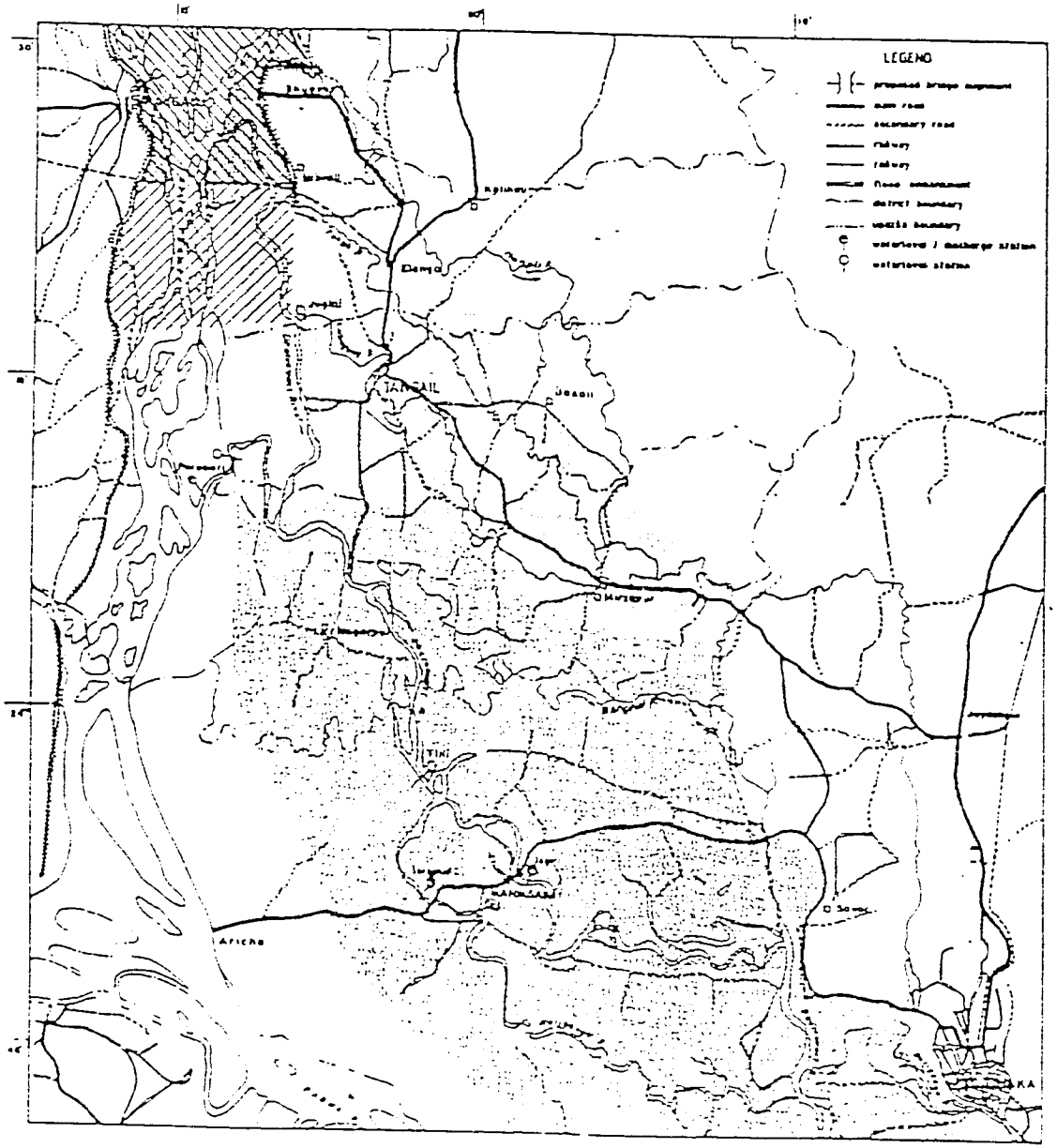
Fig. 1 Total Environmental Impact of JMBP.

2.2 Hydraulic Regime

The Jamuna River

The construction Jamuna Multipurpose Bridge will induce backwater effect, erosion and scours, siltation and accretion in the river and will exert influence on the stability of the banks and flood control embankments.

Simulation study shows that the backwater effect would be extended to about 50 km upstream and 10 km downstream due to flow constriction at bridge site. It has been estimated that the maximum backwater effect is less than 0.1 m during average flood. During high floods of 10 yrs, 50 yrs, and 100 yrs. return periods the estimated backwater effects would be 0.2 m, 0.25 m and 0.30 m respectively. The probability of Jamuna left and right embankments failure will be doubled due to backwater affect. The present high flood level of 100 yrs return period will be exceeded on average every 50 yrs. Similarly the present 1 in 50 years flood level will be exceeded every 25 years. The river training work would provide additional protection to bank and flood embankments over a distance of about 10 km at each bank. the project related additional scours will be 3 m due to river constriction and 4 m at bridge piersas local ascour. The model test confirms that dynamic equilibrium between accretion and erosion will exist and braiding nature of the river will remain



Legend

- upper Dhaleswari basin
- middle Dhaleswari basin
- backwater effect due to flow constriction
- disrupted drainage

Fig.2
Dhaleswari river basin and impact area with respect to watermanagement and agriculture

2.3 Human Interest

Disruption of Communication

The JMBP will have some influence on road transport and navigation on the river Jamuna and Dhaleswari. Navigation on the upper Dhaleswari river will be adversely affected by the closure of the north intake. The country boats will not be able to enter into the Dhaleswari through the north intake which is navigable for a period of about 3 months . The navigable period in the northern part of the Dhaleswari river would be reduced to about 1.5 months. The related additional transport cost would be in the order of TK 4 to 6 million per year.The new approach roads will cross several other drainage channels outside the flood plain. Bridges on these channels will be constructed keeping ample clearance for free plying of small country boats.

The analysis of the river channels in the Jamuna that occurred during last 20 years shows that a minimum clear channel width of 170 m will always be available to meet the requirements for "A" class waterways.

During construction of the Jamuna bridge, additional traffic on the road from Dhaka to the bridge will be generated but these will neither be different from the conventional traffic using the route nor hamper the normal traffic flow.

Agriculture

Agricultural activities in the area acquired for construction purposes will be permanently disrupted and in some areas in close vicinity of the construction sites agricultural activities will also be temporarily disrupted. Changes in water regime due to the bridge project are likely to exert the major impact on agricultural practices and production. In the upper and middle Dhaleswari Basin the cropping patterns are likely to change from low yield to high yield varieties as a result of flood reduction. The reduction in flood depth would lead to reduction in crop losses and increase in the average yield. But the early flood recassion and overdrainage would result in lower yields in some areas depending on local conditions. The available soil moisture for non-irrigated rabi crops will also decrease, affecting their yields. The availability of surface waters as well as the ground water development potential for irrigation in the upper Dhaleswari Basin will decrease.

Socio-Economic Change

It has been estimated that 1150 ha of agricultural land will be lost to the project affecting about 724 households or 4,300 people. The number of houses to be moved from the right of way of the project work is estimated at 202. It has also been found that about 90% of the affected households will lose more than 80% of

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their cropped land and hence their means of living.

The JMBA has taken up the responsibilities of rehabilitation of displaced persons. The strategy for rehabilitation has been drawn up, and a rehabilitation plan is being prepared. The displaced families will be provided with a plot and appropriate training so that some of those farmer can find job outside the agricultural sector.

The construction of the bridge will increase money supply and generate new economic and social structurein the project area. The land price will go up, particularly the demand for the roadside plots will increase for industrial, commercial and settlement purposes. The bridge construction, followed later on by operation and maintenance will introduce skilled workers in the area. Commercial and industrial growth will follow and will provide employment to many people.

2.4 Ecology and Pollution

Ecology

The JMBP will have an impact on the migration, reproduction and growth of fish in the river courses adjacent to the bridge site, flood plains, canals, and depressed areas fed by the Dhakeswari river. In addition to capture fishery, there is a carp spawn and fry collection industry in the area. The collection of carp spawn is important because fresh water acquaculture in closed water bodies is largely dependent on the supply of captured fry and fingerlings. The longitudinal migration of fishes in the Dhakeswari will be affected by the proposed embankments on the flood plain. Although the seasonal up and down migration of fishes in the Jamuna will not be impaired, the lateral migration will be affected by the construction of dikes. It has been estimated the reduction of spawn fry fish fish collection in the Dhakeswari-Kaliganga river system will result in the loss of 35 tons/year of fish and loss of flood plain will reduce fish production by about 300 tons/year. The changes in turbidity, silting pattern, current, and physico-chemical conditions may

result in spawning failure, changes in species diversity, and shifting of spawning and migration grounds.

The construction of the bridge may cause temporary and permanent distruption of wild life in the area. A study reported the presence of 6 species of mammals, 115 species of resident and migration birds, 3 species of reptiles, and 5 species of amphibians in the area. The impact of the project on wildlife specially on rare and endangered species in the area is yet to be assessed.

The impact area is almost entirely used for agricultural and human settlement purposes. There is no significant natural vegetation, forest or other natural resources of environmental concern in the area. The transport of gas to N.W. zone will save estimated 300,000 tons of fuel wood, which will help conservation of scarce forest resources in this zone.

Pollution

The traffic density in the area after the construction of the bridge will be tremendously increased to cause traffic related pollution such as road surface runoff, noise, air pollution and spill of hazardous materials. The road surface runoff will pollute the road side areas with biodegradable substances and heavy metals. However, it is expected that during flood and rainy season the pollutants will be dispersed to concentrations lower than the acceptable levels in the environment.

The exhaust gases from cars, buses, trains, and trucks will cause atmospheric pollution . The pollutant in the exphaust will affect the quality of ambient air of the surrounding villages where people presently live in non-polluted environment. In addition people in the neighbourhood of the road will be exposed to high noise caused by the traffics. It is estimated that the noise level in the vicinity of the approach road will exceed the international standard level of 50 dB for outdoor residential areas.

It has been estimated 1% of the total freight transport over the bridge is hazadous which may cause pollution along the road by accidental spillage. Apart from this, urbanization and industrialization on both ends of the bridge will generate industrial and urban related pollution in the areas.

3. MITIGATORY MEASURES

The major environmental impacts of the JMBP have been identified. The mitigatory measures required to minimize environmental impact are as follows:

- Improvement of drainage facilities for agricultural land in the flood plains upstream of the bridge.
- Resettlement of the displaced families, including training programs to provide skills for alternative employment.
- Establishment of carp hatcheries, and nurseries and setting up of extension support programs to compensate for the adverse effects on fish production.

- Impose security, safety and control measures to reduce construction accidents, prevent social unrest, minimize pollution hazards and sanitation risk during construction period.

- Preparation of a masterplan for urban and industrial development at the bridge ends.

- Preparation of the inventory of the wild life in the area and identify the species affected by the JMBP.

In order to workout definite action plans and to determine the feasibility of the possible mitigation measures to minimize adverse impacts of the JMBP, the following studies were completed:

- Land Use Master Plan (Annex-I)
- Dhaleswari Mitigation Plan (Annex-II)
- Fisheries Impact and Mitigation Study (Annex-III)
- Wild Life Study (Annex-IV)

The findings of the studies have been presented in the Annexes.

4. ENVIROMENTAL COSTS AND BENEFITS

A summary of costs and benefits prepared by the consultants (RPT, nedeco, and BCL) to JMBP has been presented in Table 1. The most significant benefit is the higher agricultural yields due to flood reduction during the monsoon period in areas affected by the closure of the north intake of Dhaleswari river. The additional benefit is derived from the protection of the flood embankments provided by the river training works. The annual benefits outweigh all environmental costs. However, the author, DoE and many local and international experts are of the opinion that the increased crop production computed by the consultants in the Dhaleswari basin during monsoon is based on optimistic assumptions.

5. ACKNOWLEDGMENT

The author acknowledges that some of the materials presented in this paper have been derived from the EIA and Resettlement study reports on JMBP prepared jointly by Rendel Palmer Tritton, nedeco and BCL; Comments on the above reports by national and international experts, and proceedings of the meetings of the Environmental Management Committee of JMBA.

Table .. 1

COSTS AND BENEFITS OF THE ENVIRONMENTAL IMPACT OF THE BRIDGE
(Tk 000)

	Temporary Effects	Backwater Effect	Embankment Erosion	Agriculture-Monsoon	Agriculture-Floodplain Upstream	Agriculture-Dry Season	Navigation	Fish Resources	Land Acquistion	Resettlement	Total	Total ($000)
1990	(350)	(960)										
1991	(700)	(1,920)								(343)	(1,554)	(53)
1992	(700)	(1,920)								(686)	(3,306)	(107)
1993	(700)	(1,920)								(686)	(3,306)	(107)
1994	(136)	(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)	(686)	(3,306)	(107)
1995	(68)	(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		42,388	1,383
1996	(34)	(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		42,956	1,386
1997		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		42,990	1,387
1998		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
1999		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2000		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2001		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2002		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2003		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2004		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2005		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2006		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2007		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2008		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2009		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2010		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2011		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2012		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2013		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2014		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2015		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2016		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2017		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2018		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2019		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388
2020		(190)	2,024	88,900	(17,410)	(18,860)	(540)	(2,600)	(8,300)		43,024	1,388

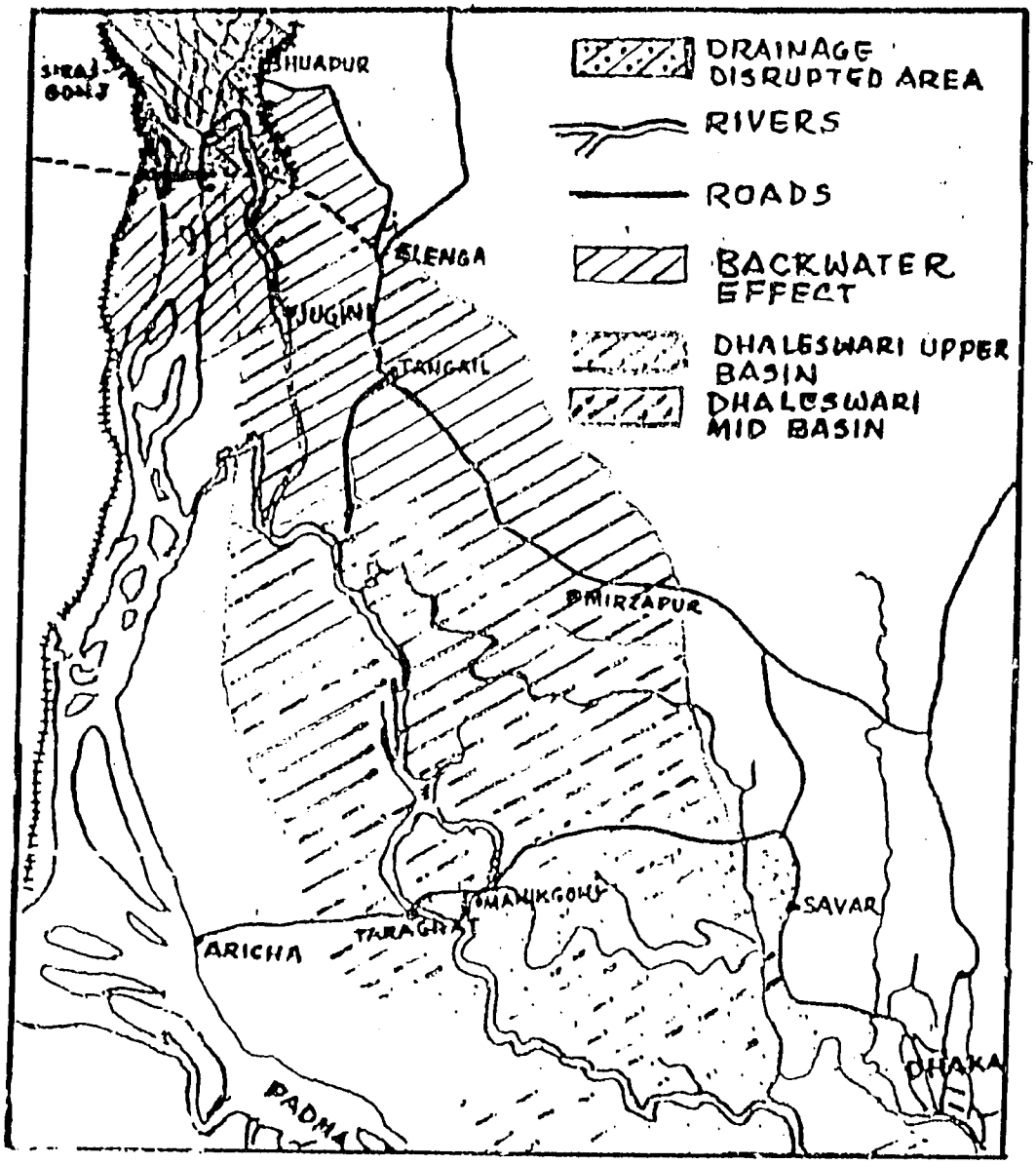
ENVIRONMENTAL IMPACT ASSESSMENT

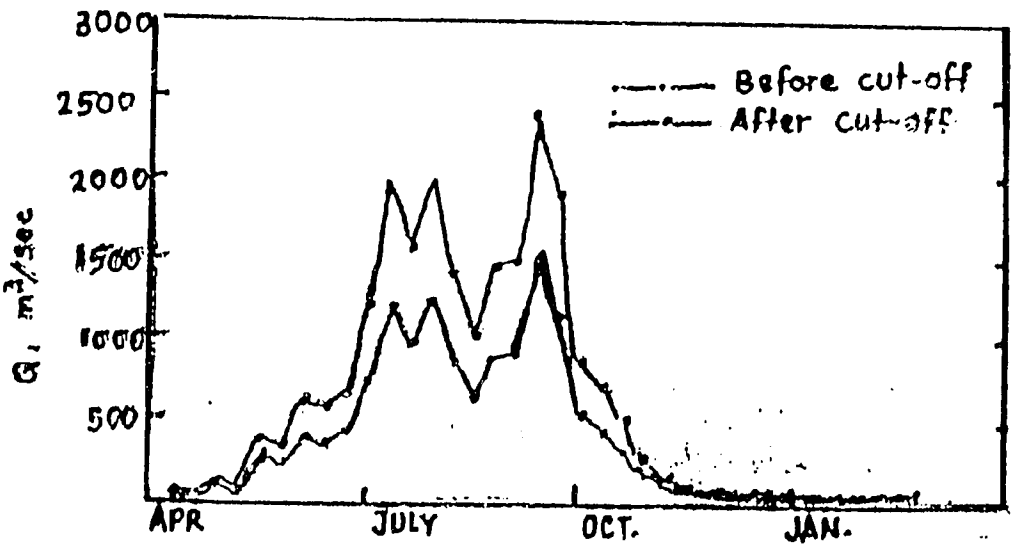
EIA METHODOLOGIES

1. Checklists
2. Matrices
3. Networks
4. Environmental Evaluation System
5. Overlays
6. Environmental Impact Indices
7. Simulation Modeling Workshop
8. Cost-Benefit Analysis
9. Expert System.

Considerations

1. Objectivity
2. Communicability
3. Comprehensiveness
4. Replicability
5. Uncertainity
6. Data requirement
7. Tools/ software requirement
8. Time requirement
9. Resources (Manpower, Fund) requirement





Discharge of Dhaleswari River Before & After Cut-off of North Intake

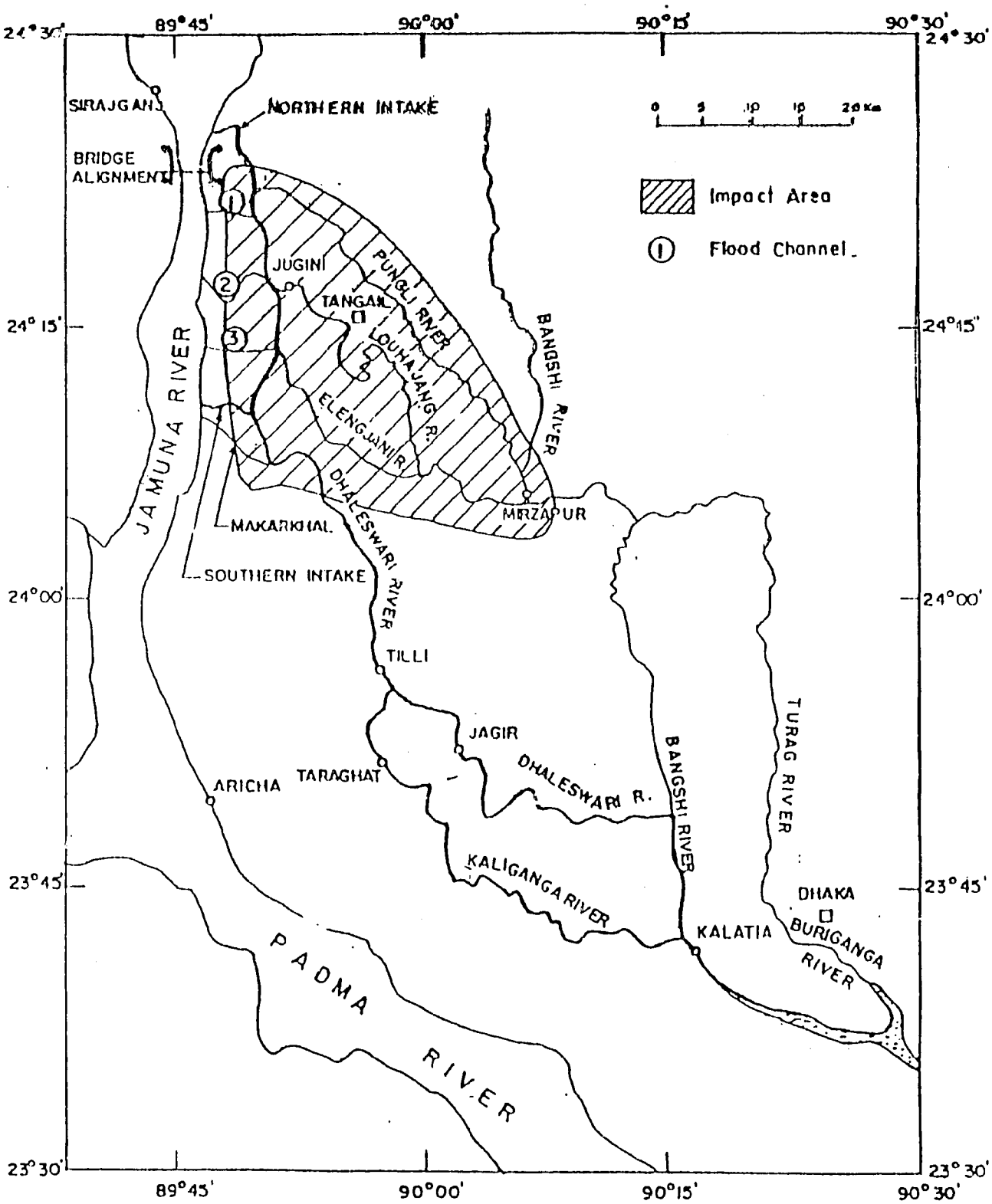


Fig. 4.4 Impact Area Due to Closing of the Northern Intake

JAMUNA MULTIPURPOSE BRIDGE PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

INTERACTION WITH WATER AND LAND RESOURCES

1. Back Water Effect: 50 km upstream, 0.1m. Av. flood level increase
   Tail Water Effect: 10km downstream, decrease in flood level
2. Drainage Congestion: Upstream of approach road
3. Erosion & Siltation : Up and down stream of the bridge
4. Scour : 3m due to Constriction; 4m local scours.

CLOSURE OF NORTHERN INTAKE OF DHALESWARI

5. Flood Reduction : 60,000 ha (0 to 1m)
6. River Discharge : Upper Dhaleswari – 45% Reduction
   Pungli – 53% Reduction
   Louhajang – 25% Reduction.
7. Overbank Spillage: 83% Increase

ENVIRONMENTAL IMPACT

1. Construction Related Impacts
2. Agriculture
3. Fisheries
4. Boat Navigation
5. Wildlife
6. Plantations
7. Environmental Pollution
9. Population Displacement

COST- BENEFIT ANALYSIS METHOD

Advantages

- Best method for taking decisions on the project
- Environmental Costs and Benefits can be incorporated in the cost-benefit analysis of the project
- Results can be communicated easily
- Response to mitigation measures can be well understood

Disadvantages

- Precise impact quantification is needed which requires advanced techniques, highly qualified experts and relatively high cost
- Costs and Benefits of all environmental resources cannot be ascertained

CONCLUDING REMARKS

- All methods are nor suitable for all projects
- Use of different methods for similar projects may lead to different results
- Uncertainties and lack of replicability more or less prevail in all methods
- Resources constraints or profit motive often lead to incomplete and inadequate EIAs

Some of the above difficulties may be avoided through development of **SECTORAL GUIDELINES** for EIA

ANNEXURE 4: SEMINAR III: STRENGTHENING THE EIA PROCESS

A. Program

B. Participant List

C. A Brief Summary of Participant Responses

Table 4 Program: Strengthening the EIA Process in Bangladesh

A. Program

April 26, 1995

SEMINAR ON STRENGTHENING THE EIA PROCESS IN BANGLADESH

Facilitator	Asgari Ahmad	
Chairperson	**Syed Amir-ul-Mulk** Secretary, Ministry of Environment and Forests	
Welcome Objective - Program	Asgari Ahmad	09:10 - 09:20
Introduction	A.M. Shafi	09:20 - 09:30
Overview	Syed Amir-ul-Mulk	09:30 - 09:45
Tea		09:45 - 10:05
Introduce Group Exercise		10:05 - 10:20
Group Exercise		10:20 - 11:50
Presentations		11:50 - 12:50
Discussion		12:50 - 13:50
Concluding Remarks	Syed Amir-ul-Mulk	13:50 -14:00
Vote of Thanks	Asgari Ahmad	14:00 - 14:05

B. PARTICIPANT LIST
Strengthening the EIA Process in Bangladesh.

GOVERNMENT AGENCIES

BWDB

Ashfaque Ahmed
A.K.M. Shamsul Alam
Md. Rafiqul Ansari
H.S.M. Faruque
I.M. Reazul Hasan
Md. Mutahar Hussain
A.K.M. Shariful Islam
Zahirul Islam
Md. Ali Reja Khan
Md. Abdus Salam
Md. Golam Saleque
Md. Mustafizur Rahman Serniabat
Md. Abdul Wahid

DOE

Tamizuddin Ahmed
Begum Ummay Hasna Mst. Akhtaruzzahan
Md. Rabiul Alam
M.K. Farooque
Mahmood Hossain Khan
Champa Nag
Sultana Rafia Zahan
Hasan Zahid

DOF

Md. Nurul Amin
Begum Anwari
Farida Begum
Rahela Begum
Md. Nazrul Islam

FPCO

Sheikh Nurul Ala
Md. Bashiullah
Md. Nurul Huda Chowdhury
Md. Delwar Hossain
M.N. Huda, Chairman, Panel of Experts
Md. Abdun Noor
Md. Siddiqur Rahman
Afzalur Rahman
A.K.M. Mukhlesur Rahman
A.M. Shafi, Superintending Engineer
Md. Shajahan
M.H. Siddiqi, Chief Engineer
Md. Abu Sufian
Md. Abu Zahid

Forest Department

S.M. Alauddin
Md. Haroun-or-Rashid

LGED

Tahsina Ahmed
Dilruba Akhter
Shahana Akhter
Md. Monowar Hossain Chowdhury
Md. Tarik-ul Islam
Fahima Shahadat
Qamrul Islam Siddiqe, Chief Engineer
Iftikhar Uddin

Ministry of Agriculture

Syed M. Latif

Ministry of Fisheries

Md. Haroun Rahman

Ministry of Land

Dilruba Begum

Ministry of Planning (IMED)

Shakhina Begum
Md. Reazul Karim
Q.A. Quadir

Ministry of Water Resources

K.A. Khaleque
S.M. Abdul Majid
Md. Hasan Manzoor
Md. Badiuz Zaman

Planning Commission

Humaira Khan
Khandakar Nuruzzaman
Md. Hamidur Rahman
Md. Abdur Rouf

WARPO

Md. Anwar Pasha

NON-GOVERNMENTAL & PARASTATAL AGENCIES

AQUA Consultant & Associates Ltd.

Md. Mohasin
J.C. Saha

BARC

Md. Anwar Iqbal

BCL

Korshed Alam
Md. Kalam Hossain
Md. Mostafa Kamal
Dr. Md. Nazim Uddin

BETS

Zahurul Azim

Bangladesh POUSH

Md. Iqbal Mahmood Fattah
Md. Mehdi Hassan

BUP

M.A.F. Younus

CNRS

Aminul Islam

DDC

Md. Humayun Kabir
Bahnni Shikha Das Purkayastha
Novera Yesmin

DPC

Abdur Razzak
Ashraful Alam Sarkar

EPC

Md. Naziruzzaman
M. Shamsul Hoque

FAP 6

Raguib Uddin

FAP 16

Asgari Ahmad
Mustafa Alam
Darrell Deppert, Chief of Party, ISPAN
Md. Jakariya
Khurshida Khandakar
Subrata K. Mondal
Kazi Fazlur Rahman, Principal Advisor, ISPAN
Mukhlesur Rahman
Haroon Er Rashid, Advisor FAP 16
Dara Shamsuddin

FAP 17

Md. Mansural Haqu

HCL

D.S.S. Abed
Khondakar Khairul Anam

IUCN

M. Anwarul Islam

Kranti Associates

Md. Mozibul Haque

Petrobangla

Rehan Uddin Ahmed

Proshika Manobik Unnayan Kendra

Shamina Pervin

PRESS

Daily Sangbad

Bulbul M. Ahsan

Weekly Holiday

Sadeque Khan

UNIVERSITIES

Dhaka University

A.K.M. Nurun Nabi

Independent University, Bangladesh (IUB)

D. S. Kabir
Naila Rahman

Jahangirnagar University

Hajera Sultana

Organisations and their members have been listed alphabetically).

C. A BRIEF SUMMARY OF PARTICIPANT RESPONSES
Strengthening the EIA Process in Bangladesh

GROUP 1

1. How have you used your EIA training?

- Directly did not conduct EIA
- Review EIA reports
- Review EIA Guideline
- Introduce EIA training experience in O&M Manual in BWDB
- Solid waste recycling in environmental management
- Four out of twenty-five members of Group I used EIA training in their work

2. What were the problems you faced?

- No SCOPE for conducting EIA

3. How can these problems be overcome?

- Procedural system of present planning and approval to be modified
- Need for trained manpower at different level

4. How can we establish an EIA network?

- Establishment of environmental societies, organizing seminars and symposiums, publishing journals and booklets
- Publicity through different media
- Interaction between universities and government organizations
- Close liaison between different organizations and beneficiaries

5. How can EIA be Institutionalized in Bangladesh?

- Establishment of environmental cell in different ministries and development of organization with trained manpower
- Political commitment and development of environmental policy and legislation
- Interaction with local government agencies and NGOs
- Need for training

GROUP 2

1. How have you used your EIA training?

- No scope in application for many agencies
- Involved training in planning stage
- Incorporated EIA in different projects
- Awareness development through training
- Involve in improving EIA Guideline
- Involve in preparing mitigation plan
- Direct involvement in ICE/EIA

2. What were the problems you faced?

- Time consuming
- Large numbers of schemes
- EIA Guidelines to be simplified
- Lack of awareness of other professionals
- Lack of proper monitoring
- Complex methodology
- Lack of fund
- Question whether there is scope for application

3. How can these problems be overcome?

- Rules regulations, legislation should be introduced
- Coordination among concerned organizations
- Existing methodology is complex. it must be simplified.
- Multidisciplinary personnel should be included in EIA team
- Sectoral Guideline needed
- Inter agency or inter ministerial planning cell should have training on EIA
- Need more training
- Follow up
- Change of national service structure

4. How can we establish an EIA network?

- Formation of practitioner group
- There must be an institution for exchange of ideas
- Professional association at different level
- Liaison officer in every organization
- Incorporate EIA in all other sectors

5. How can EIA be institutionalized in Bangladesh?

- There should be a professional journal
- There should be a national training institute
- An EIA network for using local resources
- Advanced level training
- Establish coordination among different organizations

GROUP 3

1. How have you used your EIA training?

- To collect baseline information
- In the preparation of different EIA reports
- In the review of FS reports of different projects
- In the review of water sector projects suggesting environmental plan
- In diffusion of public awareness
- Ensuring People's Participation in the EIA process

2. What were the problems you faced?

- Inappropriate posting of trained people
- Inadequate data/lack of standardized data
- Non-institutionalization of EIA
- Lack of management awareness of EIA
- Lack of structured format for project review
- No updated standard for environmental quality
- Lack of awareness for environment at policy and grass-root level

3. How can these problems be overcome?

- Ensure appropriate posting of EIA trained people
- Set standard data bank
- Create management awareness for EIA
- Project reflection of EIA in PCP/PP
- Diffuse awareness of environment at policy and grass-root level

4. How can we establish an EIA network?

- Form an EIA association
- Arrange annual convention of EIA experts
- Make a common campus with library facilities for EIA
- Listing of EIA practitioners by DOE, and strengthening of their activities

5. How can EIA be institutionalized in Bangladesh?

- Establish appropriate professional EIA cell in the Ministry of Environment and Forest and strengthen other ministries with EIA expertise
- Re-design PCP/PP format
- EIA training be institutionalized at APD
- A separate chapter be included in the FYP

GROUP 4

1. How have you used your EIA training?

- In PCP and PP preparation
- In field level work
- In different projects
- Extensive use in reviewing papers
- Used in FAP-9 implementation process
- In environmental module building
- In JMBP (Drainage congestion).
- In fisheries project

2. What were the problems you faced?

- Lack of consciousness in different levels
- Lack of data base
- Lack of information
- Lack of PP
- Lack of integration and coordination
- Lack of data quality
- No mitigation and compensation plans
- Lack of proper monitoring

3. How can these problems be overcome?

- Monitoring should be strengthened
- More training programs for creating environmental awareness
- Effective insertion of environmental studies in higher education
- Resource allocation towards EIA should be increased
- Adequate compensation (land for land simplified process)
- Integrated approach

4. How can we establish an EIA network?

- The role of DOE should be strengthened in order that it can coordinate environmental activities and institutionalize EIA
- Establishment of EIA data base and documentation center in DOE
- EIA cells in different ministries and agencies etc.
- Extension of EIA networking at local level

5. How can EIA be institutionalized in Bangladesh?

- National level institution should be established
- ICE/EIA be made mandatory for development projects
- Post EIA of some projects be done as case studies.