



**PROCEEDINGS OF THE THIRD CONFERENCE
ON THE FLOOD ACTION PLAN**

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BANGLADESH FLOOD ACTION PLAN

**Proceedings of the
Third conference**

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**Ministry of Irrigation,
Water Development and Flood Control/
Flood Plan Coordination Organization
(FPCO)**

BANGLADESH FLOOD ACTION PLAN

Proceedings of the Third Conference

Table of Contents

	<u>Page Nos.</u>
ACKNOWLEDGEMENTS	i
PREFACE	iii
INAUGURAL SESSION - OPENING ADDRESS by Mr. M. Asafuddowlah, Secretary of MIWDFC	1
Speech by Mr. C. R. Willoughby, Chief of Mission The World Bank, Resident Mission in Bangladesh	5
Speech by the Hon'ble Minister of Finance Mr. M. Saifur Rahman	9
Speech by the Hon'ble Minister of Planning Mr. A. M. Zahiruddin Khan	13
Speech by the Hon'ble Minister of MIWDFC Mr. M. Majid-ul Haq	17
Speech by HE, Mr. Henry Gajentaan, Ambassador The Royal Netherlands Embassy	21
Speech by the Hon'ble State Minister of MIWDFC Mr. Mosharef Hossain Shajahan	23
Concluding Speech by Mr. M. H. Siddiqi Chief Engineer, FPCO	27

(ii)

**Proceedings of the
Third Conference**

Table of Contents (Cont'd.)

	<u>Page Nos.</u>
SESSION : FAP OVERVIEW	
TECHNICAL SESSION I	
FAP 2 Technical Paper	29
Questions and Answers	51
TECHNICAL SESSION I	
FAP 3 Technical Paper	65
Questions and Answers	91
FAP 3.1 Technical Paper	99
Questions and Answers	131
TECHNICAL SESSION II	
FAP 4 Technical Paper	139
Questions and Answers	161
TECHNICAL SESSION I	
FAP 5 Technical Paper	173
Questions and Answers	193
TECHNICAL SESSION II	
FAP 6 Technical Paper	209
Questions and Answers	255
SPECIAL SESSION ON FISHERIES	
Fisheries Technical Paper	277
Questions and Answers	307
TECHNICAL SESSION III	
FAP 20 People's Participation in the CPP	317
Questions and Answers	331

(iii)

**Proceedings of the
Third Conference**

Table of Contents (Cont'd.)

	<u>Page Nos.</u>
TECHNICAL SESSION III	
People's Participation and the Flood Action Plan	355
Questions and Answers	361
PREFACE	380
Guidelines for People's Participation	381
TECHNICAL SESSION II	
Technical Session on Inter-Regional Impacts	407
Questions and Answers on Inter Regional Impact	410
SPECIAL SESSION ON MACRO-ECONOMIC ANALYSIS FOR FAP PROJECTS	
Technical Paper on Macro-Economic Impact Analysis of the Flood Action Plan - An Appraisal	419
Technical Paper on An Attempt to Quantify Macro-Economic Impact - Summary	428
Proceedings of the Special Session on Macro-Economic Impact Analysis	439
LCG Annual Report	447
Summary of Discussions at the LCG Meeting	467
List of Participants	485

(iv)

**Proceedings of the
Third Conference**

Table of Contents (Cont'd.)

	<u>Page Nos.</u>
<u>List of Tables:</u>	
FAP 2 : Table 1 - Agriculture in the Region	37
FAP 3.1 : Table 1 - Study Areas & Estimated Population	103
Table 2 - Summary of Cost Estimates	106
Table 3 - Summary of Cost Estimates - Char and Setback Land Flood Proofing Programme	115
Table 4 - Distribution of Flood Impact	118
Table 5 - Potentially Significant Negative Impacts in the Overall Study Area	120
Table 6 - Summary of Agro-Economic Impacts	122
Table 7 - Summary of Sensitivity Analysis	123
Table 8 - Multi-Criteria Analysis - Summary of Project Results	125
FAP 6 : Table 1 - Natural Gas Utilization within the Region	217
Table 2 - Natural Gas Utilization	218
Table 3 - Quantities at Bholaganj Quarry	218
Table 4 - Gender Distribution of Students	219
Table 5 - Population Per Health Worker	221
Table 6 - REB Power Distribution Network	223
Table 7 - Regional Telephone Status	224
Table 8 - Water Resource Development Status	226
Table 9 - Populations of Largest Municipalities	232

(v)

**Proceedings of the
Third Conference**

Table of Contents (Cont'd.)

Page Nos.

List of Figures:

FAP 2	: Figure 1 - The North West Region	46
	Figure 2 - Regional Development	47
	Figure 3 - Regional Plan Implementation Schedule	48
	Figure 4 - Gaibandha Improvement Project	49
FAP 3	: Figure 1 - The Study Area	66
	Figure 2 - River System & Morphology Study	68
	Figure 3 - Sub Regions North Central Regional Study	71
	Figure 4 - Planning Unit of North Central Regional Study	78
	Figure 5 - Regional Water Resources Development Plan	84
	Figure 6 - Regional Water Resources Development Plan Programme	85
	Figure 7 - Financial Requirements of the Short & Medium Term Plan	89
FAP 3.1	: Figure 1 - Jamalpur Priority Project Study	110
	Figure 2 - Jamalpur Priority Project Study - Flood Proofing in Char & Setback Lands	114
	Figure 3 - Jamalpur Priority Project Impl. Program	127
FAP 4	: Figure 1 - Southwest Area Map	140
	Figure 2 - Indicative Inundation Areas	142
	Figure 3 - External Interventions in CEP Polders	145
	Figure 4 - Food Energy Shortage (Development Without Augmentation)	146
	Figure 5 - Minimum Flows in the Ganges and the Gorai	148
	Figure 6 - Saline Front with 250m ³ /s in Gorai	149
	Figure 7 : Regional Water Resources Management Plan	156
	Figure 8 - Regional Water Resources Management Plan - Location of Proposed Development Areas	157
	Figure 9 - Development Area Location	158

**Proceedings of the
Third Conference**

Table of Contents (Cont'd.)

	<u>Page Nos.</u>
<u>List of Figures:</u> (Cont'd.)	
FAP 5 :	Figure 1 - Centerfold Figure 175
	Figure 2 - Monsoon Season Problems and Possible Measures 177
	Figure 3 - Dryn Season Problems and Possible Measures 178
FAP 6 :	Figure 1 - Northeast Region 210
	Figure 2 - Northeast Regional Project 253
FAP 17 :	Figure 1 - Total Fisheries Production - Estimated by DOF & FAP 17 284
	Figure 2 - Total Fisheries Production in Bangladesh 285
	Figure 3 - Fisheries Diagram 286
	Figure 4 - Implications of Revision of FRSS Figures 290

ACKNOWLEDGEMENTS

This book contains a record of the proceedings of the Third Conference of the Flood Action Plan which was held in Dhaka from May 17 - 19 1993. Included in the proceedings is the informal record of the Local Consultations Group meeting which was held immediately after the Conference. The Flood Plan Coordination Organization (FPCO) would like to take this opportunity of acknowledging the services of those who helped in planning and organizing the Conference, and in preparing this publication.

The Conference could not have been held without the encouragement and support of the Honorable Minister of Agriculture and Irrigation, Mr. M. Majid-ul Haq. He kindly agreed to inaugurate the Conference and his speech underlined the importance the Government attaches to a sustainable water management program and the equitable sharing of regional water resources. Supporting speeches were provided by the Honorable Minister for Finance, Mr. M. Saifur Rahman, the Honorable Minister of Planning, Mr. A. M. Zahiruddin Khan, the State Minister for Irrigation, Mr. Mosharef Hossain Shajahan, Mr. C. R. Willoughby, Chief of the World Bank's Mission in Dhaka and Mr. H. Gajentaan, Ambassador of the Netherlands.

An overview on the progress of the Flood Action Plan was provided by Mr. A. M. Khan Chowdhury, Additional Secretary of the Ministry of Irrigation, Water Development and Flood Control. The principal papers for the technical sessions were contributed by the the FAP Regional Study Teams, FAP 17, FAP 20 and FPCO staff members. We are indebted to Mr. Shahidul Alam, Mr. T. R. Franks, Mr. M. R. Chowdhury, Dr. D. A. Brown, Mr. M. F. Wallace, Mr. L. R. Munshi, Mr. R. I. Thiagarajah, Mr. M. Politzer, Mr. Mohsinuddin, Mr. Mujibul Huq, Mr. H. D. Weibe, Dr. M. Smith, Dr. P. C. Almada-Villela, Mr. S. Nandi, Mr. Nirmal Ch. Paul, Mr. Obaidur Rahman, Mr A. M. Shafi and Mr. M. H. Siddiqi for their comprehensive presentations which attracted a wide range of questions. Discussants at the technical sessions were Mr. Sadeq Khan, Mr. Zafrullah Chowdhury, Dr. Asaduzzaman, Mr. Umed Ali Mia, Professor Quamruzzaman and Professor Ainun Nishat.

Each session of the Conference were chaired either by a present or past senior government official or an eminent scholar. These Chairmen were Mr. M. Asafuddowlah, Professor J. R. Chowdhury, Mr. S. M. Al-Hussainy, Mr A. Z.

M. Nasiruddin, Dr. H. Rashid, Dr. Akbar Ali Khan, Mr. Q. K. Ahmad, Professor Emazzuddin Ahmad, Dr. K. B. Sajjadur Rasheed and Mr. A. K. Ataur Rahman. We are most grateful to them for the contributions they made to the success of the Conference. Session chairman were ably supported by Mr. M. A. Wadud Bhuiyan, Mr. M. H. Siddiqi, Dr. D. Deppert, Mr. Aminul Huq Shah, Mr. A. A. Ansari and Mr. Mir Abu Sufian who all acted as rapporteurs.

FPCO acknowledges with gratitude the support of USAID in the conference logistics. We would also like to thank Mrs. Nilufar Begum, Mrs. Biva Halder, Mrs. Lucy Reba Munshi and M. T. C. Sarker for their work in recording the conference proceedings and preparing the manuscript, and Mr. Taslim Ahmad of BRAC for his advice and guidance on publication.

FPCO Conference Management Unit

PREFACE

It gives me great pleasure to write the Preface to this book on the 'Proceedings of the Third Flood Action Plan Conference'. Water is the lifeblood of Bangladesh. One of the most critical challenges the nation faces is to more successfully manage its water resources in times of both their excess and scarcity. This task will always be complex given that the water resources are shared with our neighbors and we are grateful to our development partners for supporting the urgent need for regional water sharing and management.

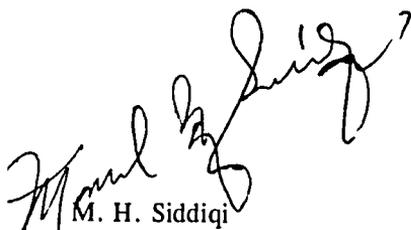
The Flood Action Plan's (FAP) studies and pilot projects have provided a unique forum for analyzing past successes and failures and, with the benefit of this hindsight, exploring future development options in the water sector. From the start, FAP gave the emphasis to a multi-disciplinary approach which would provide for a balanced technical, social, environmental and economic assessment. This skill interaction has already led to the production of Bangladesh's first guidelines on environmental impact assessment, public participation and multi-criteria project analysis. The projects that are emerging from the FAP process have utilized this thorough analysis.

FAP's studies and pilot projects were initiated in 1990 and the Government considered it was time to review the progress of the major regional studies and highlight the key issues which were emerging from this work. Therefore, the conference agenda included presentations from each of the regional studies, supported by sessions on public participation, fisheries and environmental impact and macroeconomic issues. The conference brought together a group of the most knowledgeable and experienced practitioners in the water development sector and these were supported by senior administrators and eminent scholars who chaired the sessions and served as discussants of the papers.

The FAP Conferences continue to set precedents for the breadth of views represented and the opportunity for all opinions to become part of the public record. This democratic approach has led to invitations being extended to people of all viewpoints on water development and the list of conference invitees at the end of this book bears testimony to this policy. It was especially gratifying to note that a large group of Parliamentarians, representing all the major political parties, attended most of the sessions and actively participated in the discussions.

From the outset, it was our intention that the Conference would provide an opportunity for discussion through question and answer sessions and the available time was extremely well utilized by the distinguished chairpersons. However, as was apparent at last year's conference, the large number of questions could not be fully dealt with during the Conference. Accordingly, we took the unique step of asking the presenters to prepare written answers to all the questions for publication in this book. The Flood Plan Coordination Organization (FPCO) has striven to ensure a crystal clear transparency to the FAP process. It is disappointing that this openness has not always been reciprocated by the FAP critics but FPCO will continue its attempts to build a constructive dialogue with all interested parties on the complex issues surrounding water management.

No conference, or book, can hope to address all aspects of such a multi-faceted and complex subject as water resource management in Bangladesh. Despite this, I have no doubt that the presentations and discussions in this book will provide much valuable guidance to Government in formulating its water sector strategies for the medium and long term.



M. H. Siddiqi
Chief Engineer

Flood Plan Coordination Organization
Ministry of Irrigation, Water Development and Flood Control

Dhaka, May 1994

INAUGURAL SESSION

May 17, 1993

Chair: Mr. M. H. Shahjahan, State Minister
Ministry of Irrigation, Water Development and
Flood Control

Speakers: Address by Mr. M. Asafuddowlah, Secretary
Ministry of Irrigation, Water Development and
Flood Control

Mr. C. R. Willoughby, Chief
The World Bank, Resident Mission Bangladesh

Mr. M. Saifur Rahman, Hon'able Minister of Finance

Mr. A. M. Zahiruddin Khan
Hon'able Minister of Planning

Mr. M. Majid-ul Haq, Hon'able Minister
Ministry of Irrigation, Water Development and
Flood Control

His Excellency Mr. Henry Gajentaan, Ambassador
The Royal Netherland Embassy

Mr. Mosharref Hossain Shajahan
Hon'able State Minister
Ministry of Irrigation, Water Development and
Flood Control

Concluding Speech by Mr. M. H. Siddiqi
Chief Engineer, FPCO

OPENING ADDRESS

**by Mr. M. Asafuddowlah
Secretary**

Ministry of Irrigation, Water Development and Flood Control

Mr. Chairman
The Hon'ble Chief Guest
Hon'ble Finance Minister
Hon'ble Minister for Planning
Hon'ble Members of the Parliament
Heads of Agencies, Distinguished Delegates
Excellencies, Ladies and Gentlemen

This occasion marks the beginning of the Third Conference on the Flood Action Plan that began in London in 1989 in the wake of unprecedented floods of 87 and 88 that drowned the country, claimed precious lives, and damaged innumerable habitats and installations. Countries known for their commitment to humanity, warmly responded to help Bangladesh find an answer to this calamitous hostility of nature.

Since then a series of multi-dimensional and comprehensive studies with guarantees of public participation in planning have been mounted. Some studies have concluded, some final reports submitted while some others are on stream and likely to conclude soon. During the studies a number of projects have been identified. A few are already under implementation. What was initially perceived as a strategy to protect vulnerable areas from flood -- transformed into an action research programme of review and evaluation of past investments on the one hand and of designing a total water management for the future on the other.

It is not easy to plan a long term strategy comprising an active delta that stations a common terminus of three of the ten largest rivers in the universe. It is not easy to plan protection against flood intensity of 1200 million acre feet that could drown Bangladesh under 25 feet of water. It needs some imagination to comprehend how this country drains water of seven hundred thousand square miles through the badly-silted river system of a small land mass of 55 thousand square miles. It is yet more difficult for the water sector planners to work out

2 Flood Action Plan - Proceedings of the Third Conference

a safe conveyance of such huge quantity of water mass of which 93 percent comes from outside the borders. Again, as if ironically, 95 percent of the annual flow for the six wet months is poised against a pale and sickly 5 percent that flows during the remaining six dry months. While across the border in the upper reaches of all the rivers there is no effort to contain the wet season flow that would have lowered the flood stages in Bangladesh -- there are man-made structures that role into operation for the full length of the dry season rendering the bottom of this mighty rivers into sandy playgrounds. It all sounds like the fate of the protagonist in a Greek tragedy -- doomed to the grooves of a bleak fate. But it is not. When tide is not in favour, the wind must be.

The will to survive and the determination to fight for survival characterizes the national psyche. Floods after floods, cyclones after cyclones, tidal bores after tidal bores -- people buried their closest ones -- wiped their tears and grew food for the future. In their struggle for survival they found friends.

During the past six months we heard some whispers get louder into an active campaign against the FAP on grounds of environmental offenses and human resettlement. While great care is being taken for the first time under FAP to address the problems of the rural poor, ethnic groups, minorities, women, fishermen and boatmen and while development issues are being intensely screened by a mixed teams of appropriate specialists including ecologists, social scientist and economists are assessing the likely benefits and disbenefits of the identified projects -- such fears are preemptive, if not imaginary. It is a pity that a group of people including a few Bangladeshis who failed to win consultancy contracts, are holding a conference in Europe to voice their protest against the FAP on grounds of environmental illegitimacy. I wish they were here today to raise those issues so that we could answer them. In distant Europe there can be none to answer those questions. The motive behind raising these unrealistic issues far away from the headquarter of FAP can be anything but fair and objective. We have no political answers to technical and professional issues. A five member Parliamentary team from the Netherlands visited Bangladesh two months ago. The visit was triggered by some doubts on environmental issues. The team, we have learnt, has submitted its report that has expressed full satisfaction on this concern. It is unthinkable that the democratically elected Government in Bangladesh will allow a planning outlook that will jeopardize the interest of the people or pejorate the environment. The provision of consultation process brings the most coveted fresh breeze into the planning mechanism. Feasibility planning would require initiation of a series of structural consultations

in multiple locations. This would ensure public support during and after implementation of the project. FAP has helped us recognize that despite the dominance of technical construction aspect, the water management activities are no less social than they are technical.

One of the FAP studies has identified a great environmental degradation in the south west region of the country. In the entire planet of Earth, the greatest environmental poisoning has been caused to the South Western region of 10,000 square miles with over 30 million of the World's poorest people fighting another grim battle with salinity due to unilateral upstream diversion of fresh water by a barrage devised by man. The environmental lobby against FAP, -- particularly its Bangladesh members should have been campaigning against such man-made acts that is slowly desertifying one of the most fertile areas in the world.

During the next two days we shall review the progress of work on all 26 components of FAP. We shall, with the help and assistance of the experts and consultants, try to answer the questions in a demonstration of transparency. We would also welcome various suggestions. This we intend to achieve with the active participation from our development partners.

My sincere thanks go out to the World Bank whose untiring efforts helped us achieve the desired coordination with bilateral partners and also with other donor agencies. We would look forward to a broadening of the bilateral and multilateral base of FAP support. I would also like to extend my gratitude to the 16 bilateral partners, namely, United States of America, United Kingdom, France, Japan, Germany, Sweden, Denmark, Netherlands, Canada, Switzerland, Finland and the multilateral agencies, namely, IDA, EEC, ADB and UNDP, for their support.

I welcome the representatives of the governments and funding agencies who have travelled long distance to come and take part in the proceedings of this Annual meeting. I hope their stay would be rewarding.

With these words I conclude my statement. Thank you.

Speech of Mr. Christopher R. Willoughby
Chief of Mission
The World Bank Resident Mission in Bangladesh

It is an honour and a pleasure to participate, on behalf of the World Bank, at the inaugural session of this Third Conference on the Flood Action Plan. Many of us well remember the very lively discussions we had a bit more than a year ago in this magnificent hall. We are grateful to the Prime Minister's Office for having us back. I hope and am sure that this year's sessions will be equally lively and constructive.

I would like also to congratulate the Government on organizing this third conference and providing an opportunity for all interested people to learn about the FAP's progress, to ask questions and to raise issues. As adviser to the Government and coordinator of the outside assistance administered by the many foreign governments and international agencies represented here, we have offered our suggestions for the Conference and we respect the Government's choice. We think that the agenda which is set before you is an excellent one. It seems very timely to have a full presentation of the actual work progress on each of the regional studies, to discuss the difficult questions of inter-regional impact and morphological changes, and in particular to review progress on the crucially important topic of people's participation and how really to get that going, building on the innovative experiments that the FAP has already contributed in that area.

Mr. Chairman,

The Flood Action Plan, or FAP as it is now popularly known, was born out of controversy, the differences of opinion inside and outside Bangladesh on appropriate measures for development of the country's land and water resources and response to the flood problem. It was intended to lead to as great a degree of consensus as possible, and to practical steps to enable water resource management and investments over the next twenty years to improve substantially on the record achieved over the past twenty years. The consensus was not intended to be forced or channeled but rather to be the product of profound study -- as the Secretary so well described it just now, a very thorough, open-minded, objective, multidisciplinary exercise, reviewing in depth the experience of the

past and the evidence of the present to try to identify a better way forward. Despite the complexity of the issues, there has been progress towards consensus and some projects have begun to emerge, a few already close to execution and several more requiring and receiving considerable further study benefiting from the greater consciousness that the FAP research itself has induced of the disappointing results and negative side-effects of some of the past interventions.

But quite apart from movement towards a greater degree of consensus, quite apart from individual projects and programs, it has always seemed to me that perhaps the most important impact of the FAP effort may turn out to have been improvement of the process and the procedures for analysing and deciding about public interventions in the land and water sector in Bangladesh. Many processes and procedures have begun to be greatly strengthened as a result of the combined efforts of everybody involved over the last three years. Examples are the process of data collection and data maintenance, the thorough analysis of the past, and the regional assessments themselves about which we are going to hear in the coming days. A particularly important area of process improvement that has started is the popular participation and consultation on which the Honourable Prime Minister laid so much stress in her address to last year's FAP Conference. Since then the FAP guidelines on people's participation have been issued - and critiqued in a useful independent review. Many regional and district meetings have been organized to sound out local people's views of problems and of alternative possible solutions to them. The debate about the overall package of solutions has also been greatly broadened. Honourable members of parliament have been playing a very important role in all these efforts. Another important process contribution is the environmental assessment guidelines. The whole approach of planning and management with wide review procedures for the documents as they go through the various stages, and the systematic socio-economic evaluation now required should also be mentioned as important procedural and process changes being brought about by the Government of Bangladesh. Changes are underway too in the Water Board, stemming partly from other projects but benefitting from the FAP studies, such as improvement in the Board's treatment of operation and maintenance, a start on cost recovery efforts, and steps to improve land acquisition procedures. I don't think any body would try to claim that any of the process and procedural changes I have mentioned are already complete and perfected. As would be expected, they all require further work to improve their operation and to spread the best approaches wide. But a lot of very important starts have been made, thanks to FAP.

There are a couple of points of procedure/process improvement that I would like to highlight for further attention. One, which was stressed in last year's meeting between the Government of Bangladesh and the development partners and again by the Secretary just now, is the need for sharing of rainfall, river level and project information from neighbouring countries, so as to achieve effective flood forecasting and early warning and also to assess downstream hydrological and morphological impacts on the main rivers. Second, although there has been progress, quite a bit of work remains to be done on how to deal with the problems of resettlement which are obviously difficult in such a densely populated country as Bangladesh. Almost any project large or small will require some people to be displaced and it is important to try to ensure that these people, who may easily be among the poorest in the country, do not suffer adverse consequences from the public investment undertaken.

I would also like to comment briefly on the need to maintain and even further the dialogue on FAP, both domestically -- as for instance, by this forum so well organized by FPCO and meetings like the one yesterday for the NGOs - - and also outside of Bangladesh. We are going to need great understanding overseas to secure the financial and technical support necessary for actual realization of the interventions and investment actions which finally emerge from all the studies done. We also need the understanding and support of people and institutions from those other countries in international meetings and discussions.

Mr. Chairman, Ladies and Gentlemen,

I am sure we all agree that we face a big challenge over the coming year. The regional studies have progressed quite well by now, some supporting studies have been completed while others are still in train, much data gathering has been accomplished and it must be maintained and extended, and some experimental investments are getting underway. But the next year, the next 12 months will be the critical period for bringing all of the 26 studies' work together and seeing where we stand. There will be need for continuation of foreign assistance for this work, for further preparation of promising projects to the stage at which they can pass the regular Government approval procedures of the Planning Commission and the ECNEC, and, perhaps most important of all, for further thinking and development on the institutional side, to strengthen capacity for implementing and operating water development schemes. The work of the coming year will make more explicit the considerable convergence of views and steps toward consensus that seem to be emerging from the scientific

work carried out. But we must not forget the broader context in which our results will be appearing, a context affected also by the important changes that the Government of Bangladesh is introducing in the local government structures. Our findings will have to fit with, and contribute to, the evolutionary process underway towards institutional arrangements that will yield effective, popularly supported and socially equitable responses to the complex and location-specific land and water development choices that this immensely fertile but climatically vulnerable country faces.

Mr. Chairman, Ladies and Gentlemen,

I would like finally simply to wish great success to the discussions of the next days. They will be important in helping to set the framework for the effort to bring the study together over the next year, and in giving the authors the benefit of a wide range of commentary from within Bangladesh and from overseas. I am delighted to be able to pass on to you the best wishes for your deliberations that I received this morning from our headquarters in Washington.

Thank you.

ADDRESS

by Mr. M. Saifur Rahman
Honorable Minister for Finance

Bismillahir Rahmanir Rahim

Mr. Chairman, Distinguished Chief Guest,
My Colleagues of the Cabinet
Hon'able Members' of the Parliament, Excellencies
Distinguished Members of the Multilateral Organizations
Chief functionaries of the Government

Ladies and Gentlemen,

Assalam-Alaikum,

I am indeed delighted to be invited by the authors of this conference to be a Guest Speaker. I also had the privilege of speaking at last year's conference. This is third conference of the FAP and sponsored by the Flood Plan Coordination Organization and the Ministry of Irrigation, Water Development and Flood Control and coordinated by the World Bank.

We have been living with floods for centuries but the floods of 1987 and 1988 startled the conscience of the world. The humanity in this part of the world were devastated by the two floods unprecedented in living memory and that caused the FAP to be developed following the conference in Paris in July 1989. FAP has 26 studies and we are having this conference to hear about embankments and other proposals to resolve the flooding problem. I am not very much concerned about the technicalities but I am concerned that the studies are continuing without identifying an investment program.

The Secretary, Irrigation and Flood Control quite rightly pointed out that our problem here is that about 95 percent of flood water comes from outside this territory. We have no control of this water. During the dry season, he rightly pointed out the rivers becomes almost deserts in the months of March and April. The action, taken beyond the territories of Bangladesh is causing this

havoc. While the water is restrained in the dry season, we have to bear its full force during the flood season. I am not quite sure to what extent embankments can fully control the floods as I live on the bank of a river and two of the rivers in my area, the Monu and Khowai, regularly overflow. My town has often been devastated by the floods and to protect against the water coming from Tripura, Agartala, Assam an embankment was built and continually raised. Now it is as high as the roof of my house and there is a risk if the water penetrates, as happened in 1984 and 1985 in Maulvi Bazar and in Habiganj, houses will be swept away. If you go to the Khowai and other neighboring rivers you will see the embankments are higher than the houses. I am not quite sure to what extent that we will benefit but I am not questioning the approach because I am not a technical expert in this matter.

The first thing that we have to do is to involve the international community. They have been to be involved in this issue which is causing the havoc. The issue which is causing flood during the rainy season and causing drought in the dry season is due to actions beyond the territory of our country. The issue must be addressed by regional actions as it can not be resolved at a country level.

We also have another problem arising because of the environmental concerns about the FAP. This is both a pleasant and an unpleasant issue for me as a Finance Minister. It is pleasant because the country should be concerned about the environment but it has recently become rather an unpleasant issue because every program and project that I want to take up, I find there are environmental issues preventing my action. Developed countries, having devastated the environment all over the world, now put environmental concerns to the forefront when we start developing our resources. Many of the environmental people who are raising these concerns did not stop the cutting of the rain forests in Brazil and Argentina or stop the production of 60 or 100 page newspapers which are scarcely read before being thrown into the dustbin. Yet they are concerned about the embankments and the environment in the FAP.

Two or three of my main development programs are being held up or being questioned because of the cost outlay needed for the environmental and resettlement issues. We have been trying to convince our development partners in Bangladesh that the way things are going, the northern part of the country will be turned into a desert and we may need to look for somewhere else to live. On resettlement, you may have seen on your way here lengths of new sewerage pipe

waiting to be laid. People's live at night within the sewerage pipe and if you go to the Dhaka Railway Station you will find thousands of people living in the railway station at night. Now if I am going to resettle all those people sleeping in the sewerage pipes, there will be no new sewerage line in Dhaka. Just in and around Dhaka many projects are being held up because hundreds of crores of extra money are needed for resettlement. Road projects are held up, embankments projects are held up because of these things.

The group of people who are behind these environmental demands have become like Frankenstein. The same people parade with placards and make their demands in front of the World Bank and Asian Development Bank at the time of their Annual General Meetings. Recently, I have been in the Asian Development Bank where a lot of emphasis was being placed on resolving certain environmental and resettlement issues in Bangladesh. I asked how do we resettle people? We can give compensation to the people but where do we find new land? Similar unrealistic demands are being made to resolve environmental matters. I am raising this because the Secretary mentioned about the environment issues in FAP and some Bangladeshis going to Europe to agitate against that program of this country. This is most unpleasant and unfortunate.

We are a small country of 55 thousand square miles with massive population pressures. It is very difficult for us to use the same environmental criteria which are being used in developed countries. We must be allowed flexibility in addressing such issues or else it will become impossible for us to carry out any projects or programs. However, it is important that the FAP is culturally friendly and takes into account how people perceive solutions to their own problems. Much of the success in Asia's newly industrialized countries, Hong Kong, China, Taiwan etc. has been achieved by using the strengths of traditional cultures. Therefore if FAP is to succeed, it needs to pay attention to how local people over the years have coped with floods and managed disasters. In my own home area there are many lessons to be learnt by the planners in this regard.

The Secretary mentioned in his speech that we have been studying the flooding problem for a very long time and even now in 1993 the studies are still being proposed. The FAP should be called a feasibility action plan because it has yet to take actions. Whatever money has been placed and spent, has been used for studies and more studies. This feasibility action plan needs to develop actions and I hope this conference will find a way of moving the plan from

software phase to the hardware phase. We have had long years of software and now we should progress to the hardware of FAP.

Again I would stress the wisdom of the local people and local institutions in managing floods. Local people know how the rivers behave and FAP should give attention to their wisdom in resolving the flooding problems in Bangladesh. With these few words I will hand over to my colleague, the Chief Guest to give us his wisdom. I would like to thank the organizers of the conference for inviting me and I hope I was able to show the practical difficulties in responding to all the demands for environment friendly resettlement and cultural orientation. These sound like innocent words but let me tell you as Minister of Finance, they are not innocent. It is now a very, very difficult world for Bangladesh and becoming very expensive to carry out development programs. As we move forward on FAP the international community, who have sponsored FAP, should also address the water management actions outside our territory which are effecting Bangladesh. Thank you very much - Ladies and Gentlemen.

ADDRESS

**by Mr. A. M. Zahiruddin Khan
Honorable Minister for Planning**

Bismillahir Rahmanir Rahim

Mr. Chairman, Distinguished Chief Guest,
Distinguished Members' of the Cabinet
Distinguished Members' of the Parliament and Excellencies
Representatives of the Foreign Agencies

Ladies and Gentlemer,

The importance of the Third Conference of the Flood Action Plan cannot be over emphasized and I am happy to be attending the inaugural session of the conference. Bangladesh has one of the most volatile and dynamic deltaic region in the world. Historically, people of Bangladesh have been both victims and beneficiaries of floods. However with the present increase in population, the associated increased habitat of the people, coupled with the environmental degradation in the region, the adverse effects of floods are magnified. This is a matter of great concern to the people of Bangladesh. The devastating flood of 1988 brought this into the greater focus of the international community. The catastrophic floods of 1987 and 1988 created havoc in Bangladesh and led to the realization that a long term sustainable flood control plan was essential.

The Ministry of Irrigation prepared a report in December 1988 while four other studies each supported by UNDP, France, USA and Japan were concurrently undertaken. The developments were reviewed in G-7 summit in Paris in July 1989 which stressed the urgent need for effective coordinated action by the international community in order to find the sustainable solution to the flooding problem in Bangladesh. Meanwhile the Government requested the World Bank to coordinate and synthesize a plan drawing on the various studies. The World Bank in close cooperation with the national experts prepared the five

year flood action plan (FAP) which was endorsed in the London Conference in December 1989. The action plan comprises 11 main components and 15 supporting studies. Most of the supporting activities have been completed and a number of reports and guidelines have been produced which have provided a good understanding of the problems. These have brought in substantial changes in approach from the earlier concepts of flood control, with new emphasis on controlled flooding and finally water management with the active participation of the people.

In the Second Conference of the Flood Action Plan held in March 1992 here in this Conference Center, the Honorable Prime Minister stressed the need of involving people at all stages of planning, implementation, and operations and maintenance. Acceptance of any scheme by the local people and attention to environmental issues are prerequisites to such a program. I am happy that these two aspects have been dealt with in the FAP. A series of seminars in each of the study regions was organized to initiate this process. The esteemed Members of the Parliament participated in these seminars to express the concerns of the local people. They suggested the need for holding a dialogue with the people at lower level. These suggestions were then followed up by holding seminars at District level, where the Members of Parliament, Union Parishad Chairpersons, Representatives of Local Communities, and NGOs highlighted the problems of the whole area with suggestions for solutions. These suggestions have been actively considered and incorporated in the regional water management plans. All aspects of the FAP will be reviewed in this conference before deciding on a future course of action, which again will need to be endorsed by the people. This may be accomplished by continuing the dialogue at the grass-roots level with local people during the feasibility study stage, where proper attention to institution building, involving local people should be emphasized. I would request the planners to take note of these requirements and ensure we have an agreed and accepted a water management plan for Bangladesh that will help in poverty alleviation and make the best possible use of land, water and human resources of the country. It is a fact of life that flooding has a direct and immediate bearing on the socio-economic condition of Bangladesh as the country is predominantly dependent on agriculture, with a vast majority of our people living in the deltaic region. As such, development options identified in the FAP should take into account the public wants. You will be happy to know that adequate provision has been made in the fourth five year plan to accommodate these problems. The presence of the Minister of Agriculture and Irrigation, Water Development and Flood Control, the Finance Minister, and other

Ministers in today's inauguration illustrates the importance that the government attaches to the short and long term solutions to flooding problems. I am confident that Third Conference on Flood Action Plan will be meaningful and it will achieve its objectives. Thank you very much.

INAUGURAL ADDRESS

by Hon'ble Mr. M. Majid-ul Haq, M.P.,

**Minister for Agriculture and
Irrigation, Water Development & Flood Control**

Mr. Chairman

My Colleagues in the Cabinet, in the Parliament, and the Government
Distinguished Guests,
Representatives of the Various International Organizations,
Excellencies the Ambassadors of the countries accredited to Bangladesh and
Friends.

Today is a very important day for me personally and for my Ministry of Irrigation, Water Resources and Flood Control. However, I must say that my tasks has been made easier by the enlightened speeches of my friends the Planning Minister and the Finance Minister who have subtly raised issues of international concern which warrant debate.

In this Government of Begum Khaleda Zia, we believe in transparency, we believe in openness, we believe in sweeping the carpet clean, and not putting the dust under the carpet. We welcome all criticisms and all opinions and we will assess them not only on their face value, but we will deeply examine and analyze their ideas. To come to the subject proper, you all know that floods have raged and ravaged the plains and habitats of Bangladesh for millions of years. This has led to an attitude amongst some people, that, since people have had to live with the floods, they should continue to do so. Well, that is one opinion. However, we have seen the havoc that was wrought in 1987 and 1988. It stirred the conscience of people all over the world and every country who could afford to, even SAARC, donated rescue and relief assistance to the masses who immeasurably suffered. These were the events that convinced people to study the problem in depth. I agree, it is taken several years, but then in a country which in geological terms is perhaps one of the youngest to surface from beneath the seas, a green delta composed primarily of alluvium, the water regimes are complex. Rivers do indeed meander and change as my friend the Finance Minister has emphasized. But it is not just a river course changing by a couple

of miles in a decade, I have seen the meanderings of a river changing its course by 50 miles in a period of three decades. Perhaps the irony is that in this land of rivers, we are becoming progressively dryer in the dry season and progressively wetter during the monsoon. No other country in the world is subjected to such environmental extremes and we are being forced to live in this perilous situation.

However, the FAP studies have taken time and rightly so because no hasty action was warranted. We wish to be sure that we have examined all the pros and cons, and all the pluses and minuses. Now we are on the threshold of moving on to the next phase, that of feasibility and design studies. However, I would like to assure my friend the Finance Minister that we have no intention of walling up all the rivers, we have no intention of dredging all the rivers and we have no intention of creating structures all over the country. The studies will point out the solution which will be dictated by mathematics, by geology, by sociology, and by environmental considerations. The solution may include embankments, dredging and drainage in various combinations but whatever, the outcome we will have thoroughly studied all the available options.

There have been lot of criticisms about the FAP studies and those who have been carrying them out. Some of these criticisms appear to come from those who did not win a place in studies. Technical concerns have been raised over embankments inducing faster siltation in the rivers which would raise their beds and give rise to perpetual and greater flooding. Another concern has been that the fisheries, the main source of protein of the poor man of Bangladesh, will be depleted by flood control projects. By preventing floods, it is perceived that all the 'Haors' and 'Baors' which are well known to my colleague the Finance Minister, would dry up. A further criticism is, why geomorphological studies have not been undertaken and why has not more emphasis been given to the environment. Here may I ask the anti-FAP environmentalist groups to search their souls and give us an answer to a question as to why over the past decade, they have not protested the desertification of the southwestern part of Bangladesh. We have not heard any voice from the international community or from environmental groups about this degradation. So therefore, when we talk about environment, let us talk about the creeping salinity and drought being caused by the unilateral withdrawal of water from the rivers beyond our borders. I am not a doctor, nor do I aspire to command the Ministry of Health but I am told that the increased incidence of cholera and diarrhoeal diseases in the south has a lot to do with the pollution of water supplies through saline intrusion. This

creeping up of the sea water from the delta now extends over a hundred kilometers to the north. So, when we talk of this major problem we need to consider all aspects.

There was another criticism which was that all the FAP studies, 26 components, should have been completed together. May I humbly mention that the size, the parameters, the aims and objectives of each of the 26 components show a great diversity and therefore time taken to study each component will vary. However, we have established a discussion framework which encourages the people concerned with the studies to pass on their findings to each other. We will judiciously take note of the interplay and interaction of each of the components on one another and only then make a coordinated assessment. We are now, assessing, examining, all the options but we do expect some of the studies such as those involved with river morphology to continue for several years as I am sure those, who are knowledgeable in the subject would accept this approach.

Another touchy point is that a lot of money has and is being spent on these studies and that the people who are concerned with the studies or people from the Government who are dealing with them, are perhaps playing to the tune of those who are offering the funds. I would like to very politely but firmly state that we do not play to the tune of somebody just because they are offering the funds. We go by reason, we go by pragmatism, we go only by consideration of what is feasible and what would be in the best interest of the people.

Lastly, the final criticism is that ordinary people are not participating in these studies. May I say, this criticism is without foundation. We are a new democracy and it is the first time in 10 years that the country has become a practicing democracy. However, we have taken a giant step towards associating all the affected people with the FAP studies. We have asked them and we have tried to sense their pulses as to what solutions they think will be effective. Although we cannot talk to the each individual villager, we have done so democratically through the elected representatives of the people. The response we have got from our colleagues in Parliament has been more encouraging than anyone expected. It was really heartening to note that most of them participated, including a lady who was more vociferous than the male members in championing the causes of the common man, in the series of meetings which were held throughout the country.

In passing, may I mention we are keenly and eagerly awaiting the report from our very friendly country, the Netherlands, who have a special place in the hearts of the people of Bangladesh, since they were the first in the 1950s to come up with modern irrigation and water management methods. I hope we will be seeing those reports very soon.

Finally, I would like to mention for the benefit of everybody, that so long as this Government is in position, we can assure the people that not a penny will be spent unnecessarily, there will be no extravagance, there will be no trimmings since we are conscious that the burden will be passed on to our next generation who are very dear to us. We would like to also assure our people, that we are quite conscious and the critics should also be conscious, that the Ershad era has passed. It is a different era now, there is accountability, there is transparency, there is economy, and we mean it, every word of it. I would like to say to all, that we have taken a new step. We have made a departure from the age-old favorite dictum of South Asia which is, "whatever was good enough for my grandfather, had been good enough for my father, so whatever had been good enough for my father, should be good enough for me." This is how our minds have worked. However, the new Government of Bangladesh have taken new steps, it is a departure from what our grandfather did and from what our father did. These are the decisions we are taking consciously, not for today, not for tomorrow, but for future for many years.

With these words I declare this conference open and wish it every success. Thank you Ladies and Gentleman. Khoda Hafez.

ADDRESS

**by HE Mr. Henry Gajentaan
Ambassador of the Royal Netherlands Embassy
on behalf of Development Partners**

Mr. Chairman

Honorable Chief Guest, may I thank you very much for your kind words

Honorable Ministers, Excellencies

Honorable Members of Parliament

Mr. Secretary, Members of FPCO

Distinguished Guests and the Participants

I feel deeply honored to have been invited at this moment to this rostrum during the inaugural session of this third conference. I would like to make, on behalf of bilateral donors participating in the flood action plan i.e. Canada, Denmark, France, Germany, Norway, Sweden, United Kingdom, United States, the European Community and the Netherlands, the following statement:

First of all, we would like to express our appreciation to the Government of Bangladesh, for the fact, for the third time a conference on flood action plan is being held. In view of the fact that the FAP will impact lives of millions of people in Bangladesh, be they farmers, fishermen, women, landless, or urban citizens, we are very pleased to note that attention is being given to the need for people's participation and to possible inter-regional impact of FAP projects. FAP has required extensive coordinating between donors and the Government and I should like to say, on behalf of the bilateral donors, how much we value the central role played by the World Bank, which we see essential to this coordinating process.

We also welcome the fact that representatives of concerned Ministries and as well as delegates of the Research Institutes and NGOs have been invited to participate in the conference. We hope that FAP constitutes a platform for discussion and that all concerned parties will be consulted and involved in planning and implementation phases of FAP.

We do however, have several concerns about the conference's organization, which I know are shared by other donors. Three years after FAP was launched, it is now generally recognized that its implications are more wide ranging and multi-disciplinary in many aspects than was originally thought. In particular, it is the environmental implications which need more recognition and study. We therefore regret that in the program of this conference no specific session is foreseen for environmental implications on FAP, presumably because some regional studies do deal with the environmental impacts. Furthermore, the institutional arrangements for the present FAP period as well as for future phases deserves thorough attention.

The FAP agenda is a large one and it may be that not all subjects can be extensively dealt with during the three days at our disposal. But it is important that these key issues are discussed in public domain. We acknowledge that this is mainly a technical conference. However, we trust that the critical issues will be dealt with during this conference. A follow-up will no doubt be necessary and we see the scheduled LCG meeting on Thursday will provide a forum for the first follow-up discussion.

Finally I would like to express my sincere hope that this conference will be fruitful and instrumental for all participants. We hope it will constitute another step towards identification, planning, design and implementation of projects, which are technically, economically, environmentally and socially feasible and which together constitute a sound program for dealing with floods and effectively managing water resources in Bangladesh. Thank you very much.

ADDRESS

by Mr. Mosharef Hossain Shajahan
Hon'ble State Minister
Ministry of Irrigation, Water Development & Flood Control

Chairman of the
Third Flood Action Plan Conference

Bismillahir Rahmanir Rahim

Honorable Chief Guest,
Honorable Minister,
Members of the Parliament,
Excellencies

Ladies and Gentleman,

Its a great pleasure and honour for me, to get the opportunity of presiding over this inaugural session of the Third Conference on the Flood Action Plan. This is an occasion of great national importance. I hope that this conference will help in achieving a consensus and lead to streamlining the activities of the FAP and improving them through an exchange of views and knowledge between the national and international experts.

Recalling our pasts sufferings due to catastrophic floods and natural disasters, I would like to stress the need for taking measures to alleviate flood problems and diminish the recurring economic losses due to flood hazards. Though some structural measures have been taken in the past, these have been insufficient to protect the increased level of infrastructure. Moreover, these measures did not sufficiently consider other sectoral impacts. However, the FAP has been conceived with a new dimension of controlled flooding which will keep in view such sectoral interests as fishery development, socio-economic activities and above all the environment. People's participation in planning, implementation, operation and maintenance of projects were not successfully addressed in the past but the FAP has made it one of its prime considerations.

The concept of the FAP is not limited to floods only. It also takes into consideration the water resources utilization during the dry season. The FAP therefore, deals with the comprehensive water resources management in the country. The present five year program of the FAP is only the first stage of the Government's long term program of flood mitigation. More than fifty percent of this first stage of the Plan's activities have been completed and I am happy to note that several pilot projects and priority projects have been identified such as, The Dhaka City Flood Protection, The Secondary Town Protection, The Compartmentalization Pilot Project in Tangail, River Bank Protection, Jamalpur Priority Project, and the Coastal Embankment Rehabilitation Project. I am optimistic that many investment projects will be identified for implementation by the end of this first stage.

Ladies and Gentlemen,

As the FAP also considers water management during the dry season, the present trend of low flows in the Ganges during dry season is of a major concern to this study. Due to unilateral withdrawal of the Ganges flows at Farakkha in India, the dry season flows in Bangladesh have been rapidly reducing and now have dwindled down to a minimum in March of this year which are threatening the very survival of the Ganges distributaries. The situation is seriously affecting the whole of the Southwest Region covering about one third area of Bangladesh. Domestic and drinking water is becoming scarce, navigation in the Ganges and the Gorai is becoming impossible or severely restricted, saline intrusion in the surface and ground water is adversely effecting crop production, lack of water is closing the GK pumps, health hazards are increasing, bio-diversity is being lost and the overall environment is being degraded. Besides the annual direct damages of many millions of Taka, the Southwest Region is heading towards decertification. Therefore, we must take measures to eliminate or at least to mitigate the environmental degradation. As I understand, a Ganges Barrage in Bangladesh would go some way to partially counteract the adversities created by the Farakka Barrage. The concerns of the people of the Southwest Region and their need for action were clearly reflected in the FAP regional seminar held in Jessore in January 1993.

Ladies and Gentlemen,

I have observed that lot of studies in the flood control and irrigation sectors have been performed in the past but have achieved very little in practice. I hope that meaningful and useful investment projects will be identified under the FAP. I have a great expectations that the development partners and agencies will come forward to help Bangladesh in implementing major flood control, drainage and irrigation projects.

Ladies and Gentlemen,

I wish this conference every success. Thank you all.

CONCLUDING ADDRESS

by **Mr. M. H. Siddiqi**
Chief Engineer
Flood Plan Coordination Organization (FPCO)

Mr. Chairman,

Ladies and Gentlemen,

FPCO expresses its deep appreciation to the Honorable Minister of State for Irrigation, Water Development and Flood Control for kindly chairing this inaugural session. He has always been kind to us.

We would next like to express gratefully the patronage that we have received from the Hon'able Minister of Agriculture and Irrigation in connection with this conference. Whenever we have asked his guidance and assistance, he has very sympathetically and passionately supported and advised us. FPCO is grateful to him. We also want to register, the appreciation and sympathy that we have always received from the Honorable Finance Minister. We extended a request to him to speak at this conference, and despite his busy schedule of budget preparation, he agreed to make time for us. And as an indication I will tell you, three of our projects are under implementation and they would not have reached this stage had not it been for their speedy clearance by the Hon'able Finance Minister as Chairman of the ECNEC. We also express our gratitude to the Honorable Planning Minister, whose intervention or sympathy with us has resulted in rapid approval in the Planning Commission for FPCO projects, flood action plan projects. We express our gratitude to the World Bank for its role as a Coordinator of this huge program. I don't think the cooperation we got from the World Bank could have been better. FPCO acknowledges gratefully, the patronage received from our Secretary of Irrigation. He has been constantly monitoring us, and advising us on the preparation and detail of the conference. Here I would like to make special mention of the Honorable Ministers and Honorable Members of the Parliament whose support and cooperation the Flood Action Plan has enjoyed. We have taken the FAP, as suggested by the Government, 16 places outside Dhaka to meet the people and their elected representatives. The enthusiasm and zeal shown by the Honorable Members of

the Parliament for this process has been tremendous, and they have been repeatedly been with us. As an example of this support - A Honorable Member came back to Dhaka from Chittagong early in the Morning and at 10 a.m. she was at Jamalpur receiving me at the District Council Hall where I should have received her earlier. In fact, I was delayed. So much interest has been shown by the Honorable Members and we thank them for it.

Now talking about the Development Partners, we gratefully acknowledge their support and cooperation. I on my personal behalf and on behalf of FPCO we express our sincerest gratitude to everyone present and trust this inaugural function will be a success.

Khoda Hafez.

SESSION : FAP OVERVIEW

Chair: Mr. M. Asafuddowlah
Secretary
Ministry of Irrigation, Water Development and
Flood Control

Presentation: **"Approach to Flood Action in Bangladesh"**
by Mr. M. H. Siddiqi, Chief Engineer
Flood Plan Coordination Organization (FPCO)

"Flood Action Plan Progress Report"
By Mr. A. M. Khan Chowdhury
Additional Secretary
Ministry of Irrigation, Water Development and
Flood Control

Mr. Ashfaqui Azam, Superintending Engineer, FPCO

Mr. A. M. Shafi, Superintending Engineer, FPCO

Flood Action Plan - Proceedings of the Third Conference

TECHNICAL SESSION I

May 17, 1993

(13:30 - 15:00 Hrs.)

- Chair: Prof. Jamilur Reza Chowdhury
President
Institute of Engineers, Bangladesh
- Rapporteur: Mr. Mir Abu Sufian
Executive Engineer, FPCO
- Topic: FAP 2, North West Regional Study
By Mr. Shahidul Alam and
Mr. T. R. Franks, FAP 2 Study Team

THE NORTHWEST REGIONAL STUDY FAP 2

Introduction

1. Bangladesh has regularly faced floods including catastrophic ones similar to those experienced in 1987 and 1988. The Government of Bangladesh has embarked on a major initiative to combat the flood threat and create an environment for secure social and economic growth. Following a Flood Policy Study financed by UNDP and flood studies by France, Japan, China and the USA, the Government asked the World Bank to assist them in developing and co-ordinating a five year flood action plan, which drawing on these studies, would form the first stage of a long-term flood control program.

2. The objective of the study is to assess the flood control and drainage options and to reduce flooding or manage flooding, establish the preferred solutions, prepare a regional water development plan and to come out with a feasibility study of priority project.

The Northwest Region

3. The Northwest region covers about 34,600 sq.km of land and has a population of 25 million. The east and south of the region are bordered by the Brahmaputra and Ganges rivers. The region is sloped north to south-east with a maximum altitude range of 90-100 m. The average cropping intensity is about 158% of which rice forms about 119%. The varieties of rice planted as broadcasted aman, transplanted local and HYV aman and HYV boro (in irrigated areas). Other crops of the region include wheat, jute, oilseeds, sugarcane and pulses. The fisheries production of the region is dominated by 70% from the river floodplain and production has gradually decreased from 107,224 tons (1983/84) to 84,810 tons (1988/90). The reduction of fish resources is thought to be due to increased dry-season irrigation, over fishing by the expanding population and the impact of FCD intervention.

Flooding and Drainage in the Region

4. That part of the region bordered by the Brahmaputra river suffers from flooding caused by breaches in the main Brahmaputra Right Embankment (BRE).

This type of flooding is very damaging in the disruption it causes to people's lives and in the losses to agriculture and infrastructure. Similar problems of a more limited of a more limited scale occur along the Teesta, Dharla and Dudhkumar in the northeast of the region. In the south, breaches from the Ganges are not a major source of flooding.

5. Within the region, flooding and drainage problems are mainly caused by the drainage patterns of the internal rivers. The majority of these drain to the southeast into the Lower Atrai/Lower Bangali system, and hence to the Brahmaputra through the Hurasagar outfall. Outfall conditions are often constrained during the monsoon by high levels in the Brahmaputra, and this in turn results in backing up and extensive flooding throughout the Lower Atrai and Lower Bangali. Flooding of over three meters regularly occurs in many parts of the Lower Atrai. However, while such flooding constrains agricultural production, it is not a problem in the same way as that caused by breaches from the major rivers since it develops more slowly and does not cause the same amount of social disruption. The upper reaches of the region are steeper than elsewhere and are susceptible mainly to flash flooding. In most cases the floods last only for a few days and do not cause a great deal of damage to crops, though they can do to infrastructure.

6. The Region was divided into fifteen planning units in order to provide comprehensive coverage of these problems. Within each unit the flooding situation was assessed by a combination of field visits, primary data collection and analysis of secondary sources. The principle data used related to agricultural cropping, and infrastructure damage due to flooding, and water bodies and fisheries. This was supplemented by analysis of hydrological data and the development and use of a hydrodynamic model covering part of the region.

Issues and Approaches in the Regional Development Plan

7. Planning for the region has been based on a number of broad principles. The main objective has been to create a stable flooding regime which gives local people the ability to plan their lives with some degree of confidence and which allows them control of the local natural resources. A second aim has been to create a sustainable pattern of development, which balances the requirements of agriculture, fisheries, navigation, ground water and the environment. The third aim has been to safeguard lives and property to the extent possible at the time of major floods.

8. Within these broad objectives a number of other principles have been applied. The most significant feature of flood protection measures is the impact that they have on adjacent and downstream areas. Generally flood control in one area will lead to increased water depths or discharges and consequent disbenefit elsewhere. In extreme cases this leads to the cutting of flood control embankments by people, in an attempt to reduce level differences between protected and unprotected areas. Such "public cutting" is widespread through the region. It causes significant loss and damage and is an important source of social conflict and tensions. For this reason a major policy adopted has been to avoid, as far as possible, any plans which would result in significant disbenefits downstream or elsewhere. While it is not possible to apply this principle always, it has meant, for example, that structural measures have generally not been recommended in the upstream reaches, since this would have the effect of increasing discharges and flooding in the downstream reaches, where serious problems already exist.

9. Experience with previous developments indicates that small-scale schemes often perform better than larger ones, because they can be implemented more quickly and local people can more easily be involved in their management. Thus emphasis was put on small-scale schemes however, these must take place within a regional or sub-regional context which tries to ensure, as far as possible, that disbenefits do not occur elsewhere.

10. Flood control and drainage (FCD) schemes are extensive throughout most of the region, and there are many existing and on-going projects. Considerable efforts have been applied to integrating the planning with these existing developments where appropriate, and to making the best possible use of existing infrastructure.

11. A broad range of responses to flood and drainage problems exist. Structural responses are based on embankments to exclude the water, and drainage channels and structures to drain it rapidly. Within the general policies of the Flood Action Plan (FAP) structural measures are intended to provide controlled flooding & drainage (CFD) facilities to the protected areas, which will allow the beneficial use of flood water for agriculture, fisheries, navigation and the environment, but exclude the damaging major floods. In parts of the region a modified approach needs to be applied, which provides partial protection only. This is intended to provide sufficient protection for the harvesting of the important dry season irrigated rice crop (boro) and perhaps for the transplanting

of the deep water monsoon crop in the early part of the monsoon but to allow flooding over the protected area at the peak of the monsoon. Partial protection, particularly in the lower Atrai, reduces disbenefits to adjacent areas and allows a more predictable and stable flooding regime. than an attempt to completely exclude the peak floods.

12. There are a considerable number of non-structural measures which can also be applied to reduce or mitigate flooding problems. These are grouped under the general term "flood proofing" and include such measures as raising important infrastructure on platforms above the expected flood level, instituting flood warning systems, and providing secure stores for emergency relief and grain. Such measures are relevant everywhere but particularly important for unprotected areas. Generally they should be seen as complementary measures to the structural measures discussed above.

13. During the conduct of the study, efforts were made to maintain close contact with those components of FAP where there were important linkages with NWRS. Particularly the FAPs are:

- FAP 1: The Brahmaputra Right Embankment Strengthening
- FAP 9A: Secondary Town Protection Project
- FAP 12: FCD/I Agriculture Review
- FAP 13: The Operations and Maintenance Study
- FAP 14: Flood Response Study
- FAP 15: Land Acquisition and Resettlement Project
- FAP 16: Environmental Study
- FAP 17: Fisheries Study
- FAP 20: Compartmentalization Pilot Project
- FAP 21/22: Bank Protection, River Training and AFPM Pilot Project
- FAP 23: The Flood Proofing Study
- FAP 25: Flood Modelling and Management Project

14. Multi-disciplinary approach: The team has taken a multi-disciplinary view in the planning approach. Impact on fisheries, navigation and environment for flood control intervention has been assessed, based on the present condition and future condition. The social impact has also been assessed, based on response to the flooding problem, mitigation plan and response from conflicting interest groups. In the planning of flood control plans the following aspects were

taken into account:

- removing the adverse environmental effects of previous water resources management and flood control projects,
- adopting and extending environmentally and ecologically sound land use practices and conserving soil fertility,
- maintaining ecological balance, conserving wildlife and biodiversity and conserving and developing the national wetlands and migratory bird sanctuaries, and
- protecting, conserving and developing fish habitats.

Development Options and Scenarios

15. Development scenarios were formulated for all the major parts of the region.

16. **The Brahmaputra Right Embankment** - Analysis shows that the most serious flooding problems along the Brahmaputra are due to breaches in the BRE. It also shows that these flooding problems can be eliminated, if the BRE is effectively sealed. Sealing of the BRE is therefore a priority measure for the region. The development scenario for the area includes proposals by other FAP studies. FAP 1 has proposed sealing of the BRE and is preparing a master plan for its long-term protection. Six locations have been identified for heavy engineering works because of their susceptibility to bank erosion. These are Fulchari, Sariakandi, Mathurapara, Kazipur, Serajganj and Betil. Out of these Sariakandi, Mathurapara and Serajganj have been identified as the first priority for river training works. In addition, FAP 2 has considered providing a "second line of defence" if the BRE fails but after examination it has recommended that any available investment should be concentrated on the BRE itself rather than providing a second line of defence. FAP 21/22 is engaged in developing a bank protection and river training strategy and has selected Kamarjani (situated in the Gaibandha improvement project area) as a test site for developing future design criteria. Flood proofing in the areas susceptible to damage from BRE breaches and behind the BRE is an important associated measure. FAP 20, the Compartmentalization pilot project has started activities north of Sirajganj to

investigate water management and drainage improvement.

17. **Upper Korotoya/Middle Bangali System** - The upper Korotoya basin is subject to extensive flooding at its downstream end where it joins the Bangali system. Proposal for this area includes CFD works along both banks of the river. However, in keeping with the principle that upstream works should not lead to increased disbenefits in downstream reaches, these developments are associated with a major drain, the "Bangali Floodway", which connects the Upper Korotoya to the Brahmaputra main river and residual flow to the lower Bangali. Thus the increased discharge due to the CFD works on the Upper Korotoya are not transferred downstream to the Brahmaputra. The most important measure in the Middle Bangali System is sealing of the BRE and if this can be successfully accomplished major projects to reduce flooding are not needed. In this area due consideration was given to a second line of defence against breach flooding through the BRE.

18. **Lower Atrai/Lower Bangali System** - Extensive development of FCD works have taken place in the Lower Atrai. On the whole these have not performed as well as expected due to problems of increased water levels, public cutting and consequent damage. Full protection along the Lower Atrai is now considered an infeasible solution. A number of alternatives were investigated to try to improve the situation, including major drains which would divert water entering the Lower Atrai and channel it to the main rivers, thus considerably reducing the water entering the Lower Atrai. These were found to be infeasible. An alternative engineering solution suggested was a large regulator at the Hurasagar outfall, however, the problem at the outfall is the constraint set by the outfall level in the Brahmaputra, rather than backflow from the Brahmaputra to the Atrai and such a structure would not be effective.

19. The main scenario examined for the Atrai has been the "Green River". In this, partial protection only is provided near the Atrai itself, so that at peak monsoon water flows over the floodplain, as it would have done in its natural state. Away from the river the existing infrastructure is utilized as far as possible to provide CFD facilities. The Green River scenario is intended to stabilize the existing situation so that local people can plan their lives accordingly; it enables considerable agricultural production to take place while at the same time reducing the disbenefits due to confinement, facilitates floodplain fisheries and navigation, and reduces adverse environmental impacts. Within the broad

"Green River" scenario, a number of variations were analyzed.

20. **Teesta Basin Development** - Breaches from the Teesta River cause similar problems to those along the Brahmaputra, but on a smaller scale. The main development scenarios involve repairing and sealing the Teesta embankments which already exist along both sides of the river and more most of its length. Drainage lines are from the north to south so that the impacts of breaches on the left bank are relatively limited in extent. On the right bank, natural slopes mean that flooding from breaches can have effects far downstream. The first element of Teesta Basin Development is the sealing of the Teesta Right Embankment as part of the Gaibandha Improvement Project, the priority project investigated under the Northwest Regional Study.

21. Gaibandha Improvement Project (FAP 2.1) was identified as a priority project and a feasibility level study was conducted. The project area lies south of the confluence of the Teesta and the Brahmaputra, the gross area is 57,600 ha. and has a population of 550,000. The base option and main features of the project is as follows:

- sealing of the Teesta Right Embankment both upstream and downstream of Kaunia, together with necessary strengthening of the existing embankment and improvement of structures,
- retirement of the BRE as necessary,
- removal of the Manas Regulator and the construction of a new regulator at the outfall of the Manas to the Ghagot,
- provision of a Ghagot floodway, which allows drainage of the Ghagot to the Brahmaputra and construction of a backwater embankment along the Ghagot upstream of its confluence with the Brahmaputra,
- construction of a regulator at the head of the Alai River,
- an extension of the Ghagot left embankment upstream from Bamandanga as far as the Alai Kumari confluence and

- compartmentalization with the Gaibandha Improvement Project area.

The implementation of the Gaibandha project will increase rice production by about 335,000 tons annually. Major development in the Teesta basin is the on-going Teesta irrigation project, of which the barrage was completed in 1991 and this has been duly considered in the planning.

22. **Other Areas** - A limited number of proposals in other areas were investigated. This is in keeping with the general policy of not exacerbating downstream problems by further developments upstream, where flooding problems are in general not so acute. The Kurigram Project (North and South) is an on-going scheme. The embankment and drainage sluices have been completed. JICA has recently completed a feasibility study for irrigation development of the project along with flood control and drainage improvements. FAP 9A, the Secondary Towns Integrated Flood Protection Project, has identified three important towns in the region, these are Panchagarh, Dinajpur and Kurigram. The implementation of the project extends over a period of six years and is likely to end by 1997-98. The components of the works include, flood protection, bank protection drainage, solid waste management, sanitation and slum improvement. The Pabna Project (Phase 1) is an FCD development together with irrigation facilities, and was completed in 1992. Baral basin development is under study and a feasibility study of North Rajshahi Irrigation Project was completed recently. Small FCD schemes undertaken by EIP and SRP were also reviewed by the team during planning. FAP 2 has prepared proposals for CFD facility for the right bank of the Little Jamuna River where fairly extensive flood damage problems are known to exist. The right bank of the Mohananda River also suffers from flooding and drainage problems and FAP 2 has proposed CFD facilities for this area.

Agricultural Aspects in the Regional Flood Plan

23. **Present situation** - The cropping pattern is largely dictated by flooding, soil moisture storage capacity although irrigation facilities and markets are among other factors which affect choice of cropping. Irrigated dry season paddy (boro) is increasingly popular as it is more reliable and productive than the wet season crop. The present cropping pattern is as follows:

Table 1 - Agriculture in the Region

<u>Name of Crop</u>	<u>%</u>	<u>Name of Crop</u>	<u>%</u>
<u>Rice</u>		<u>Others</u>	
HYV Boro	26	Wheat	8
HYV Aus	6	Jute	7
HYV Aman	28	Oilseeds	6
Local Boro	1	Sugarcane	5
Local Aus	20	Pulses	3
Local T. Aman	28	Vegetables	2
Aus/Aman	5	Others	8
B. Aman	5		
	----		---
	119		38
Cropping Frequency	158		

24. **Agricultural Benefits of Flood Control** - Direct agricultural benefits from flood control fall into two main categories; benefits due to agricultural intensification and shifts to higher value crops, and benefits due to reduced crop damage as a result of floods. If significant increases in output of high yielding crops can be attained, such increases make the greatest contribution to project viability. However, experience from previous FCD projects shows that the increases that appear to be possible are in reality often difficult to attain for a variety of reasons (e.g. disbenefits caused to outsiders which result in regular public cuts). Reductions in crop damage may then take on greater importance although they are rarely in themselves enough to justify a project. These remarks emphasize the need for careful assessment of particular proposed schemes so that a realistic forecast of project benefits can be made. The main source of agricultural benefits is undoubtedly increased HYV T.Aman production. However, a number of points need to be made with regard to the potential for increased agricultural production as a result of flood control schemes.

- (a) In the NW region HYV T.Aman is already more important than Local T.Aman in terms of cultivated area and this trend will continue even without flood control. Some farmers continue to grow Local T.Aman even on land where they could grow HYV T.Aman, possibly because of lower input costs, taste preferences, etc. There is little doubt that most of these farmers will ultimately switch to HYV cultivation.
- (b) Possibly a greater constraint at present is the indirect impact of lack of irrigation. On some non-irrigated land farmers grow B.Aus (perhaps preceded by rabi crops) and then find it difficult to follow B.Aus by HYV T.Aman, opting for local T.Aman or fallow.
- (c) HYV boro areas are taken to be the same in future-without and future-with conditions. Flood waters generally rise relatively late in the region and in most years will not effect HYV Boro, certainly not preventing it from being planted. Any occasional effect of floods on boro is accounted for in the crop damage analysis.
- (d) Cropping intensities barely increase and may even decrease with the project. Incremental HYV T.Aman cultivation, for example, generally replaces another paddy crop (Local T.Aman, B.Aus or B.Aman) and, if the cropping pattern HYV Boro - HYV T.Aman replaces Rabi - B.Aus -Local T.Aman, cropping intensities decline.
- (e) In the Lower Atrai, some benefits can be gained from regulating the rise of water to allow a deep water aman crop to become established. Some farmers try to transplant deepwater aman paddy after harvesting the boro crop, but rising floods may wash away plants before they have developed. Modest benefits have been assumed to accrue in "flow" areas of the Lower Atrai as a result of partial protection provided there.

Crop damage due to flooding occurs to both the aman crops and is significant throughout the south and east of the region, particularly along the main rivers.

Benefits from avoiding this damage are significant.

Fisheries Consideration in the Regional Plan

25. **Present Situation** - Fish supplies an estimated 70-80% of the animal protein diet of the Bangladeshi people. Freshwater fish are preferred, and the inland waters provide 80% of the annual harvest. The fisheries production systems generally fall into two classifications: open water capture fishery relating to rivers, beels and floodplains, and closed water culture fishery, mainly related to ponds. Most of the open water capture fishery is based on the river floodplains and these provide 70% of the fish yield in the region. Yields of capture fishery have decreased recently, this is due to overfishing, dry season irrigation and flood control and drainage (FCD) projects. Declining water quality is also seen to be a contributory factor. The following is the fish production under present conditions.

Fish Production in the Northwest Region (Metric tons)

	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>	<u>1987/88</u>	<u>1988/89</u>
Rivers	24,507	22,840	11,883	7,824	7,865	3,937
Beels	15,141	12,000	10,638	8,379	9,466	8,555
Floodplain	42,344	45,343	52,033	43,237	44,452	42,183
Sub-total	81,992	80,183	74,554	59,440	61,783	54,675
Fish-ponds	25,232	23,257	26,190	25,493	26,712	30,135
TOTAL	107,224	103,434	100,744	84,933	88,495	84,810

Source: DOF Statistics

26. The main impacts of FCD and FCDI projects on the fisheries in the Region can be summarized as follows:

- (a) There is potentially positive impact by effective flood control on culture fisheries in closed water bodies, such as ponds, borrow pits and canals, whereby the protection against over-flooding encourages regular stocking, improved culture methods and where necessary, pond rehabilitation.
- (b) Negative impacts on capture fisheries arise from FCDI works which reduce the areas of perennial beels and floodplain for fish breeding, feeding and nursery grounds; which block essential fish migration routes from beels to and from the rivers and which thereby alter and diminish the fish stock size and species composition of the faunas both within and outside the FCD project boundaries and with detrimental effects on fisherman's catch rates and earnings.
- (c) reduction of the areas of open water remaining within FCD developments has severely restricted access for subsistence fishing.

Benefits

27. The main economic benefits of flood protection works are derived from agricultural production, and the avoidance of crop and infrastructure damage. Cropping benefits derive primarily from a transition from the broadcast monsoon rice crop (B.Aman) to a transplanted monsoon rice crop (T.Aman), which needs much lower depths of flooding to be successfully grown, and from replacement of local varieties by high yielding varieties (HYV). If the change from B.Aman to T.Aman can be successfully accomplished, the financial and economic returns are high. In the Northwest Region, the rivers rise relatively late in the monsoon season and after the boro rice crop has been harvested. This means that there are generally not significant benefits to flood protection works related to the production of boro rice. Crop damage due to flooding occurs to both the aman crops and is significant throughout the south and east of the region, particularly along the main rivers. Benefits from avoiding this damage through CFD works are significant. On implementation of the Northwest Regional Plan an additional 2.8 million tons of rice will be produced annually (including only Lower Atrai development, Upper Korotoya, Teesta left and right banks and GIP development.

28. The economic benefits to agriculture are offset by disbenefits to fisheries. However, there are two components to the fisheries. Culture fisheries should generally benefit from CFD works as it provides a more stable flooding regime and prevents losses. This is not normally sufficient to compensate for losses of capture fisheries on the floodplains, which may be caused by blockage of fish migration routes between the rivers and the floodplain. (There are, of course, other factors contributing to losses in the floodplain fisheries, notably over-population and overfishing).

29. Bank protection works along the main river banks are expensive because of the erosive nature of the rivers. In economic terms such projects may be marginal unless there are specific factors operating, such as the protection of urban infrastructure. Their social benefits are, however, considerable. CFD works within the region, by contrast, are relatively cheap, since they normally involve the rehabilitation or modification of existing facilities. This is particularly the case along the Lower Atrai. Returns to CFD projects can therefore be high.

30. Economic returns are very sensitive to the returns to agricultural production, and particularly to changes in the monsoon rice crop. Fisheries disbenefits are considerably less in economic terms (around 20-30% of agricultural returns but depend on the area proposed for the development and the characteristic of the intervention works. Returns are not particularly sensitive to project costs. This means that plan and project appraisal needs to pay particular attention to forecast changes in rice cropped areas (it is assumed that CFD development will not cause changes in yields) and to rice prices.

Impacts

31. Besides economic benefits, there are a number of important social and environmental impacts. The social benefits of protective works along the main rivers are considerable. River erosion causes loss of land, displacement of population, and loss of social cohesion, as well as putting a strain on scarce local resources. Even for those who do not lose their lands to the major rivers, breaches through the main embankments are very damaging, disrupting living patterns, crops and infrastructure and preventing development.

32. On the inland rivers, social benefits from flood protection are more mixed. Since the flooding takes place more slowly it is easier to adapt living patterns to it, and social disruption does not take place on the same scale.

Moreover, successful CFD works tend to increase agricultural production, so that benefits go to those who own land. The benefits in increased employment for the landless, both during construction and thereafter for agriculture are, however, considerable. Culture fisheries tend to increase and capture fisheries tend to decrease. However, in the CFD concept, impact on fisheries is minimum.

33. CFD works have a number of impacts on the bio-physical environment. The most important relate to bio-diversity, floodplain fertility, the wetlands, ground water and morphology. All these impacts are significant and need to be appropriately taken into account during planning. However, in the case of bio-diversity, floodplain fertility and the wetlands, it should be borne in mind that CFD works are only part of a complete system which is putting great strain on these resources. The key impact on bio-diversity is the increasing reliance on HYV of rice, but this is as much the result of irrigated boro cropping as CFD: indeed, there is some evidence that bio-diversity increases on higher flood-free lands which support a variety of plant and animal species, and to some extent CFD may have a positive impact. The wetland and water bodies have considerably reduced in extent over the last two decades but this is also due to pumping for dry season irrigation as much as to CFD works. The key role for the wetland now lies in the part they play in fishing systems. There is evidence that floodplain fertility is increased by the fixing of nitrogen through blue-green algae which accompany extensive flooding and CFD works reduces the natural process.

34. Analysis carried out during the Regional Study indicates the impact of possible works on the ground water resource may be of significance but is not an over-riding importance. The ground water resource is generally fairly abundant throughout the Northwest and potential recharge is high. There are areas where constraints to ground water development occur and these need to be judged on an individual basis.

The Regional Plan

35. **Structural Measures** - The main components of the regional plan include the following:

sealing of the BRE to the extent possible under the FAP 1 program. An associated program of flood proofing should be carried in areas particularly susceptible to damage from breaches through the BRE.

Development of the Teesta Right Bank, initially in association with the Gaibandha Improvement Project (FAP 2.1). The main features of Gaibandha Improvement Project are as follows;

- sealing of TRE with river training works and retirement of BRE as necessary,
- replacement of Manos regulator and construction of Alai regulator,
- provision of a Ghagot floodway and backwater levee along the Ghargot,
- compartmentalization for area development.

consideration of the Green River strategy in the Lower Atrai, to provide partial flood protection close to the river and full CFD facilities in the upland areas. This would take the form of a sub-regional development plan, together with a feasibility study for the stabilization and improvement of Chalan Beel Polders C and D (Polder 2 and 3 are already under re-design) under FAP 2.2.

development of flood protection and drainage measures by others in other areas, notably Kurigram (South and North) under JICA funds, Bogra Polder 2 and 3 redesign under EIP and improvement of Gazaria-Ichamati under SRP.

flood protection of 3 important towns and other infrastructure in the upstream reaches (Panchogor, Dinajpur and Kurigram) under FAP 9A.

other schemes show lower returns but could be considered for development in the long-term. These include developments on the right bank of the Mohananda, and of the Upper Karatoya/Bangali Floodway.

Economic returns are high for the Green River developments in the Lower Atrai and for the small development on the right bank of the Little Jamuna. They are marginal for the Gaibandha Improvement Project and the Teesta Left Bank. Returns are low for the other major developments which have been considered. Social and environmental impacts are generally shown as negative but are not of such magnitude as to necessitate rejection of the proposals.

36. **Associated Development** - A program of associated development is recommended for implementation with the plan. This includes:

- a program to mitigate capture fisheries losses.

- a program for the development of navigation facilities.

- a program to mitigate adverse impacts on health status.

- a program of flood proofing, particularly behind the BRE, on the unprotected lands in the main rivers (the chars), and in the upper reaches where major CFD interventions are not recommended.

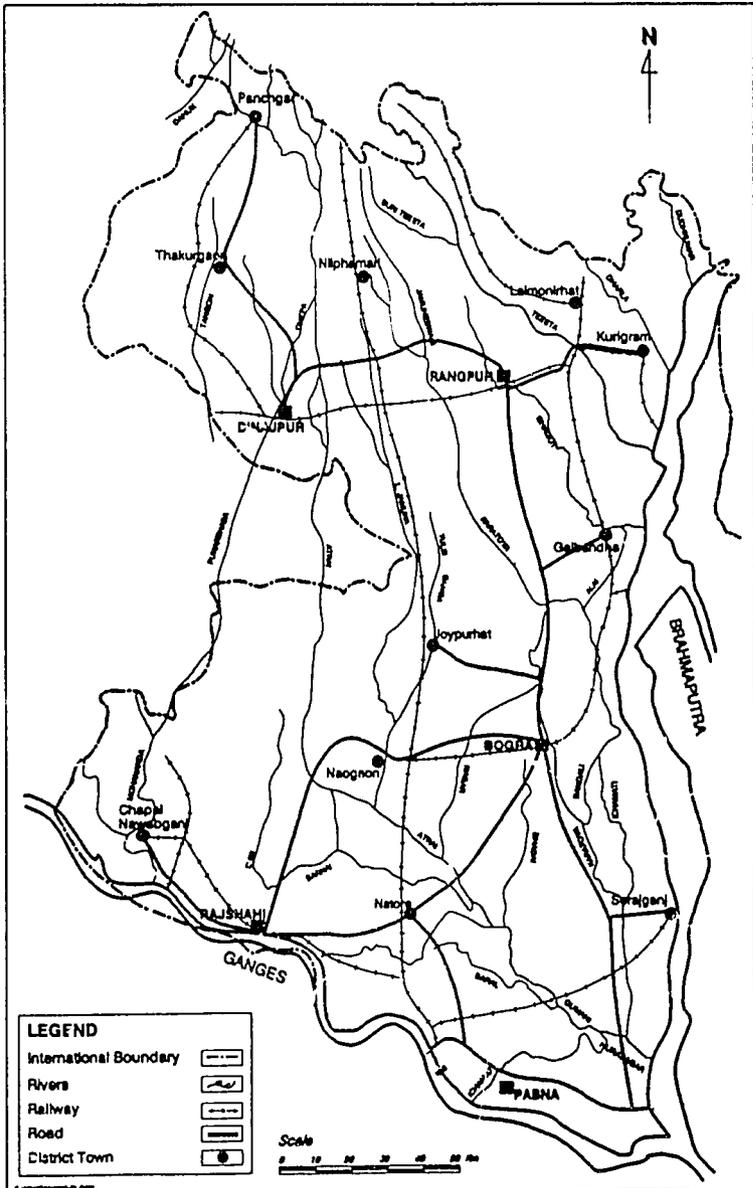
Plan Implementation

37. The schedule for implementation of the plan is divided into short-term priority works, plans for the medium-term and possible developments in the long-term. Priorities have been determined on the basis of needs, economic returns, and the objective of achieving balanced development throughout the region where flooding takes place. Two priority projects should follow directly from the Northwest Regional Study (FAP 2). These are the implementation of the Gaibandha Improvement Project (FAP 2.1) and Sub-Regional Planning and Feasibility Studies for Priority Projects in the Lower Atrai (FAP 2.2). The implementation of the Gaibandha Improvement Project involves an intensive period of further planning and detail design leading to a program of river training works, CFD and area development. Work in the lower Atrai involves a feasibility study for the restructuring of Polder C and D together with sub-regional planning involving the following:

- further development of the hydrodynamic model used by the Study.
- a continuing program of public consultation concerning possible developments.
- liaison with FAP 16 on the wetlands needs and with FAP 17 on fisheries development in the lower Atrai.
- co-ordination with other programs working in the lower Atrai, notably EIP on the redesign of Polder 2.

Figure 1

The North West Region



Source : NWRS

Figure 2

Regional Development

The map shows the short-term, medium-term and long-term measures proposed for incorporation within the regional development plan. Short-term measures (5 years) are concentrated in the south and east, where the most serious flooding occurs. Medium-term measures (5-15 years) would include further restructuring projects in the Green River, following priority works in polders C and D. Long term measures are potential projects beyond 15 years.

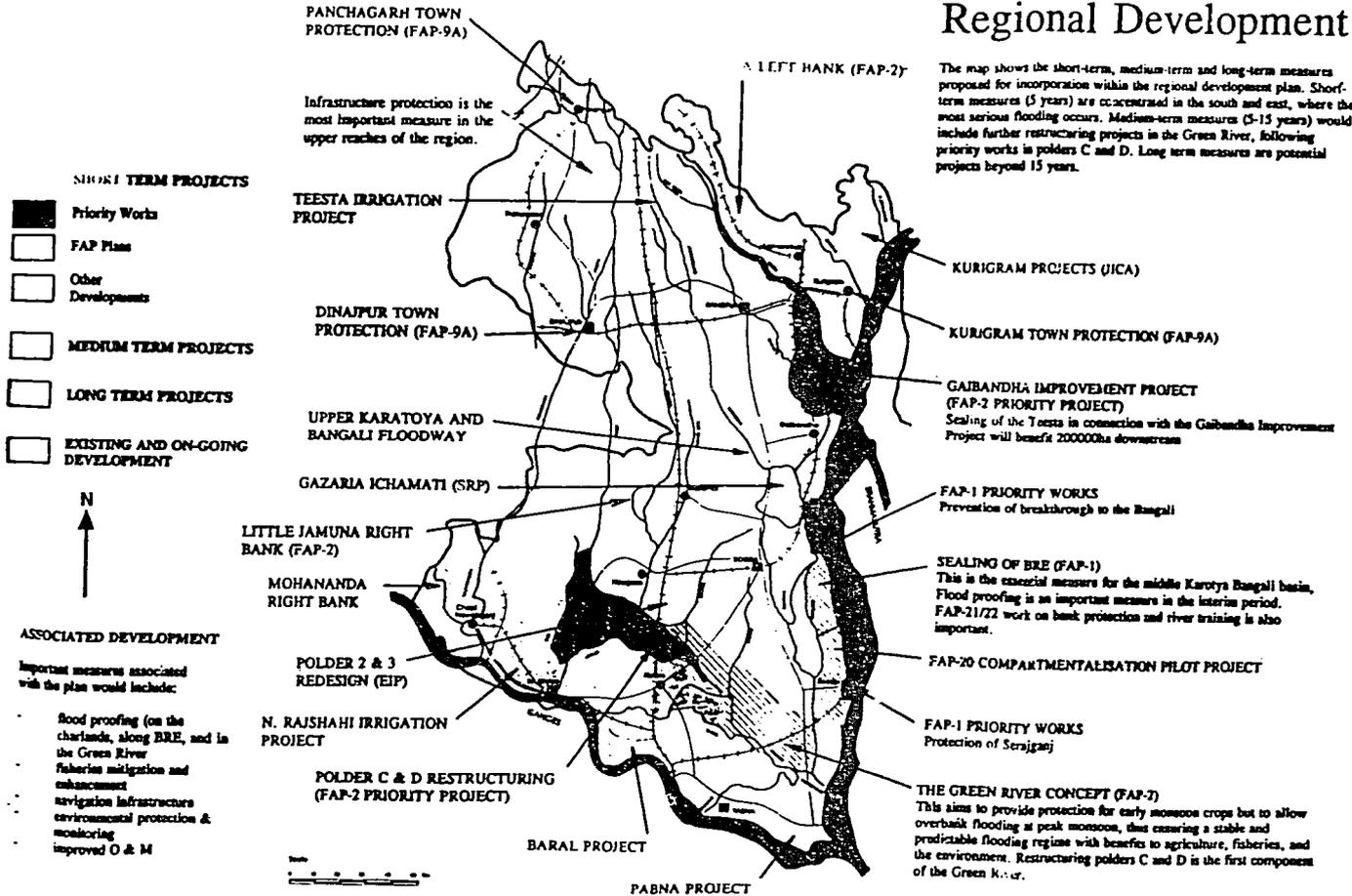
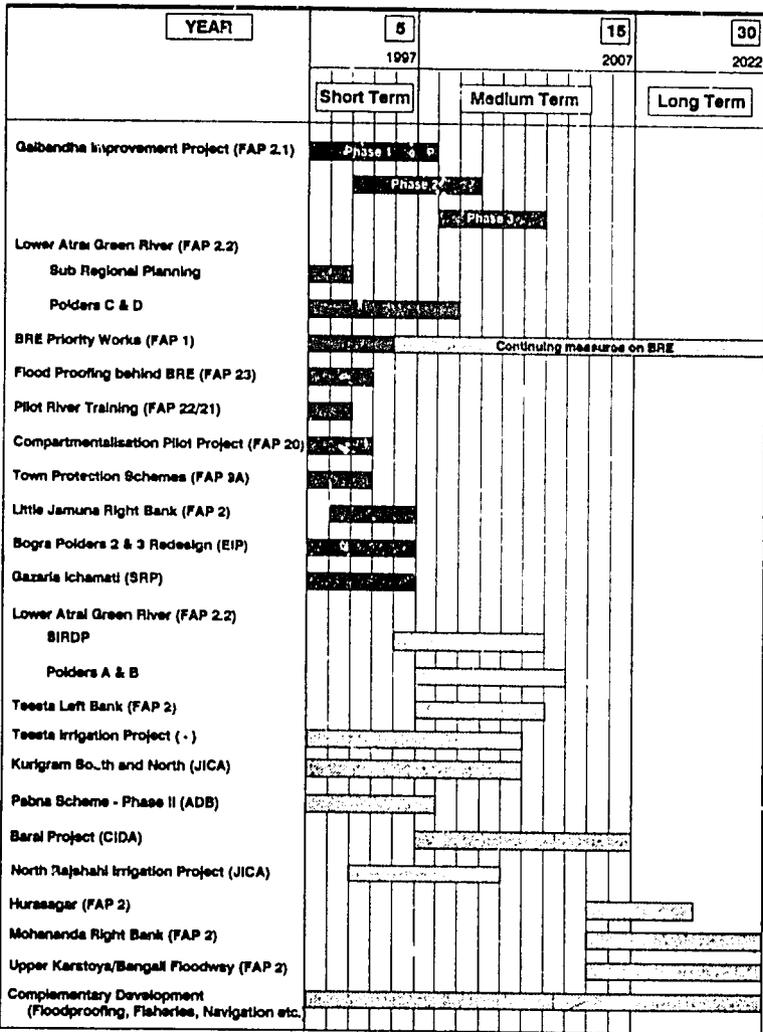


Figure 3

The Regional Plan

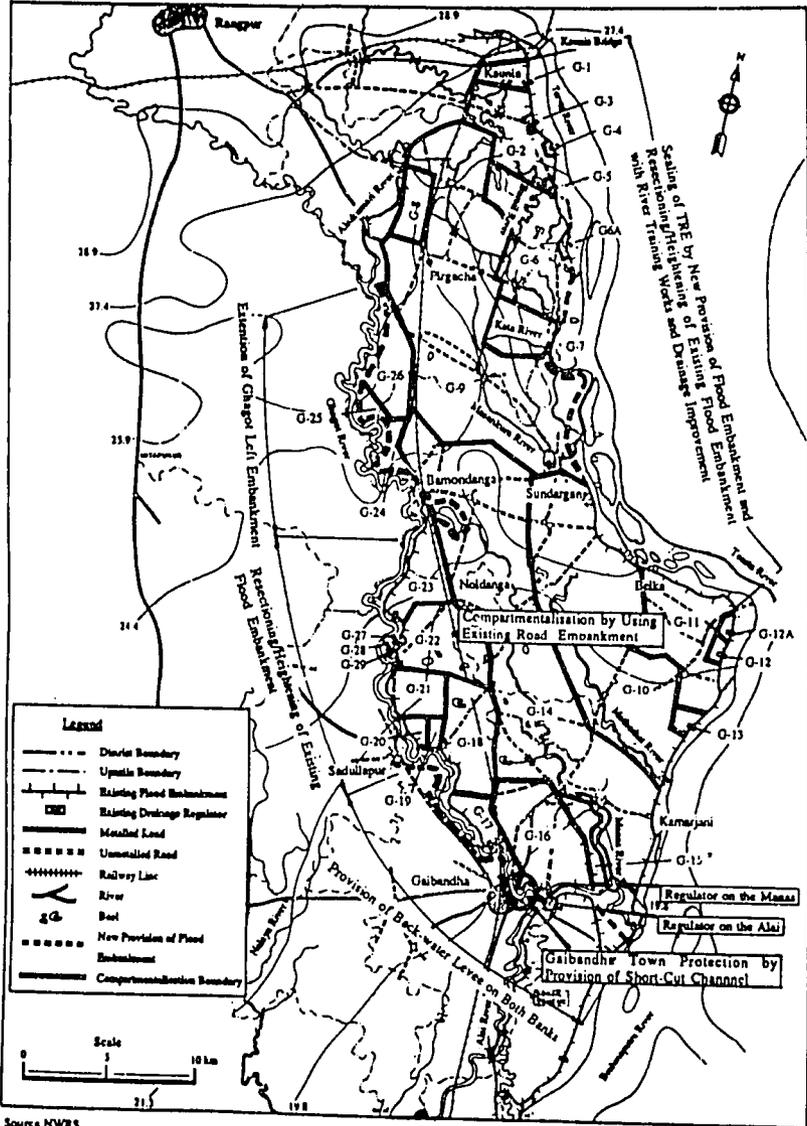


Source : WFP

Continued on next page

Figure 4

The Project Plan



Source: NWRS

TECHNICAL SESSION - FAP 2

Answers given by FAP 2 Team Members and FPCO Staff

Mr. Abu M. Sufian: Research and Advisory Services

Question: Compartmentalization - To date, compartmentalization has been referred to as a concept which is to be tested in FAP 20. On what ground are you making recommendations for the GIP?

Answer: The GIP area is already divided up into compartments by the existing road structure and these compartments, in many cases, they have their own water management regimes.

Mr. Akhtar Hamid Siddique, MP Naogaon-3

Question: Mr. Frank mentioned that he was trying to make sense of the large number of projects and large number of cuts made by the public, he also mentioned that about 100 cuts were made, does that mean that the previous plans were not done properly?

Answer: The large number of cuts have occurred recently and are a result of changing hydrological and socio-economic condition, rather than unappropriated concepts at the time of planning.

Question: Sustainability in Lower Atrai basin not very clear as to how and in which way the water can be sustained. To my knowledge lot of water enters from the nearer area of our neighbouring country.

Answer: Sustainability refers to sustainability of use of land and water resources, rather than hydrological control. It is acknowledged that cross border flows from India made control of lower Atrai flood plain more difficult.

Question: What steps have been taken so far to project Manos Regulator which may be destroyed this year.

Answer: The BWDB is taking all possible steps by construction of retired embankment at upstream of the structure and also making bank protection works at Manos regulator site.

Md. Sariat ullah, CIDA

Question: I did not find any assessment of Baral river impact on FAP

2 area. I would appreciate if the Team Leader provides his idea on the inter related impact of proposed Baral Project and FAP 2.

Answer: The Baral Project is briefly reviewed in the final report. Proposals being made for the project include strengthening of the Ganges left embankment. In other respect the impact of the project on flood planning for the NW is small since it lies at the downstream of the region.

Mr. Colin Palmer

Bangladesh Country Boat Owners Association

Question: The regional plan for FAP 2 recommends a programme for developing navigation facilities. What information and consultation was used in the preparation of the programme.

Answer: Mr. Shahid Ali, a local consultant, worked for two months, mainly in the lower Atrai and GIP area, he used a combination of field work and secondary data sources.

Mr. S. R. Khan, FAP 21/22

Question: Do you suggest that BWDB should not spend any more money for the protection of Manos Regulator?

Answer: Probably not, it will be very expensive and possibly not effective. We also believe that our proposal for GIP make better drainage configuration in this area.

Mr. M. A. Salam, Chief Engineer, BWDB

Question: Have you given any of your observations about the study of compartmentalization project in Serajganj? Whether FAP 2 consultant had the responsibility of coordination with this study?

Answer: We were in constant contact with FPCO and FAP 20 concerning the Sirajganj Project. However we did not have opportunity to coordinate this study.

Mr. Dara Shamsuddin, FAP 16

Question: In what way FPCO EIA Guidelines helped FAP 2 Study?

Answer: We followed the EIA guidelines to the greatest extent possible and generally found very helpful.

Question: From your experience, do you recommend any particular approach to peoples participation?

Answer: The approaches to people participation been developed by FPCO and the FAP studies are generally sensible, and our approaches were in accordance with them. We recommend that participation must be a combination of village level meetings together with meetings at all levels of the political hierarchy (MP, Union Chairman, etc.)

Md. Sariatullah, CIDA

Question: Appreciate attempt of public discussion/consultation. Have you documented the discussion or have any plan to document public discussion.

Answer: Public consultation under FAP 2 are fully documented in volume II of the Draft Final Report.

Mr. Jorn Rasmussen, FAP 25

Question: FPCO guidelines for Project Assessment outlines a framework and procedures for environmental review of the recommendations of the various FAP regional plans (i.e. review by FPCO, Department of Environment and Local Government Authorities). Have your proposals for Gaibandha Project been subject to this review.

Answer: The FAP 2 plans were reviewed by FPCO. We do not know whether they were reviewed by Department of Environment or Local Government Authorities.

Mr. Mostafa Kamal Majumder, The Telegraph, Dhaka

Question: Has any estimate been made about the costs implementation of your recommendation in respect of the North West Region.

Answer: Yes, these are presented in the Regional Plan Final Report.

Mr. Monwar Hossain, Managing Director, MARC and
Team Leader, FAP 15

Question: Is the flow of water in the Ganges an important parameter in optional planning of water resources management in the NW Region? If no, what assumption have been made about future values of this parameter?

Answer: Ganges flows are not a particularly important parameter in the flood planning for NW region as the Ganges left embankment and Pabna scheme embankment successfully stops the overbank spilling. Therefore the FAP 2 study did not need to make assumption about its future value.

Mr. Md. Lutfur Rahman, BWDB

Question: It has been said that Deep Water Aman will grow in the Green River Area. Will velocity of flood water allow that?

Answer: The average velocity in the Green River will be 0.01 m/s, the velocity will permit the growth of Deep Water Aman.

Mr. M. F. A. Siddiqi, MARS & Associates, MARS & Associates Ltd.

Question: Since you stated that your studies were confined to wet season only and did not address any dry season situation would you then agree that your studies are incomplete as they do not cover the whole year planning. Suppose later these studies appear to be conflict with the requirement of the dry season, then are you not left in a quandary?

Answer: Our studies addressed the dry season situation to the extent that we assessed the impact of possible measure on the ground water resources. The scope of work of FAP 2 was especially confined to the flood season and the report is not therefore contractually incomplete. It is acknowledged that it would have been preferable if the study had covered wide year planning but it is normally that regional plan proposals will be in conflict with dry season requirements.

Mr. T. Herman, World Bank HQ

Question: Are there flood proofing proposals in the plan and what impact do they have on flood mitigation?

Answer: Flood proofing proposal are included in the regional plan. These will have little direct effect on the hydrological conditions but will be impact in mitigation of human and personal suffering are less.

Dr. Bilqis Amin Hoque, Environmental Health Science
IDDRB, Mohakhali, Dhaka

Question: Environmental and health issues have been hardly mentioned in regard to their findings and future strategies.

Answer: These are fully covered in the Draft Final Report (in particular Volumes 4, 8, 14 and 15).

Dr. A. L. Sarkar

Question: How does the Green River Scenario help mitigate the capture fisheries losses? Could you please explain?

Answer: The Green River scenario retains a large area of flood plain for flooding during monsoon then the alternative strategy for the lower Atrai such full confinement. It thus helps to mitigate the capture fisheries losses.

Mr. J. U. Chowdhury, BUET

Question: As per TOR, the NW Regional study concentrates mainly on the wet season. Do you think without looking into the whole water year a regional water resources plan would be successful?

Answer: See response to above question. (Mr. M.F.A. Siddiqi, MARS & Associates)

Mr. Abu M. Sufiyan, Research and Advisory Services

Question: Presently the Fishery Study (FAP 17) has not been completed; will the proposed construction works at GIP be carried out prior to the findings and recommendations from FAP 17? If not, why?

Answer: FAP 17 will be completed before construction begins for GIP.

Question: Does a priority project require public consultation, EIA, etc.?

Answer: The GIP has been the subject both of public consultation and EIA.

Mr. Halimur Rahman, FPCO

Question: Whether any diversion of water from Jamuna/Brahmaputra or Teesta is required in order to meet up the water resources requirement of NW Region. If so, whether any structure across Jamuna is required for this purpose.

Answer: As noted above (question 13) the FAP 2 study did not directly address problem of dry season supplies. We are not therefore in a position to respond to this comments.

Dr. Hassannuzzaman Khan,
Bangladesh Agriculture University (BAU)

Question: There is consensus that embankment would rise river bed in future. How does FAP take into account the effects of such raised river bed?

Answer: The FAP 2 studies included consideration of morphological impacts of proposed flood protection measures within the region (Volume 10, Draft Final Report). For the major rivers a national level study must be undertaken.

Mr. Syed Waliullah, FPCO

Question: Public Participation

How would you respond to the criticism made by our friends at Dhaka and abroad that people are not taken into consideration in FAP studies?

Answer: As fully described in Volume II of the Draft Final Report, FAP 2 studies put considerable resources into public consultation.

Mr. J. Dempster, POE/FPCO

Question: The strengthening of BRE is a top priority? I understand that FAP 1 is coming up with provision of hard points only. Who will be dealing with BRE itself.

Answer: As the FAP 1 proposals become classified, it will be necessary to undertake a program of strengthening or retaining the BRE along reaches outside the head points. Thus would be best done under a separate project (FAP 1.1 or FAP 2.3).

Mr. T. Herman, World Bank - HQ

Question: What is your view on the impact of erosion on the sustainability of a Bangali Floodway Headwork? How much land acquisition would be required?

Answer: Bangali floodway is proposed at upstream of Sariakandi, presently there is no erosion at outfall of the proposed floodway. The outfall is situated between Fulchari and Sariakandi, BRE will be strengthen at Sariakandi as priority location and Fulchari in long term. Under the present situation the outfall of Teesta and Hurasagar is functioning without any protection works. However detail morphological implication will be examined during feasibility study of Bangali floodway, it should be decided to go ahead with the proposal in the medium to long term.

About 6700 hectare of land is required for the entire 100 km floodway.

Mr. M. A. Quassem, BWDB

Question: Public cuts are the logical consequences of bad (or inadequate) planning, if need of the target beneficiaries are considered prime. What is your opinion.

Answer: See response to the third question. Extensive public cuts are a relatively recent phenomenon and are a result of changing hydrological and socio-economic condition.

Dr. A. L. Sarker, POE/FPCO

Question: Mitigation plan for the disadvantaged group full time fishermen/landless/subsistence fishermen. Did you plan any mitigation plan for the aforesaid disadvantaged group with cost effectiveness?

Answer: Various mitigation measures for fishermen were identified and defined. These were not subject to cost benefit (Cost effectiveness analysis).

Engr. Md. Aminur Rahman, Consultant for Research and Advisory Services

Question: Please explain the utopian term compartmentalization as mentioned in page 5 of the paper.

Answer: In FAP 2 planning compartmentalisation means the elimination of cross-basin drainage transfers. It is an attempt to reduce the volumes of flood water to be controlled at each compartments and make water management much easier.

Question: It is paradoxical that an alien consulting organization named Leed-Shill de Leuw designed and supervised the construction of the present Manos regulator in the sixties now other conglomeration of alien consultants are suggesting its removal. And what next after 20 years from now?

Answer: The design report of the Manos regulator (1965) clarify that the regulator is to take care the drainage loads of the Manos basin and Ghagot basin in pre-monsoon time, however during monsoon excess flood flows through Alai river to Bangali system. Under the present situation TRE is being breached every year contributing flood in the Ghagot and on construction of Sonali scheme and changes in infrastructures in the area causes substantial changes in hydrological regime. As a result public cuts is regular feature in the BRE and Sonail scheme area and thus we recommend improved drainage facilities by Ghagot floodway and relocating Manos regulator for Manos basin.

As socio-economic conditions in Bangladesh are changing very fast it is quite likely that planning priorities and concepts may change significantly over a 20-year period.

Mr. G. T. Keith Pitman, ISPAN

Question: Given the complexity and challenges posed by on-going projects, is it not premature to implement the Sirajgang compartmentalization project and the Gaibandha Improvement Project until sufficient time has elapsed to allow meaningful evaluation of FAP 20's Tangail CPP?

Answer: Please see response to the first question.

Mr. Abul Kalam Azad, MP Jamalpur

Question: Do you think you can resolve the flood control problem without the cooperation of India? If the answer is no, what happens with FAP in the future?

Answer: Cross border flows from India are complicating factors in flood planning and full co-operation with India would be desirable. FAP 2 also recommended not to implement measures on the upstream reaches of the river Atrai which might increase flows in the middle of the river in the Indian enclave. However the main FAP 2 proposals are valid whether or not cooperation with India can be obtained.

Begum Matia Chowdhury, MP, Sherpur-2

Question: Flood control by Dams are expensive but effective is not considered. Other measures like embankment could not solve the flooding problems rather loss of lands due to embankments. Fisheries is the main source of protein, has reduced due to intervention by embankments. The rivers are gradually silting up and navigation draught is reduced. Why dredging is omitted on the ground of huge expenditures.

Answer: As suggested by the question, the main argument against dredging is the huge expense involved, together with difficulties of operation and maintenance (e.g. the need to continually repeat the dredging operation and the disposal of the dredging spoil).

Mr. Abul Kalam Azad, MP Jamalpur

Question:

In 1954 - 35% of total land went under water

In 1974 - 36% of total land went under water

In 1988 - 57% of total land went under water.

If FAP is executed in total, what percentage of total land may be saved from flooding?

Answer: Several of the major regional studies have yet to be completed and therefore it is not possible, at this stage, to assess in total the flood control recommendations.

Mr. M. F. A. Siddiqi

Question: How much land additionally is required for using the existing roads as flood embankments under compartmentalization plan compared to the total land area protected in the proposed Gaibandha improvement project?

Answer: About 47 ha of land is required and the protected area is 57600 ha.

Question: What do you propose to contain the Brahmaputra along the present alignment if the implementation of river training work along the right bank of the Brahmaputra is delayed or fails to deliver the objectives?

Answer: We recommend retirement of embankment if BRE fails.

Question: Why do you want to remove the existing Manas regulator? If you take up the training works earlier can't the Manas regulator be saved?

Answer: The Manos regulator is inadequate, present Manos regulator is draining the part of Ghagot basin and Manos basin, our plan is to isolate Manos basin and the Ghagot basin. Hydrodynamic model shows Ghagot floodway reduces the flood peak in the Ghagot by more than a meter.

Question: Have you enquired thoroughly the public reaction to the Green River concept from the people of Polder C? If you did so what your contact point? Is your methodology of ascertaining the public opinion compatible with the existing legislative provision in force for the time being (EB Act I)

Answer: We discussed with the public in Bagmara, Singra, Bindarkhari etc; during discussion the people opined that if rate of rise in flood flows is slow they will be able to cultivate the monsoon crops.

Question: What is the ratio of land protected in Polder C area compared to the land thrown to annual inundation under Green River concept?

Answer: Protected area in polder - C is 17800 ha and partial protected area is 25800 ha.

Question: What is the ratio of new embankment length to the land area protected under Green River concept compared to the same ratio under full protection as under the existing concept in the Polder C.

Answer: 445 ha/km of new embankment for full flood control and 645 ha/km of new embankment for partial protection.

Question: What are the reactions of the people living on the natural levee on the right bank of the Atrai to your proposal of keeping the levee open to flood flows of the Atrai?

Answer: The people views are positive to our plan, but due to intervention they want the facility of transportation by bridges.

Question: Is it a fact that the results of the model run of the Atrai floods by the SWMC are different from the results of your model, both using the Mike II program?

Answer: There is minor difference but generally both the models forecast similar results (about 2 meter rise of water level for full confinement).

Mr. Saeed A. Rana, World Bank Resident Mission, Dhaka

Question: How is Teesta Barrage area affected by the regional studies in the North West?

Answer: NWRS considers Teesta Barrage in its planning. During study period Teesta drainage model was not completed, we have considered the proposed drainage channels in formulating the flood control and drainage planning. CFD facilities proposed are not interfering with the Teesta Barrage works.

Mr. Shapan Adnan, Research and Advisory Services

Question: Are you implying that flooding, rather than erosion by the river is the problem which concerns the people of the Gaibandha/Manas regulator area?

Answer: Flooding from the main rivers affects more people than erosion. It is acknowledged, however, that erosion is a very serious problem and catastrophic for those who lose their lands.

Question: Is the probable break through of the Brahmaputra into the Bangali river taken into account in the NW Regional Plan?

Answer: FAP I proposed protection work at Sariakandi which will be sufficient to guard against the possible break through.

Question: Is two rounds of consultation sufficient for people's participation?

Answer: In a feasibility stage it is sufficient. Further consultation will be necessary during the detail planning and design stage.

Mr. Badiuzzaman

Ministry of Irrigation, Water Development & Flood Control

Question: Did you make any specific recommendations/comments on the following projects in the final report?

- (i) North Rajshahi Irrigation Project - studied and favorably recommended by JICA
- (ii) Kurigram FC and irrigation project - studied by JICA.
- (iii) Baral Basin Development Project - CIDA wants to study.

Answer: The regional development plan recommends the following:

- (i) North Rajshahi Irrigation Project
- (ii) Kurigram Project (North and South) and
- (iii) The Boral Basin Project under CIDA

Question: BWDB wants to implement a project for protecting the Manos regulator through some protective work at the BRE. But you have suggested to construct a new Manos regulator at the outfall of it. Is not contrast?

Answer: Erosion is very serious at Manos. Until Gaibandha Improvement Project is implemented we recommend protection of the Manos regulator. We have suggested new regulator for manos on the Manos Khal with outfall at Ghagot river.

Question: BWDB has a proposal for rehabilitation of Chalan Beel, Polder C. Do you recommend it when the implementation of Sirajganj IRD project, Rehabilitation of Chalan Beel, Polder D and Hurasagar FCD have failed to achieve their objectives.

Answer: We have proposed sustainable development plan considering the confinement effect, monsoon crops, fisheries aspect and navigation. Our proposal in the lower Atrai is the broad base Green river scenario.

Mr. Aminul Haque Shah, EE/Joint Rivers Commission

Question: In the Lower Atrai due to drainage congestion during high stage of the Brahmaputra the velocity of flow from upland is likely to drop. Therefore, sedimentation process may occur in the Lower Atrai. Have you studied thoroughly this phenomenon. If so, what would be the rate of sedimentation.

Answer: Under the present situation the area is receiving sediment. The Green river concept will not change the flooding regime in the Atrai basin substantially, we have examined the sedimentation and there will be no major changes in sediment transportation from the present condition.

Mr. Mesbahuddin Ahmed, Chief Engineer
(Monitoring Cell), BWDB

Question: The erosion around Manas Regulator in Gaibandha is very alarming at present and there is tendency of diverting of the Brahmaputra river through Ghagot river to Bangali river. The proposed option of sealing of TRE with river training were and retirement of BRE may take 1-2 years. What is your suggestion for protective works at upstream and downstream of Manas Regulator for this flood season.

Answer: See response to the question 33, BWDB are using their best efforts to protect the existing Mannos regulator.

Mr. M. A. Salam, Chief Engineer, BWDB

Question: Instead of allowing cut along the northern boundary of SIRDP, a diversion canal to allow to divert the flood water to Nimaichari river to mitigate flooding would have been considered better? Has it been considered?

Answer: In the analysis we have considered improved drainage flows through Nimaichari but it has substantial impact on adjoining area. The SIRDP embankment (Taras - Nimaichari) causes serious flooding to the west of the existing SIRDF embankment and the overland drainage flows is also restricted. Hence we recommend the Taras-Nimaichari embankment to allow flooding under Green river concept.

Dr. A. M. Chowdhury, SPARSO

Question: In addition to the summer monsoon flood problem we seem to have a serious shortage of water in the dry season. To address the problem there is suggestion of a Ganges barrage. Now the question is can the two problems - excess of water and shortage of water be addressed in an integrated manner?

Answer: The serious shortage of water occurs in the SW region than in the NW region. However as discussed in are response to question 13, it would be preferable if the next stage of flood planning should address the monsoon and dry season together in an integrated manner.

Mr. M. A. Khan, Chief Engineer, Project-4, BWDB

Question: When the strengthening of Teesta Right Embankment is going to be implemented? Who will bear the cost?

Answer: Strengthening of Teesta Right Embankment is a precisely proposal of the GIP. A funding agency has not yet been identified.

Dr. A. L. Sarker, POE/FPCO

Question: Gaibandha Improvement Project (GIP)

This project includes sealing of the Teesta Right Embankment both upstream and downstream together with strengthening of the existing embankment. What is your development option for mitigation by structural measures. If it is a fish friendly structure, is there any costing?

Answer: Cost for fish friendly structures has been included in the GIP.

Flood Action Plan - Proceedings of the Third Conference

TECHNICAL SESSION I

May 17, 1993

(15:45 - 17:50 Hrs.)

- Chair: Mr. S. M. Al-Hussainy
Ex-Chairman, Public Service Commission
- Rapporteur: Mr. A. A. Ansari
Director, Program
Bangladesh Water Development Board
- Topic: (a) FAP 3 North Central Regional Study
by Mr. M. R. Chowdhury and
Dr. D. A. Brown
FAP 3 Study Team
- (b) FAP 3.1 Jamalpur Priority Project
by Mr. Malcolm F. Wallace
FAP 3.1 Study Team

North Central Regional Study (NCRS) FAP 3

Introduction

1. The Flood Action Plan was prepared in December, 1989 by the World Bank in close co-operation with the Government of Bangladesh. It was formally endorsed in a meeting of Government of Bangladesh and Donor's representatives in London in December, 1989 and subsequent Dhaka conference in January, 1990. The Flood Action Plan (FAP) comprises more than twenty six components of which eleven are main studies and rest are Supporting Studies and Pilot Projects. Out of the eleven Main Studies five are Regional Studies. North Central Regional Study is one of the five Regional Studies designated as FAP-3.

Project Area

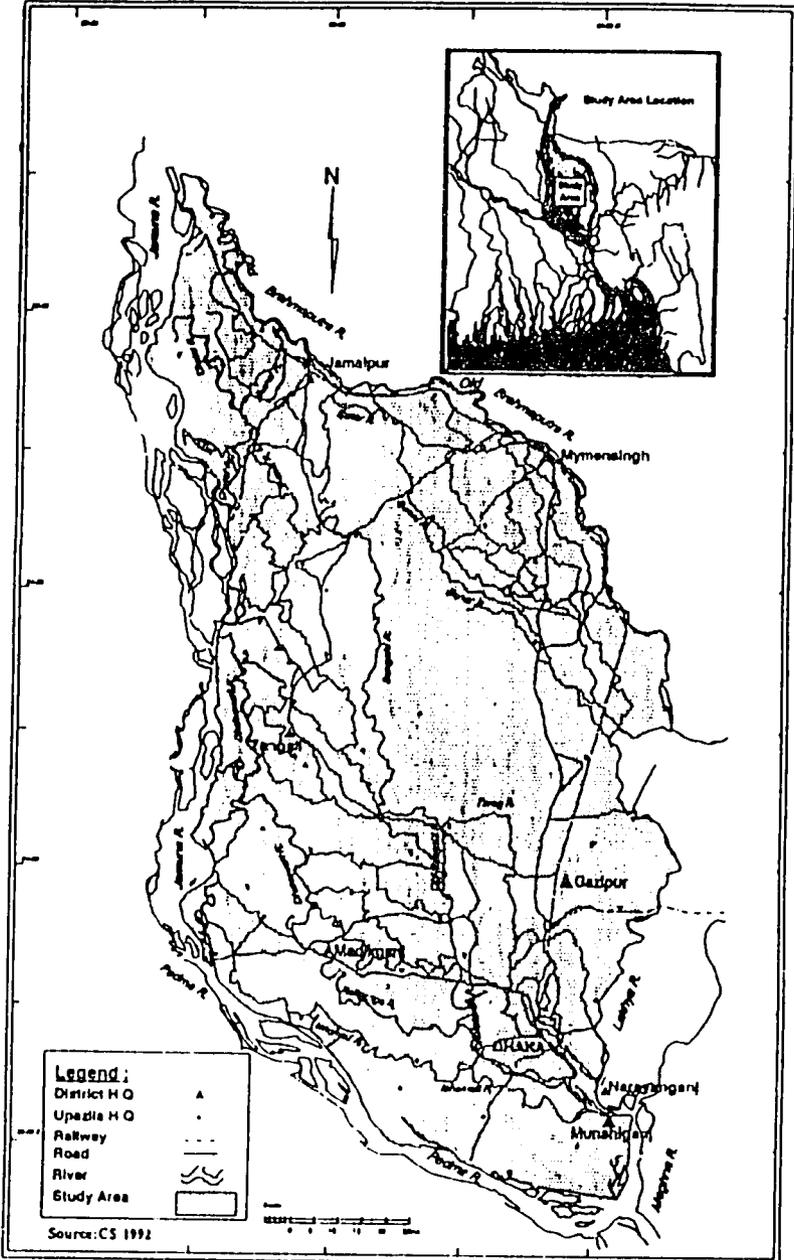
2. The project has an area of 12,000 sq/km covering the districts of Mymensingh, Jamalpur, Tangail, Gazipur, Manikganj, Munshiganj, Dhaka and a small part of Narayanganj (Fig. 1). It is a very flat one with elevation between 18m (PWD) in the north to 4m (PWD) in the south. The area is bounded by the Jamuna river in the west, the Padma & Meghna rivers in the south and the old Brahmaputra and Lakhya rivers in the north & east. The population of the area is about 17 million. Agricultural products are the main output of the region except the industrial output of Dhaka and its neighboring area.

Study Objective

3. The overall objective of North Central Regional Study (NCRS) is "to prepare a regional water development plan with emphasis on the flood control and drainage measures that would be needed to achieve a sustained development of the regional economy, taking into account social and environmental factors. The regional study will focus on areas where flooding and impeded drainage hamper economic activity and will identify a series of measures to alleviate these adverse effects and to develop the land and water resources". Subsequently the importance of assessing the year round management of water resources has become

Figure 1

The Study Area of FAP-3



apparent and it is recommended that this should be incorporated into a full water resources development plan, including the irrigation potential of the region.

Present Situation

4. Flooding in the North Central Region originate from 3 sources: direct rainfall, direct over bank spillage from the major boundary rivers and overbank spillage from the internal regional rivers. It is possible for each phenomenon to occur separately or in combination with any other. The proportionate contributions of rainfall, Jamuna and local rivers varies between years and within flood seasons.

5. The pattern of river levels generally experienced in the region shows a 2-peaked response, the first peak being generated by internal regional rainfall excess, normally in June/July, and the second peak resulting from high cross-boundary flows in the major rivers, normally in early September.

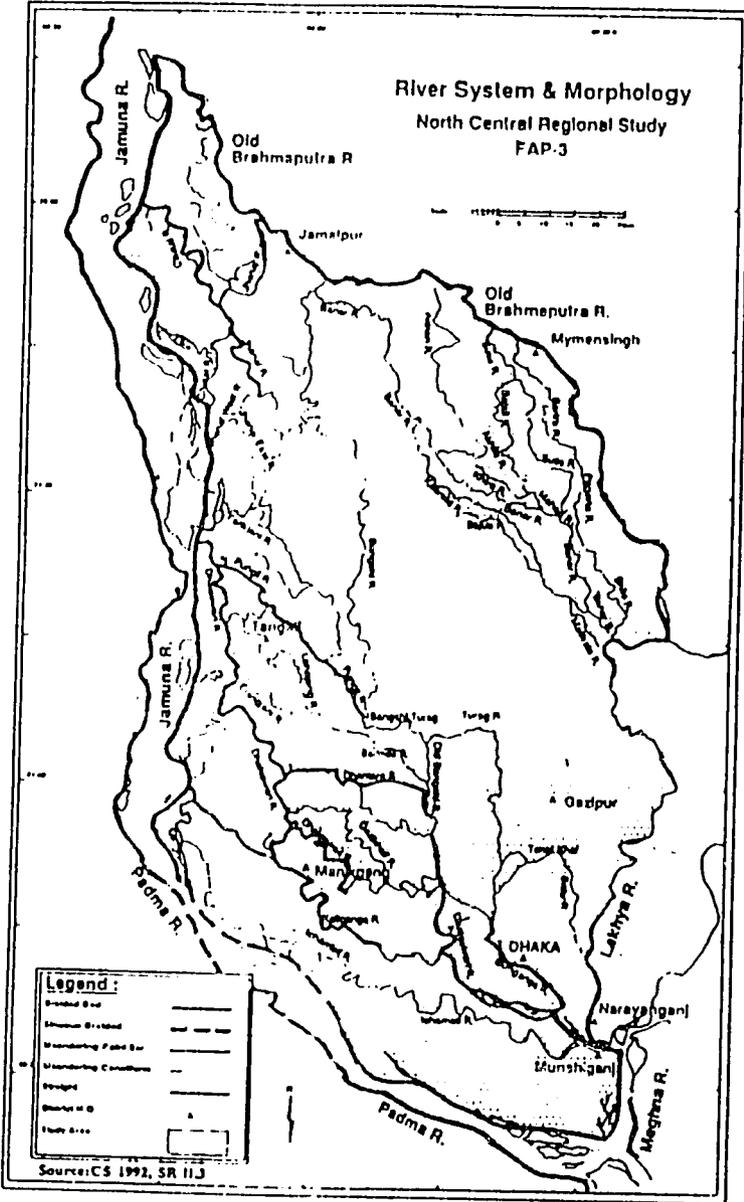
6. The flooding and drainage system of the North Central Region is characterised and influenced by the 3 major rivers forming its boundary: the Jamuna, padma and the Old Brahmaputra-Lakhya-Meghna system (Fig. 2).

7. The old course of the Brahmaputra River forms the northern and part of the eastern boundary of the study area. The mouth of this river has been steadily silting over the years since the river changed its course and the flows down this branch is a fraction of the original. The remainder of the eastern boundary of the study area is delineated by the Lakhya River, a distributary of the Old Brahmaputra River.

8. The interior rivers may be categorised as falling into 3 distinct systems:
- (a) the Dhaleswari-Kaliganga system in the south-west
 - (b) the Bangshi-Turag system in the central part
 - (c) the Banar-Lakhya system in the eastern part.

The Dhaleswari-Kaliganga system comprises the major distributaries of the left bank of the Jamuna, (Old Dhaleswari, Dhaleswari, and a number of un-named but significant spill channels), together with their distributaries, (Lohajang, Elangiani, Barinda). Downstream from its offtake from the Jamuna, the Dhaleswari bifurcates, the major channel now called the Kaliganga to the south

Figure 2 - River System & Morphology Study of FAP-3



of the diminished Dhaleswari. The two channels reunite at Kalatia, the Dhaleswari at this point having "captured" the Bangshi River.

9. The Bangshi-Turag system provides the central spine drainage of the region. It is fed partly by spill from the Jamuna through the Northern Dhaleswari intake via the Pungli River, partly by the accumulated runoff from the north-west of the region, (Jhenai River, Fatikjani River), and partly from the direct runoff into the Bangshi from the western slopes of the Madhupur Tract.

10. The Banar-Lakhya system to the east of the Madhupur Tract is mainly rainfall fed, with direct contribution from the Old Brahmaputra through the Lakhya River, Downstream of Toke, the Lakhya River is the main branch of the Old Brahmaputra. This system is unaffected by flows in the Jamuna, although extreme levels in the Old Brahmaputra can result in spillage at certain locations.

11. Average monsoon rainfall of the area varies from 1,400 mm to 2,200mm. The south-west monsoon winds usually begin in June and last through to October bringing heavy, persistent rains.

12. The regional rivers in the west of the North Central Region are predominantly characterised by having river banks (levees) which are elevated above the surrounding flood plain. This is a result of either man-made intervention, in the form of embankments, or a natural phenomenon of built-up levees, typically exhibited by rivers subject to regular flooding of sediment-laden waters. The consequence of this physical characteristic serves to determine the system response to rainfall and river flooding.

13. Drainage of the North Central Region takes place at 4 levels: the boundary river system (primary), the regional river system (secondary), the khal system (tertiary), and the beel system (quaternary). The mechanism by which the region drains relates directly to this hierarchical system and its interconnections. Excess rainwater accumulates first in the depressions, (beels), until these have reached their capacity. Gradually the extent of inundation increases until the small khals linking the depressions begin to flow. These khals form an interlinking network with the internal drainage system and they are also the means by which the transfer of water between the regional rivers and the flood plain takes place.

14. The key to the drainage of the North Central region lies in the

prolonged influence of the high river levels in the boundary rivers over the regional river levels. Unless the levels of the lower Meghna can be reduced at times of high flow, the drainage outlet from the North Central region will remain congested. Limited improvements can be made to local drainage conditions within the region, but these will ultimately be at the expense of the downstream reaches, however restricting the inflow from the main rivers into the distributaries would decrease flooding by limiting the water entering the regional drainage network.

Regional Overview

Natural Resource

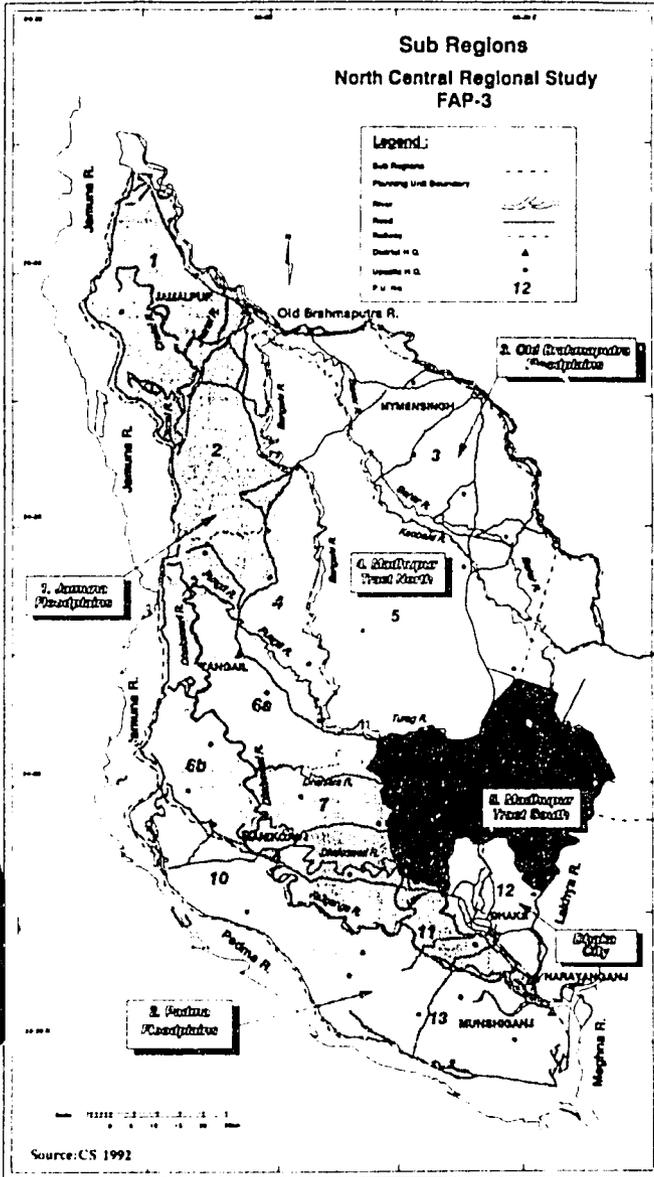
15. The NCR land resources broadly consist of five main characteristic sub-regions on the basis of physiographic units (Fig. 3.)

- Young Brahmaputra and Jamuna Floodplains
- Old Brahmaputra Floodplain
- Padma Floodplain
- Madhupur Tract north
- Madhupur Tract south

The soil occur in complex patterns, but consist mainly of two types - (a) Floodplain soil type, and (b) Madhupur Tract soil type. Floodplain soils comprise a pattern of sandy to loamy soils in the higher parts of the floodplain ridges grading into clay in adjoining basins, with the southern (downstream) floodplains being more clayey. The Madhupur Tract Soils are underlain by Madhupur clay with variations in depth, drainage and degrees of weathering most soils, both deep and shallow, are well to moderately well drained. The Madhupur Tract can be classified as moderate agricultural land, except the shallow red and brown soils which have a low potential for both agriculture as well as forestry.

16. The parts of Madhupur Tract that extend in Savar (Dhaka District), Kaliganj and Kapasia (Gazipur District) and Muktagacha (Mymensingh District) have reserve forests, but due to the increasing population pressure along with the expansion of habitat and industry, the forest land in the NCR is diminishing very fast. Forest trees are felled randomly and the programme of afforestation is meager.

Figure 3 - Sub Regions North Central Regional Study of FAP-3



17. Fisheries form a significant resource of the area particularly in the floodplains. Flooding in the North Central Region, whilst being disruptive and at exceptional times highly damaging, also provides benefits, one of which is a very important, self-sustaining floodplain fishery. A large number of fish species migrate from rivers to reproduce, feed and grow on the floodplains. Most of the fish production in the NCR is derived from open water capture fisheries, the greatest proportion being provided on the floodplains.

Infrastructure

18. The principal manufacturing activities are the jute, garments, leather, chemicals and food industry in and around Dhaka. The remaining area is mainly agricultural. However more than 21% of the national cottage industry units are located in the NCR. The Jamuna Fertilizer Factory is located at Tarakandi on the bank of the Jamuna River.

19. The region is well connected by national railway network. There is a relatively high proportion of the national highways inside the NCR. The peripheral boundary of the region has a well developed navigational network.

Other Activities of Particular Relevance to NCRS

20. The NCRS is being carried out within the overall framework of the Flood Action Plan (FAP) and both provides information to, and depends on information from, other FAP studies. Linkages are being maintained with most FAP studies. The approach to planning and impact assessment also follows the Guidelines on Project Assessment prepared by the FPCO (FPCO 1991).

FAP 3.1

21. The Jamalpur Priority Project Study is being carried out concurrently with the latter half of the North Central Regional Study, Phase 2.

22. The interaction between the two studies is important, and development strategies for the Jamalpur area must accord with the overall development strategies for the Region as a whole and thus form an integral part of the Development Plan. Close liaison has been maintained between the two studies to ensure a coordinated approach to the work.

FAP 20

23. One of the two pilot areas for the Compartmentalization Supporting Study (FAP 20) is located around Tangail, with the NCRS area. This study began in mid-1991 and is planned to continue for 4 years. The objective of the project is to test the compartmentalization concept. The study addresses the complex social and environmental aspects of such local level development and carried out planning in close consultation with central and local government agencies and the public.

Jamuna Bridge Project/Dhaleswari Mitigation Study

24. The Jamuna Multipurpose Bridge Project lies within this region. The bridge will connect Sirajganj on the west and Bhuapur in Tangail district on the east Bank. The go-ahead, in principle, has now been given for the construction of the Jamuna Bridge. The Jamuna Bridge Authority's (JMBA) plan to cut off the northern intake of the Dhaleswari has direct implications on the NCR and in particular the area around Tangail including the FAP 20 pilot area. The impact of the bridge on water levels and the river morphology is significant and thus the NCRS had to consider all possible development scenarios both with and without the Jamuna Bridge being implemented. The Dhaleswari Mitigation Study (JMBA 1991) has also investigated the impact of a guide bund downstream of the Jamuna Bridge. This has also been taken into consideration in the NCR planning process.

Jamuna Fertilizer Factory Road

25. The Jamuna Fertiliser Company (JFC) plans to facilitate access to their factory by improving the existing BWDB embankment from Bhuapur to the factory site at Tarakandi. The JFC is giving this a high priority and has started construction through the Roads and Highways department in 1992.

26. The road should assist with the control of flooding from the Jamuna for a 30 km stretch of the river. The NCRS and the FPCO have communicated to the RHD the recommended formation level. Work has already started for construction of this road.

Multi-Disciplinary Planning Process

27. The Regional Planning approach is structured to cope with the varying physical and water regime conditions which prevail across the region. Strategies are based on different forms of intervention either structural or non-structural. Where adverse impacts might be expected in relation to the ecosystem or on socio-economic factors from a particular intervention, mitigation measures are also formulated.

28. The major focus of attention has been given to the western and south western parts of the region where flooding is normally the most severe. Flooding cannot be completely eliminated from these areas and it is not considered desirable to modify the seasonal water regime to much extent. However measures are proposed to provide a greater degree of control of the flood events and reduce flood peaks. The interventions being considered provide, through water management and spillage reduction, an attenuation of the flood hydrographs within the system. Reducing spillage from the Jamuna will decrease regional river channel discharges and hence the risk of damage to infrastructure in the south western part of the area. This will reduce the rate of flood water rise and benefit the agricultural sector through changed cropping patterns and reduced crop damage.

29. The planning process was multi-disciplinary and involved extensive field work including socio-economic and environmental surveys, giving due importance to public participation. A hydraulic model was used along with engineering, economic, agricultural, fishery and socio-economic analysis as well as institutional and environmental studies. These were incorporated into a multi-criteria analysis for the identified scheme alternatives.

Water Development Strategy

30. A water development strategy is proposed and the water resources characteristics, are considered along with socio-economic, environmental and national planning aspects:

- (a) identify economically viable developments
- (b) identify where high agricultural value can be added from controlled flooding interventions
- (c) priority to heavily distressed sub-regions

- (d) develop first where socio-economic frameworks exist to sustain growth
- (e) involve local people in the planning and management of FCD/I programmes
- (f) promote local economic initiatives induced by agricultural/livestock/fisheries improvements
- (g) allow for mitigatory measures wherever persons are adversely affected by a development
- (h) use embankments for several socio-economic purposes
- (i) economic promotion through improved institutional measures
- (j) sub-divide region into regional planning units to facilitate the planning process
- (k) develop environmental management programme so as to sustain the region's resources.

Development options have been formulated and include:

- (a) semi-controlled flooding and drainage, where flooding depends partly on embankments with fully gated structures, and partly on natural openings or semi-regulated ones;
- (b) compartmentalization (water management systems including required institutional agreements and comprising peripheral inlet/outlet structures, internal water control works, channel improvement, and infrastructure improvements), and
- (c) development of unprotected or partially protected areas in terms of flood proofing (both rural & urban), flood preparedness and early flood warning systems.

Within the various sub-regions of the North Central Region, compartmentalization is expected to play a key role in all future development

scenarios. The compartmentalization of protected areas creates water management units organized by the local beneficiaries and supported technically by the local institutions.

1. Meaningful environmental assessment of a regional water development plan should be postulated on an environmental data base that is adequately comprehensive and refined. The data base in Bangladesh is limited. However during the present study attempts were made to collect or assemble available data.
2. The Initial Environmental Evaluation has identified that the biological resources and ecological processes provide the life support systems which underpin the rural and urban economy of the NCR. To achieve "sustainable development" and the conservation of a diverse resource base for future generations, subsequent planning of water management systems of the NCR must include design and operational criteria that allow most of the characteristic ecological processes to continue.
3. This requires the maintenance and management of a minimum area for open water fisheries and for the adoption of project design and components to better address public health, general nutritional needs and equity issues.
4. Successful water resources development is dependent on its acceptance by the local community and public participation is important in this regard. Besides on the spot discussions with the people, a public meeting was arranged in Mymensingh to discuss the Draft Plan which heard the views of some Members of Parliament and other representatives of the Region. This has resulted in the inclusion of certain additional regional schemes which although not receiving a high priority in terms of a response to flooding problems alone, have significant irrigation and agricultural development potential. These makes them important for the overall water resources development of region.

Methodology

5. The North Central Regional Study is comprised of two phases. Phase 1 of the NCRS was a reconnaissance study and took place in April to June 1990. Phase 2 commenced in March 1991 and has involved the evaluation of alternative water development strategies and the preparation of a Regional Water Resources Development Plan (RWRDP) including the identification of priority

projects. The prioritized projects are studied at pre-feasibility level and the Terms of Reference for subsequent Feasibility Studies have been prepared.

6. The main focus of the Flood Action Plan as defined in the Eleven Guiding Principles has provided the framework for the development planning being undertaken. An inventory of development alternatives and components is given.

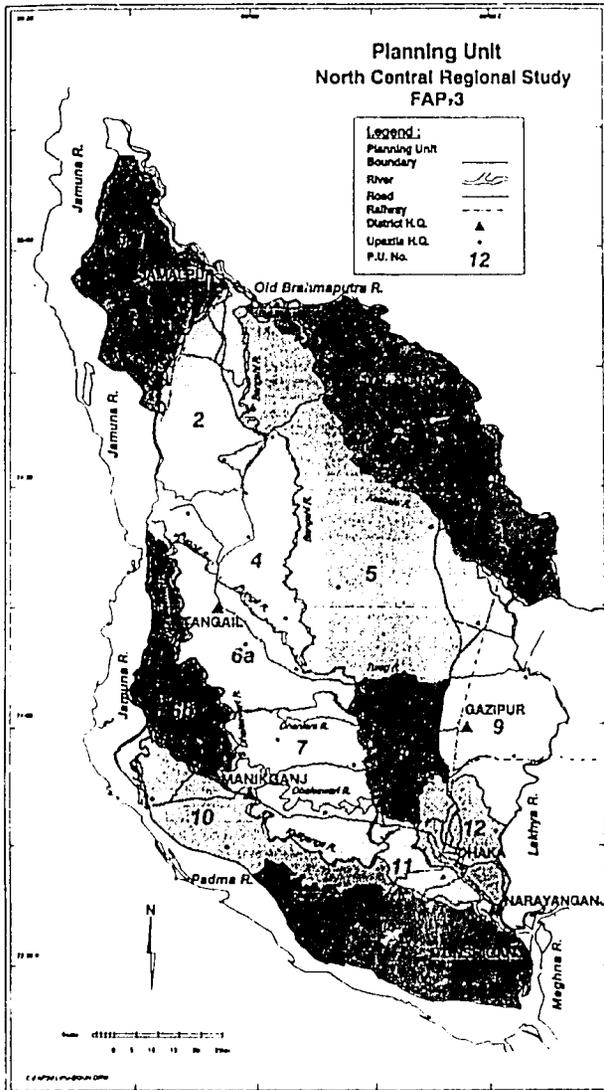
7. The Region was initially divided into thirteen Planning Units (PUs), (Fig. 4), to assist in classifying the characteristics of the region, & to allow alternative development strategies to be prepared for different PUs. These PUs have been delineated using hydrological, soils, land use, population intensities and socio economic characteristics. The PUs are defined to assist in the planning process, they are not development units and options may need to be implemented over more than one PU at a time.

Preliminary Screening of Development Options

8. Appropriate flood mitigation actions are summarized for each PU in the Study. After considering the main physical development constraints, PU's 1, 2, 4, 6, 7 and 10 are considered as priority development areas. Inside these PU's several planning actions are described in technical and economic terms with or without combination of regional schemes (linking together for instance PU1 and PU2, also PU2 and PU4 for which flood mitigation measures are clearly interrelated). Alternative scenarios have been taken into consideration for the above priority planning units which include the possible implementation of Jamuna Bridge. In addition to planning for the development of these priority planning units the Regional Water Resources Development Plan (RWRDP) also assesses the other planning units (PU's 3, 5, 8, 9, 12 and 13) and recommends local planning and water management measures.

9. Subsequently, the characteristics of the PUs have been compared and the results indicate that the NCR can be broadly categorized as falling into 5 characteristic sub-regions on the basis of biophysical and socio-economic features: The natural and socio-economic environment is described on the basis of these sub-regions and a water development strategy developed.

Figure 4 - Planning Unit of FAP-3 Study



Pre-Feasibility Studies

Jamalpur Priority Project, Schemes RS1

10. The Jamalpur Priority Project, schemes RS1 (also known as FAP 3.1) covers an area of 92,242 ha of main land consisting of PU1 is located at the northern upstream corner of the NCR. This was identified early in the FAP as being suited for priority development (the FAP 3.1 Feasibility Study has been carried out concurrently with this NCRS).

11. Both the FAP 3 and 3.1 analysis of RS1 shown that a low cost engineering option (Option B) is the most viable option for the area. An alternative flood proofing and local drainage option (Option A) would provide benefits in terms of security from floods but it is difficult to justify this option on economic grounds as the assessment of costs and benefits of flood proofing have not yet been well quantified.

12. Option B allows for the best use to be made of the advantages of the JPPs area. The option is being developed by FAP 3.1 that will utilize the existing embankments where appropriate and keep construction costs down to minimum. Fap 3 calculate that such an approach would give an IRR of 12% (without taking into account the costs or benefits of flood proofing). If allowances are made for indirect benefits (of damages avoided and increased agricultural benefit) then the IRR increases to more then 13%.

Jamalpur to Bhuapur Development Scheme, RS2

13. The Jamalpur to Bhuapur Development Scheme, RS2 covers an area of 149,000 ha, consisting of PUs 2 and 4. The area is already partly flood protected by the Jagannathganj-Jamalpur railway embankment and the BWDB embankment from Bhuapur to Jagannathganj.

14. The prefeasibility analysis shows that this scheme gives a high economic return (18% IRR, NPV of Tk. 476 million). This is largely due to the existing hydraulic infrastructure which has reduced the required investment capital. In social and environmental terms, it is also relatively attractive as fishery resources are relatively low in the area and as the embankments are already largely in position, there is a relatively small additional impact on flood levels outside the embankments resulting from the scheme.

15. The significant initiative of the scheme is the compartmentalization concept, and RS2 can be seen to be an extension of the FAP 20 Pilot Project which is located immediately downstream.

Dhaleswari - Kaliganga Development Scheme, RS3

16. The Dhaleswari - Kaliganga Development Scheme, RS3 covers an area of 150,000 ha, consisting of PUs 6a and 7. The area includes within the FAP 20 Compartmentalization Pilot Project at Tangail. Limited embankments already exist in the area, particularly in the FAP 20 area; but most of the Dhaleswari-Kaliganga remains unembanked.

17. The proposed development is to construct embankments for controlled flooding along the Dhaleswari-Kaliganga from Joker Char (near the Pungli Offtake) down to Kalatia. The possible development has been split into two phases and should be considered as either with (RS3A) or without the Jamuna bridge (RS3B).

18. The prefeasibility analysis shows that this scheme with controlled structures (RS3A1C + RS3A2C) gives the highest economic return (IRR of 22%, NPV of Tk. million 1700). However it is a large scale scheme requiring substantial capital investment (Tk. million 2700, US \$60 million) & the consequences of such a development need careful investigation before it can be justified.

19. The impact on the adjacent areas of PUs 6b, and 10 plus the environmental consequences need to be fully estimated. The scheme would affect a major floodplain fishery area (one of the largest remaining unembanked fishery resources areas), and the consequences of such an interference may have far reaching effects beyond the NCR.

20. It is therefore recommended that RS3 be taken through to feasibility study, but that time is allowed for preparatory studies to be made to establish fully the environmental, hydrological and socio-economic characteristics of the area and the consequences of such a development.

Bangshi River Improvement and Drainage Scheme, RS4

21. The Bangshi River Improvement and Drainage Scheme, RS4 would improve the flow capacity of the main drainage channel for the western part of the region. The river would be straightened, widened and deepened for a total length of 81 km. The work would start at Kalatia (constraints downstream of this point are determined by the high water levels backing up from the Meghna/Padma confluence) and be implemented upstream to include strengthening and improvement of the Bangshi river east of Basail.

22. The prefeasibility studies show that this scheme on its own would not be economically viable (IRR of 6%). But RS4 is also found to be complementary to other regional schemes, and thus the scheme is recommended to be studied as a possible addition to the scope of works to both RS2 and RS3 feasibility studies.

Muktagacha - Bhaluka Development, RS5

23. The Muktagacha - Bhaluka Development, RS5, covers an area of 172,000 ha in PU3. Substantial areas are flooded annually from local rain water and runoff from the adjacent Madhupur Tract. There is little direct flooding from the adjacent Old Brahmaputra but drainage from the area is restricted at the south-eastern end by high water levels in the rivers. Groundwater conditions are unfavorable and it is estimated that only 60% of the eventual irrigation demand can be met from groundwater.

24. The aim of development in the area would be to increase agricultural production by improving the drainage and water management. The area would benefit from improved water supply, possibly through the diversion of surface water from the Old Brahmaputra.

Bhuapur - Aricha Development, RS6

25. The Bhuapur - Aricha Development, RS6, forms an alternative to RS3. The upstream section is the same as RS3 (following the left bank as far as Dhula), but instead of following the Dhaleswari Downstream of Dhula, another embankment would be constructed on the south side of the Dhaleswari offtake following the left bank of the Jamuna down to aricha and finally connecting up with existing BWDB embankment works close to Harirampur. The scheme

forms part of the earlier proposed Dhaka South West Project.

26. This scheme is potentially a large scale development, but in south involves major changes to the present hydraulic regime of the major rivers (Jamuna, Padma, & Dhaleswari). The prefeasibility analysis has shown the scheme to be economically marginal (IRR of 11%); and there are major potential environmental consequences that are envisaged as a result of the scheme. The Scheme is seen to be even more complicated to assess than RS3 and should have a high risk factor applied to its assessment. It is not recommended for further study in the medium term but should be reconsidered at a later date in the RWRDP.

Tongi-Gazipur Development, RS7

27. The Tongi-Gazipur Development, RS7, covers 46,000 ha of PU8 and 79,000 ha of PU9. The PU9 areas cover both Madhupur Tract and Old Brahmaputra floodplain. The ground water condition are poor and limit the irrigation potential of the area. The area would benefit from improved local drainage in the valleys and anticipated development of irrigation aspects.

Regional Water Resources Development Plan

28. The Regional water Resources Development Plan (RWRDP) has been developed using a multi-criteria approach with the economic and sensitivity analyses of engineering and agricultural/fishery benefits/disbenefits being supplemented with more qualitative assessments on socio-economic and environmental impacts.

29. The RWRDP is presented below, but the success of the complete plan is subject to certain recommended institutional changes and to making the best use of experiences gained in the related FAP supporting studies. The priorities are based on the conclusions, described in the multi-criteria analysis.

30. The anticipated developments have been categorized as suitable for short, medium and long term development (see Fig.5 and 6).

Short Term

31. Short term development is considered as those schemes that could be prepared and implemented within the next 6 years. These schemes consist of priority projects that are expected to have a relatively small environmental impact on adjacent areas, and thus require only 1 to 2 year feasibility study.

32. The schemes included in this category are:

- (a) **RS1b (FAP 3.1).** RS1 was identified in the early stage of the FAP during 1990 as a priority project and the feasibility study for this scheme, the Jamalpur Priority Project is already completed. The FAP 3.1 schedule is to complete project preparation by 1993, thus allowing for implementation to begin in 1994 (year 2).
- (b) **RS2.** Significant structural elements of the RS2 (Jamalpur to bhuapur Development) are already in place. The main control embankments consisting largely of the existing railway embankment (from Jamalpur to Jagannathganj) and the existing BWDB embankment from Jagannathganj to Bhuapur. (The Jamalpur Fertilizer Co. are already funding further improvements, in 1992, to this embankment to be used as a road). The scheme complements the development of RS1b and will also benefit from control to be made under RS1b on Baushi and the Jhenai Bridges. The significant benefits envisaged from this scheme result from the compartmentalization that would be developed in the area. The findings of the adjacent FAP 20 Tangail compartmentalization project will be relevant in this respect.
- (c) **Flood Proofing and Mitigatory Measures.** Flood proofing will be required in the unprotected areas adjacent to the RS1b and RS2 schemes. This consists mainly of the char land area and active flood plain left outside of the embankments. Other mitigatory measures may be required for certain disadvantaged groups. These include the landless and fishermen. Detailed initiatives will have to be developed at the Feasibility Study

Figure 5 - Regional Water Resources Development Plan

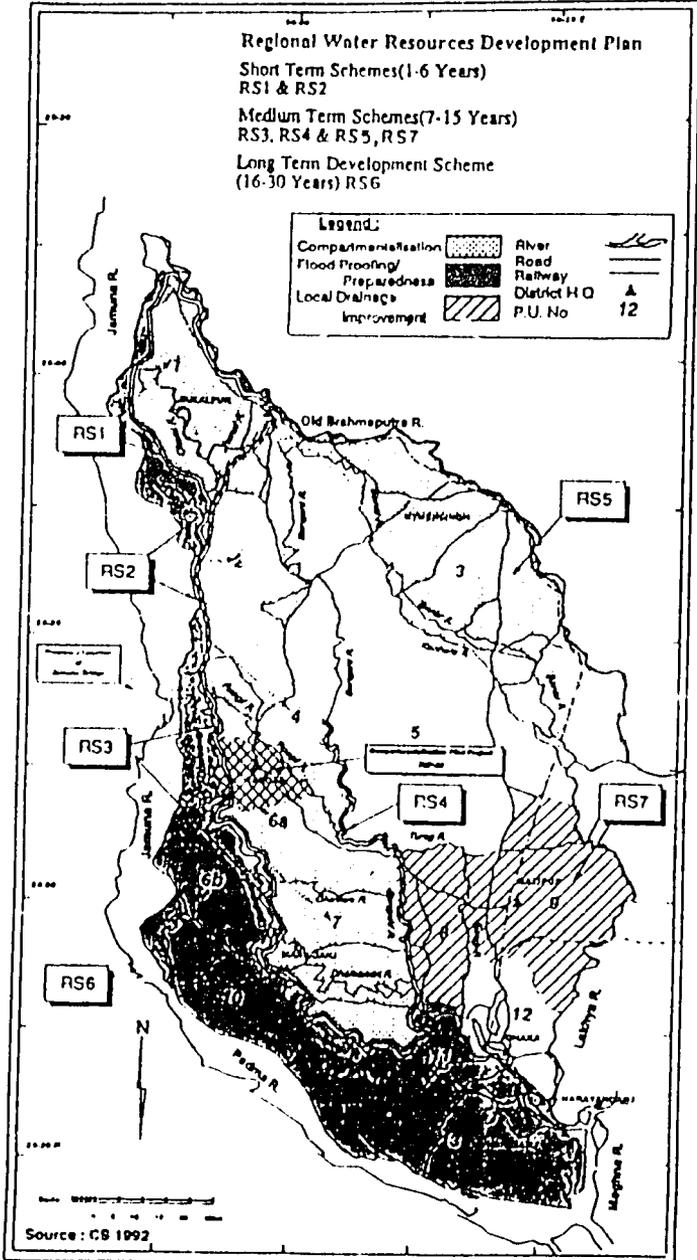


Figure 6 - Regional Water Resources Development Plan - Programme

Years	0		6					7					15					16		30	
			Short Term					Medium Term					Long Term								
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11		
PU 1	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 2	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 3	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 4	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 5	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 6	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 7	Controlled Flooding																				
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	Compartmentalisation																				
	Flood Response Measures																				
PU 8	Controlled Flooding																				
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	Compartmentalisation																				
	Flood Response Measures																				
PU 9	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 10	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 11	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				
PU 12	<i>PU 12 is Dhaka City (see FAPs 8A and 8B)</i>																				
PU 13	Controlled Flooding																				
	Improved Drainage																				
	Compartmentalisation																				
	Flood Response Measures																				

-  Controlled Flooding
-  Improved Drainage
-  Compartmentalisation
-  Flood Response Measures (e.g. flood proofing/preparedness/early warning)

Note :

1. Existing BWDB embankment is to be improved by RHD under funding from Jamuna Fertiliser Factory in 1992/93
2. FAP 20's compartmentalisation is expected to be implemented in PU6
3. Embankment works will be needed associated with developments on the Dhalerwari-Kaliganga in PUs 6 & 7.

level and may include such measures as multipurpose use of embankments and integrated fish development projects.

Medium Term

33. Medium term development is classified as implementation within 7 to 15 years. These medium term schemes require several more years of study, before a fair appraisal can be made on their advisability.

- (a) **RS3:** This scheme (Dhaleswari-Kaliganga Controlled Flooding and Compartmentalization) would be a major development. It shows significant potential benefits to agriculture indicating a large net present value. However the impact of such a development on the existing environment, nearby areas and related sectors such as fisheries will be very significant. Such a large scale development (engineering funding is estimated at Tk. million 2730, approximate US \$ 60 million) requires a comprehensive feasibility study, and time for the implications of such a development to be analyzed and considered;
- (b) **RS4:** The investigations of regional drainage has shown that the high water levels at the south-east corner of the region (the Padma-Meghna influence) create a serious restriction to the drainage out of the region. Although local drainage improvement is still seen to be a viable option, there is limited scope for effective improvements to the regional drainage. The pre-feasibility studies have revealed that improvements to the Bangshi river (scheme RS4) will bring justifiable benefits, but an improved regional model is required before this potential scheme can be recommended for feasibility analysis;
- (c) **RS5 and RS7, Compartmentalization and Local Drainage:** Although not a high priority in terms of major flooding, agricultural production in areas of PUs 3, 8 and 9 have been found to be hampered by local flooding primarily caused by impeded drainage. It is recommended that after observation of progress on compartmentalization and local drainage

improvements recommended in the short term plan (FAPs 20, 3.1 and RS2), that consideration be given to carrying out feasibility studies for similar programmes in PUs 3, 8 and 9;

- (d) **Flood proofing and Mitigatory Measures:** Flood proofing will be required in those areas unprotected by RS3. This may include large areas of PUs 6b, 10, 11 and 13. Consideration should also be given to carrying out flood proofing in these areas, even without RS3. The viability of RS6 (see below) has to be questioned and thus flood proofing may be the most appropriate development option for these areas. Other mitigatory measures may be required, as described in short term above. Fisheries are particularly significant in the RS3 area and the feasibility study should consider the impact on this sector in detail before recommendations can be made.

Long Term

34. The long term plan (16 to 30 years), shows the possible long term development that best utilizes the natural resources of the region. The time scale given is arbitrary being dependent on so many unpredictable factors:

- (a) **RS6:** The possibility of controlled flooding being extended to incorporate PU10 and 6b has been investigated. This option has the potential of making major changes to the flooding characteristics of the region but only shows marginal economic viability. The scheme would be consistent with the Dhaka South-West Project plan (proposed in the 1960's and partly completed) but is an option which should be viewed with caution as if completed it would have major environmental impacts. The scheme would potentially change the hydrological system dramatically. Advice has previously been given (FAP 19) that such drastic measures should not be contemplated at this stage. However, the possibilities still remain of such a development becoming practicable and it has therefore been included as a possible development in the long term plan, and

- (b) **Other Measures:** In addition to the other short and medium term measures already described, there is the potential for making local drainage improvements to PU9. However this again is limited by the high water levels in the Lakhya-Meghna-Padma system;

The RWRDP, as described above, has been scheduled to fit into a regional development programme. The programme allows for development to take place in a logical sequence and for maximizing the benefits of complementary activities (such as RS1b with RS2; and RS4 with RS3) where possible. It also allows for making the best use of existing facilities, by concentrating on RS2 and RS1b in the first years.

35. The schedule is fundamentally one of implementation from upstream to downstream (RS1b to RS2 to RS3). This is an indication of the fact that the worthwhile regional initiatives are seen to be those of controlled flooding (with associated compartmentalization and local drainage) rather than regional drainage.

36. An overall planning horizon of 30 years has been used for the plan, but only those schemes that would fit into the first 15 years are considered worthy of further investigation at this stage. The financial requirements in the medium term (first 15 year) are shown in Figure 7.

Project Disbenefit

37. The main negative impact of flood control and drainage schemes is anticipated to be on fisheries, especially on capture fisheries. An estimate of this impact on fish capture and production is presented in SR III in relation to the decrease of flooded areas, depth and duration of flood. Other environmental impacts have been assessed qualitatively at this pre-feasibility level of analysis.

Financial Requirements of the Short and Medium Term Plans (Tk million)

Figure 7

Description of Works	Plan Year															Total (Tk.m.)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Regional Schemes (1)																	
RS1 Jamalpur Priority Project	41.7	69.6	500.8	500.8	500.8												1613.5
RS2 Jamalpur to Bhuapur Development		36.0	60.0	400.0	400.0	400.0											1296.0
RS3-Phase 1 Dhaleswari to Kaliganga Devpmnt.			14.2	14.2	23.7	23.7	255.5	255.5	255.5	85.2	85.2	85.2					1097.8
RS3-Phase 2 Dhaleswari to Kaliganga Devpmnt.						21.6	21.6	36.1	36.1	360.6	360.6	360.6	120.2	120.2	120.2		1557.9
RS4 Bangshu River Improvement			197.0	197.0	197.0	197.0	197.0	197.0	197.0	197.0	197.0	197.0					1969.9
Flood Response Measures (2)			*	*	*	*	*	*	*	*	*	*	*	*	*	*	Note (2)
Fishery Initiatives (3)			*	*	*	*	*	*	*	*	*	*	*	*	*	*	Note (3)
Institutional Strengthening (4)			*	*	*	*	*	*	*	*	*	*	*	*	*	*	Note (4)
Total Financial Requirement	41.7	105.6	772.0	1112.0	1121.4	642.3	474.2	488.6	488.6	642.8	642.8	642.8	120.2	120.2	120.2		7535.3

Notes: 1. The Regional Schemes include for the capital cost of compartmentalisation

2. * Flood Response Measures include for Flood Proofing, Preparedness and Early Warning. Costs should be determined after FAPs 10, 14 and 23 have reported

3. * Although fishery initiatives are described in PSR III, the costs are to be determined after FAP 17 has reported.

4. * Institutional strengthening costs to be determined after FAP 20 and 26 have reported

5. Annual operation and maintenance costs have not been included in the Table

North Central Regional Study (FAP 3)

Answers given by FAP 3 Team Members and FPCO Staff

Mr. Mustafa Kamal Majumder, The Telegraph, Dhaka

Question: It is stated that interventions will lead to high economic returns. On what basis this conclusion has been reached, because the environmental aspect is yet to be taken care of? Does not cost benefit analysis remain incomplete without incorporation of environmental, that's to say long-term costs?

Answer: Yes, we would agree that the cost benefit analysis so far presented has not fully quantified the full environmental costs, although it has included for an estimate of the impact on fisheries. Our recommendation is that the sub-regional studies look at the environmental aspects in more detail.

Mr. Mohammed Mozzammel Hoque, BUET

Question: You are suggesting for improvement of drainage capacity of the Bangshi River. At this stage do you have any approximate figure by which the flow capacity should be increased? When you are suggesting for increased flow capacity, have you taken the morphological consequences into consideration?

Answer: We have looked at the Bangshi river as a drainage possibility and have run the model with a variety of options, although the changes to flow capacity are complicated by the backup effect during the monsoon season from the Meghna/Padma confluence. We have also carried out some preliminary morphological analysis. However, the recommendations include for further analysis to be carried out at the next stage of planning.

Engr. Md. Aminur Rahman, Consulting Engineer

Question: Could you please explain what is this jargon "Controlled Flooding" means. Has this "controlled flooding" been practiced anywhere on this planet?

Answer: There is a difficulty with terminology in that certain words are used and have been used in different ways. My interpretation on the term controlled flooding is as follows. The alternatives are:

- (1) Flood control which is to build an embankment without any structures so that you prevent river flooding from coming into

the floodplain. We all know the dangers and possible consequences of that, particularly the impact on the existing situation and the beneficial aspects of flooding.

- (2) The idea of controlled flooding is that if you put your embankments in the right place you build the right type of control structures on the embankment, and you get agreement to open and close the gates as you require (the kind of issues that FAP 20 will be explaining to you in 2 days time - in terms of getting agreement to control movement of water) then you can aim to get the optimum flooding that will allow for the fisheries to remain and also to optimize the agricultural output of the area.

Controlled flooding has been practiced in several countries around the world both in tropical countries such as Indonesia and Vietnam and in temperate climates such as Britain and the Netherlands.

Mr. Md. Lutfur Rahman, BWDB

Question: RS2 and RS3 have almost the same project areas and RS3 gives a higher IRR (RS3 - 22%, RS2 18%). As such RS3 should have the priority over RS2 for inclusion in short term development plan.

Answer: We would agree that the economic returns are higher for RS3, but taking into an account the environmental consequences, there is a higher uncertainty in the planning of RS3 than there is in RS2. We have not yet been able to quantify fully the impact of RS3 and thus the recommendation to go on with further studies to look at fisheries aspects and environmental aspects. Thus we cannot be sure, at the moment, how that will affect the economic return. RS2 is a different situation in that the anticipated environmental impact of the scheme is not so great and therefore we have more confidence in the economic rate of return for RS2. Thus our recommendation that RS2 should be put ahead of RS3. In fact other parties including FPCO and the donors have also questioned this point and it seems that the next stage of the planning will be to incorporate RS2, RS3 and RS4 into a more detailed sub-regional plan that will allow this question of priorities to be better resolved.

Mr. Md. A. Wadud Bhuiyan, Joint Rivers Commission

Question: The geographical setting and lower contour of the south western and southern part of the region makes it highly vulnerable to floods and from flooding point of view the area is highly distressed subregion. Why this area has not been taken under first priority project. What measure being taken to alleviate the flood problem of this area?

Answer: The answer to this is both an economic one and also a question of priorities. the agricultural and economic returns of the southern areas are restricted because of the enormous problems is being able to make any improvements to the drainage (see answer to Mr. Rasmussen, below), and this means very expensive schemes with poor economic returns. However the plan does include the whole southern and southwestern area for flood proofing and flood preparedness. This is the same as for the measures being considered for FAP 3.1 (as described by Mr. Wallace) and for the Charland areas.

Mr. T. Herman, World Bank

Question: What is the difference in principle between the N.C. Plans project proposals and those of the IECO Master Plan?

Answer: The IECO Master Plan concentrated on the water resources of the Region rather than the flooding aspects, it included such aspects as the South West Dhaka Irrigation Project, it also included pumping within the plan. The concept was thus different, although there are aspects such as the requirement for irrigation in the north-eastern sub-region of the NCR, with which FAP 3 would agree with the IECO plan, in that there is a requirement for more irrigation. However, the economics have not significantly changed and it is anticipated that the surface irrigation option would still prove to be unattractive, in economic terms, for that area.

Question: Would it be correct to say that all project proposals cannot be finally evaluated until the results of FAP 17 are available?

Answer: We would agree that the timing of planning should be such that it allows for the FAP 17 results to come into the planning. In FAP 3 the detailed planning takes place at a later stage and this allows for the feedback from FAP 17 to occur.

Mr. J. Bird, Asian Development Bank

Question: In respect of your comments on Regional Scheme RS3, what approach do you envisage in the next stage of study to resolve the apparent conflict between economic growth within the area and adverse environmental impacts elsewhere.

Answer: This was the thinking behind the recommendation in the Regional Plan that RS3 is a highly complex area that, although it shows high potential economic returns, also shows potential adverse environmental impacts elsewhere. At this stage we have pointed out the possible conflict and have recommended that in the next stage of planning, at sub-regional level, that the environmental impact has to be studied rigorously.

Mr. Rasmussen, FAP 25

Question:

- (1) How will your proposed priority schemes, if implemented, affect flood control design conditions for the Greater Dhaka Scheme?
- (2) and has this impact (positive or negative) to your knowledge been considered by FAP 8A and ensured a cost-effective design for Greater Dhaka Flood Protection?

Answer: The Greater Dhaka area is within the south western area that suffers from extensive flooding every year. The drainage in the NCR only has an affect (due to topographic levels and the water level build up at the downstream, south-easter end) further upstream than Dhaka. The south-eastern area is tidally affected due to backup from the Meghna & Padma, thus the flooding that occurs in that area is not significantly affected by interventions upstream, as the area already experiences flooding at high levels every year.

Dr. G. T. Keith Pitman, ISPAN

Question: The Jamalpur-Bhuapur Scheme (RS2) has an estimated EIRR of 18% and "the significant initiative of the scheme is the compartmentalization concepts and it can be seen as an extension of FAP 20 CPP". As the FAP 20 Tangail CPP only has EIRR between +5 and -5%, would it not be a better regional plan if FAP 20 were dropped and compartmentalization pilot project transferred to RS2 ? This would be consistent with your decision not to proceed with

Bangshi Project (RS4) which has an estimated EIRR of 6%.

Answer: RS2 has a high EIRR largely because the embankment at the north end already exists and there is an embankment from Bhuapur up to the fertilizer factory (at Jagannathganj). Thus in that area, a large component of a controlled flooding project already in position. We are therefore discussing an economic return from a project which has a large sunk cost from existing infrastructure. FAP 20 is a different situation. They are in an uncontrolled flooding area, which suffers regular flooding from the Dhaleswari and Jamuna rivers, and they are therefore dealing with a different situation which is may be more typical of the compartmentalisation problem that would arise in the country. It was recommended as a pilot project, not necessarily as a priority project. I refer the rest of the question (as to whether they should transfer to RS2) to FAP 20, although it should be noted that FAP 20's Tangail area will be incorporated into the Regional plan at the next stage, within RS3.

Mr. Zaman, Ministry of IWD&FC

Question: As the consultants of FAP 3, how many times you have sat down with those of the consultant to under FAP 2 to know what are being studied there since the two study areas are very close to each other and have the two banks of the same Brahmaputra River. If no such meeting held, do you feel such mutual discussion meetings.

Answer: As part of the FAP we have been regularly meeting, the FPCO is very strong in this regard and have insisted that each study knows the activities of all other studies. We have certainly sat down with FAP 2, separately on occasions and thus there has been good communication between us. However, probably more relevant for our particular study is that we have also been meeting with FAP 3.1, right the way through the preparation of FAP 3, As Mr. Wallace pointed out, both the regional planning and the feasibility study were proceeding at the same time, and that has been quite a key element in our cooperation, but also, as you have seen, FAP 20 are in our area. There has been good cooperation between FAP 17 and ourselves (although during the FAP 3 planning, FAP 17 was at an early stage) and there is potential for incorporating findings from their study in the next stages of the north Central Region planning.

Question: From the progress report it is seen that the consultants have identified 8 regional schemes. out of which, they have pre-selected and prioritized 5 for pre-feasibility studies and 3 for feasibility studies. I am interested to know the basis of such pre-selection and prioritization. Has it been done on political pressure? or others? Do you suggest to go for feasibility study of RS₂, RS₃, and RS₄ without getting assurance of investment fund when investment fund for RS₁ (Jamalpur Priority Scheme) is still uncertain?

Answer: The planning process looked at each Planning Unit (PU's), the Region was divided into 13 PU's, and we looked at the potential development options for each of those PU's. We looked at the hydrology of each PU, incorporated the results of the hydraulic model and brought in the agricultural aspects. We also had other specialists (fisheries, socio-economics, environment et al) working with us, so that we looked at all multi-disciplinary approaches at each PU level. We then moved on to a pre-selection, which took place in about month 6 of our planning. This then identified which PU's we should look at further. This is an ongoing process and as a result of our pre-feasibility study we have now come out with the next selection, which incorporates Regional Schemes (RS) 2, 3 and 4, which have come to the fore, primarily on their economic return. When we looked at the other RS's the agricultural returns were not so good in the flood season. Also to be considered are the complications of what happens in the dry season and whether or not there is potential for schemes that have more than controlled flooding. We have included those in the plan and it is up to the development planners as to which ones they select for the next priority. In terms of controlled flooding we have said that RS2, RS3 and RS4 are the priority. Now if we are talking about irrigation and water resources development then obviously you have to think again particularly when considering the regional schemes in the North-East of the area.

Question: did you think of Brahmaputra Barrage as a need of water Resources Development in future ?

Answer: It was not in our TOR to look at the irrigation aspects but we have identified that the N-East part of the region is short of water and therefore would benefit from such development. Earlier studies have looked at that possibility and shown it to be very expensive. We have

not been able to take the concept any further than that in our study.

Prof. Shapan Adnan, Shamabesh Institute

Question: On the surface, you appear to have taken account of all the problematic issues - environmental impact, adverse impact on char dwellers. Yet, this apparently balanced view fringes critically on value judgements such as that it is the char dwellers who have to adjust to what is in the best interests of the mainland population. Is the whole exercise one of justifying FCD constructions while paying lip-service to the buzz words in current parlance?

Answer: I assure you that we have been undertaking the study systematically through from the beginning and far from paying just lip-service to these issues, we amongst other consultants, that have been involved in the FAP, have been part of the development of bringing in some of these other issues, particularly the environment and the fisheries issues. I think I can say for most of the consultants involved in the FAP that we have become more aware of how complicated the situation is and we have ourselves been pushing for more time to be spent on these critical issues such as the charland dwellers and the environmental aspects. We have gone as far as we can with the resources that we have available to us. but we also, as professionals, have pointed out what still needs to be done at the next stage before you can finish your detailed planning and to ahead with implementation.

Mr. Abu M. Sufiyan, Research and Advisory Services

Question: Very recently consultants of FAP 25 CAT mission Inter Regional FAP Impacts have pointed out that "Engineering solutions proposed by FAP 2 and FAP 3 could change flood levels in the Jamuna. These changes could have wide ranging effects in the SE, SC and SW regions, not only in terms of flooding but also the knock on effects on agriculture, fisheries and the environment...(because) proposals for one area (will) seriously affect the conditions in another area, "and that further work is required before proceeding". Do you envisage such problems?

Answer: The question of inter-regional impacts is appreciated by the FPCO and they are currently addressing this problem.

Prof. Shapan Adnan, The Research and Advisory Services

Question: Why is the fact that the Sarishabari Fertilizer factory's contribution to building a small stretch of the embankment given so much importance in planning considerations for the Region ?

Answer: The embankment is already built by the BWDB. The fertilizer factory are simply improving it and surfacing it. Our plan includes for modifications to the embankment. No other importance has been placed on the fertilizer factory's contribution other than in so far as it effects the recommendations in the regional plan.

Question: Has the adverse impact on regional fisheries and eco-systems from the pollutants discharged by this fertilizer factory taken into account in the regional plan.

Answer: The factory is already in existence and the factory itself is outside of the FAP. However the question of pollutants is obviously relevant and should be taken up direct with the fertilizer factory authorities.

Mr. Rahmat Ali, Member of Parliament

Question:

- (1) In the process of FAP 3 will the Lakyha R., Sutar R., Turan and other rivers in the area be excavated?
- (2) Is there any plan to develop a project in the Gazipur District on the basis of the Shutan River?
- (3) Is Gazipur District is included in the FAP?

Answer: Yes, as was mentioned in the FAP 3 public participation meeting at Mymensingh. Gazipur District. The main problem of the area is drainage and it is included in the mid-term plan of the FAP 3 as RS7. Necessary care will be taken in its planning.

Begum Matia Chowdhury, Member of Parliament

Question: Will an embankment on the Old Brahmaputra River constructed by the Jamalpur Priority Project have any effect on the other embankment. If so, what consideration is the FAP taking?

Answer: There will be some limited impact and the amount is being studied both the FAP 3.1 and by FAP 25. You are please referred to those studies for your detailed answer.

**MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND
FLOOD CONTROL**

JAMALPUR PRIORITY PROJECT (JPP)

FAP 3.1

**THIRD CONFERENCE ON FLOOD ACTION PLAN
MAY 17-19, 1993
DHAKA**

FLOOD PLAN CO-ORDINATION ORGANIZATION

Contents

- Introduction
- The Project Area
- Development Options
- Outline Description of the Projects
- Project Impacts
- Project Evaluation
- Implementation Programme
- Detailed Planning and Design Studies

Glossary

BWDB	-	Bangladesh Water Development Board
CCCE	-	Caisse Centrale de Cooperation Economique (now CFD)
CFD	-	Caisse Francaise de Developpement (formerly CCCE)
CEC	-	Commission of the European Communities
DOF	-	Department of Fisheries
DTW	-	Deep Tube Well
EIRR	-	Economic Internal Rate of Return
FPCO	-	Flood Plan Coordination Organization
FAP	-	Flood Action Plan
FCD	-	Flood Control and Drainage
FCDI	-	Flood Control, Drainage and Irrigation
FSMF	-	Fish Seed Multiplication Farm
GPA	-	Guidelines for Project Assessment
GOB	-	Government of Bangladesh
ICB	-	International Competitive Bidding
JPPS	-	Jamalpur Priority Project Study
LCB	-	Local Competitive Bidding
LLP	-	Low Lift Pump
MPO	-	Master Plan Organization
NGO	-	Non Governmental Organization
NCR	-	North Central Region
O&M	-	Operation and Maintenance
SRDI	-	Soil Research Development Institute
POE	-	Panel of Experts (of FPCO)
STW	-	Shallow Tube Well
WO	-	Without Project
W	-	With Project (Option B) and With Mitigation Measures

INTRODUCTION

1. The disastrous 1987 and 1988 floods in Bangladesh raised considerable international interest in helping the country to find a long-term solution to its flooding problem. In June 1989, the Government of Bangladesh asked the World Bank to coordinate the preparation of a five-year Action Plan for Flood Control in Bangladesh, drawing on the various studies that had already been carried out. The role of the Bank in coordinating international efforts to assist Bangladesh in flood control was endorsed in the Communique of the G7 economic summit meeting held in Paris in July, 1989. The Flood Action Plan was discussed and endorsed by a meeting of donors held in London in December, 1989.
2. The Flood Action Plan (FAP) attached high priority to flood control and drainage on the left bank of the Jamuna/Brahmaputra. A priority project in the Jamalpur was identified in the Action Plan and confirmed for early implementation in the Reconnaissance study of the North Central Regional Study (NCRS). The Jamalpur Priority Project (JPP) is located on the left bank of the Jamuna River and is bounded by the Jamuna to the west, the old Brahmaputra to the east and the Jamalpur-Jagannathganj Ghat railway line to the south. The area was initially identified because of the severe flooding from the Jamuna and Old Brahmaputra rivers and the perceived severe impact that this was having on agriculture and the quality of life in the Jamalpur district. Given the comparative independence hydraulically and the apparent potential for improvement of the situation, the area appeared well placed for early development.
3. A Feasibility Study of the Jamalpur Priority Project was financed by the Government of France and the Commission of European Communities (CEC), with France taking the lead. The study was undertaken by a consortium comprising Sogreah Ingenierie (lead firm), Sir William Halcrow and Partners Ltd., and Lahmeyer International in association with Engineering Planning Consultants Ltd., Aqua Consultants and Associates Ltd, and the non-governmental organization, Service Civil International (SCI) of Bangladesh. The Final Report was submitted in January 1993.
4. The original objective of the Jamalpur Priority Project Study was to investigate and draw up plans for the sustainable development of land and water resources within the Mainland area. During the course of the Study, it became

apparent that part of the area could not be protected by embankments and that development within the Mainland could not progress without taking account of the situation within the adjacent Char Lands. A special study was commissioned to investigate this. As a result, an overall view has been possible of the different development opportunities throughout the study area and the identification of the linkages that exist between them. In future phases of the development program, further account can be taken of the latest results of the FAP supporting studies (environment, fisheries, public participation, etc.) and incorporated in the final detailed plans.

THE PROJECT AREA

5. **Physical Features** - The Study area as finally defined comprises a total of 179,842 ha bounded by the right embankment of the Jamuna to the west, the right bank of the Old Brahmaputra river to the east and the Jamalpur to Jagannathganj railway embankment to the south. The study area is considered in two parts. A summary of the areas and populations concerned is given in Table 1.

Table 1 Study Areas and Estimated Population

	<u>Gross Areas(ha)</u>	<u>Estimated Population</u>
Mainland Study Area		
- Area within proposed embankment	65,804	631,023
- Attached Chars and Setback land	26,438	270,771
Other Charland Study Area	<u>87,600</u>	<u>331,832</u>
Overall Study Area	179,842	1,233,626

The Mainland Study Area includes 6 Thanas from the North Central Region namely Madarganj, Melandaha, Islampur, Jamalpur, Sarishabari and Dewanganj, plus parts of three Thanas belonging to the Northwest Region, namely Phulchari, Sariakandi and Kazipur. The Char Land Study Area includes three additional Thanas, Dhunat, Sonatala and Saghata. The Estimated population of the mainland area is 901,794 of whom 631,023 are within the area proposed for protection, and that of the Char areas is 331,832 which together with the mainland population outside of the proposed embankments (270,771) gives an estimated total population of 602,603 outside of the mainland development.

Drainage and Flooding

6. The climate of the area is tropical with rainfall mostly occurring during the monsoon period June to October. Average annual rainfall at Jamalpur is 2241 mm and potential evapotranspiration varies between 2.2 and 4.9 mm/day. Maximum and minimum temperatures vary between 34.9C and 10.9C respectively. Hydrogeological conditions are amongst the most favorable in the country for tube well development and there is no evidence of ground water quality problems with respect to irrigation. The general pattern of topography is V shaped from east to west with the Madardhaw River (or Dadbhanga khal) as the central north-south drainage axis of the area. Several internal distributaries originate from the Jamuna River, as is the case with the Chatal or from the Old Brahmaputra River, as does the Jhenai. A number of depressions and water logged areas are not connected to the natural drainage system and do not drain easily.

7. Flooding occurs almost every year caused both by high intensity rainfall and by over-bank spillage from the Jamuna and the Old Brahmaputra Rivers and their distributaries. The high levels in the boundary rivers also inhibit drainage and cause backing up in the distributaries. In the past, a number of embankments have been built on an ad hoc basis which cannot be considered reliable enough to cope with larger floods. Widespread damage of these embankments occurred in the disastrous floods of 1987 and 1988 and floods regularly enter the Mainland area.

8. The Char land areas also suffer widespread flooding each year causing extensive damage to property and crops. These areas are also subject to dynamic changes in erosion and accretion patterns. The changing river channels lead to Chars being in widely differing ages of development which dictate soil quality

and land capability. The cycles of erosion and accretion within the floodway underscore the long-term insecurity for the people of this area.

Socio-Economic Conditions

9. The Mainland area includes an estimated 123,000 households who are to be protected by embankments under this project. About 50% of these households have no agricultural land while some 37% have less than one hectare to sustain their livelihood. Daily Labor and Farming are the main sources of employment. In addition, about 33% of the households are engaged in subsistence fisheries with 7% engaged in occupational fishing mostly on a part time basis. In the areas outside the mainland project there are about 114,000 households (66%) in the attached and setback land which have no agricultural land and may have no legally held homestead land. This is a reflection of the large number of erosion victims in the area. The proportion of agriculturally landless households is about 37% on the island Chars and the main occupation is farming, with daily paid labor being predominant.

Agriculture

10. Agriculture within the mainland area has made considerable progress in recent years, particularly with the taking up of improved rice varieties and the expansion of irrigation. The transportation network which facilitated this growth, is now in part in a very poor state since being heavily damaged in the 1987 and 1988 floods. Rice is the dominant crop, with others being wheat, jute, sugar cane, potatoes, pulses and vegetables. Within the Mainland the net cultivated area is about 74,000 ha on which an average cropping intensity of 191% is currently achieved. Some 42% of the area is irrigated mainly by STWs and treadle pumps. Further development of agriculture is severely constrained by the widespread annual flooding exacerbated by inadequate drainage facilities. Some 47% of the land is regularly inundated to depths exceeding 90 cm.

Fisheries

11. The various water sources for fish production are floodplain, internal rivers, beels and ponds, accounting respectively for 21%, 44%, 25%, and 10% of the total production within the Mainland area. The floodplain is one of the most important components where fish find a rich source of food and where, each year, fry of many species are brought in on the rising flood levels from the

main rivers and are able to grow before being either caught or departing back to the main rivers at the end of the monsoon. There are indications that floodplain capture fisheries are currently in steady decline due mainly to reduced numbers of fry entering the area each year.

Flood Damages

12. Within the mainland area flooding causes widespread damage each year to both public and private assets as well as to crops and livestock. The average economic cost of damage occasioned by floods of up to 1:100 years probability, is estimated to be Taka 68.7 million per year inclusive of exceptional damage to crops, valued at Taka 13.2 million per year. In addition, flooding is estimated to cause each year an estimated 6% reduction in gross agricultural production value on the affected area.

Table 2 - Summary of Cost Estimates (1991 Taka [Financial])

	<u>Taka</u>
Drainage Improvements	41,223,000
Embankments (Base Case)	472,756,000
Hydraulic Structures	327,053,000
Fisheries Program	59,000,000
Land Acquisition	<u>114,000,000</u>
Total Capital Cost	1,014,692,000
Physical Contingencies @ 15%	152,204,000
Engineering and Technical Assistance	219,000,000
NGO Support Program	<u>11,000,000</u>
Estimated Grand Total	<u>1,396,896,000</u>

Note: Costs are based on FPCO criteria as laid down in the Guidelines for Project Assessment. Under ICB/LCB conditions an overall increase of about 35% is anticipated.

DEVELOPMENT OPTIONS

Choices for Development on the Mainland

13. The major constraints to mainland development relate both to the combined effects of flooding caused by the Jamuna and Old Brahmaputra Rivers and to the high intensity rainfall that can occur during the monsoon season. Over the years, through experience, the population has adapted to this regime of annual flooding (as is evidenced by the relatively low loss of life even in extreme floods) and agricultural practices have both adapted and developed to take best advantage of these conditions. A fundamental aspect of the proposed development is the minimization of conditions that will disrupt these established practices whilst providing hydraulic conditions which generally favor the most productive of these.

14. During the early part of the study four development options were identified which reflect the range of choices available. The main elements of these: are flood proofing whereby flooding of agricultural land is allowed to continue but protection is provided for people and their household assets; compartmentalization involving water management measures at local level; and controlled flooding which restricts the degree of flooding to an acceptable level. The four options were:

- Option A:** Flood proofing over the entire mainland area, general improvement of drainage flows over 32,000 ha in Melandaha and Islampur Thanas and specific measures to improve drainage for 3,000 ha of beels and low-lying depressions.
- Option B:** Controlled flooding using embankments with inlet and outlet structures on 65,804 ha of mainland, accompanied by drainage improvements as in Option A.
- Option C:** As Option B, but with a reduction of the protected area to 44,800 ha by exclusion of the land west of the Chatal River and substituting provision of flood proofing measures on this area, and

Option D: As Option B, but provision of full flood protection (i.e. total exclusion of all river flooding).

Initial impact evaluation of Option D revealed that despite its apparent appeal the scheme caused severe disbenefits to fisheries and would greatly disrupt current agricultural field practices and therefore this Option was eliminated. At a prefeasibility level Options B and C were compared, from which Option B was found to be more feasible. The principal choices for development remaining were therefore Option A (flood proofing and drainage) and Option B (controlled flooding and drainage) and these two options were advanced to feasibility level study.

Comparison of Principle Options for the Mainland

15. Doing the feasibility study a comparison between Option A and Option B was made. Although three times the cost, Option B has a major impact on agricultural production which Option A does not. Similarly Option B has a much greater impact on flood damage reduction. Consequently Option B with a base case EIRR of 14.04% (under GPA conditions) is the preferred option of the two.

Choices for Development in the Char Land

16. The studies made to date reveal complex and interrelated problems for those living in the Char areas. The most urgent need is security of life and personal property from flooding and thereafter to be able to develop a means by which to raise their standards of living. The severity of their current situation depends very much on their location within the Char lands, and the condition of the Chars themselves. Shifts in river course accompanied by sudden erosion displace people from the area, creating population and social pressures in others.

17. If embankments are constructed on the mainland this will confine the main rivers, causing water level rises. For the Jamuna this is estimated to be an average 30cm in a severe flood such as in 1988. This will be much less in normal years and marginal compared to the existing regular depths of flooding. The choice of solutions to the mainland's problems need to take account of this and their acceptability is enhanced if mitigation actions are taken which would improve upon the existing situation.

18. The structural measures for the Char land have been identified in the light of initial experience elsewhere. These are either or both to improve individual properties by raising them to a safe level and to provide communal refuges where people may move to when floods occur. Refuges would require basic amenities and provide space for livestock as well as family belongings. They should be treated as places of temporary relief. They may be associated with the new mainland embankments or be independent structures. In addition, other measures relating to encouraging income-generating activities, including diversification from agriculture to minimize risk, need to be considered as well.

OUTLINE DESCRIPTION OF THE PROJECTS

Mainland Project

General Concept

19. The basic concept of Option B is to provide controlled flooding over 65,804 ha, to improve drainage on 32,000 ha to mitigate impacts on and develop fisheries through a fisheries development program and to provide engineering and technical assistance together with support to NGOs to facilitate public participation. A map of Option B5 is given in Figure 1 and a cost estimate is provided in Table 2. The following component descriptions are concerned with this alternative.

Embankment Layout and Design

20. Embankments are proposed along the left bank of the Jamuna from about 5km north of Bahadurabad as far as south as the Dayalpur Fertilizer Factory (82.04km) and along the Old Brahmaputra to the south of Jamalpur (43.17km). The alignments were selected on the basis of maximizing the protected area consistent with achieving reasonable foundation conditions and avoidance of undue risks of erosion from the main rivers. They also make the best use of existing embankments and as far as possible, minimize the need for land acquisition. The overall proposals are in line with the conclusions of the North Central Regional Study (FAP 3). The design standards adopted for the

Jamuna embankment are based on a freeboard of 1.5m over the 1:100 year flood level with a top crest width of 7.0m. Provision is made for a 3.5m maintenance track which could be upgraded to a paved road at a later date. Alternative heights, protection levels, costs and benefits arising have been investigated in determining the design return period. For the selected Jamuna embankment option the minimum height is 2.5m, the maximum 7.5m and the average 4.9m.

21. The alignment of the Old Brahmaputra embankment has been set to provide protection of three main towns Dewanganj, Islampur and Jamalpur and of the Jamalpur to Bahadurabad railway line. It also enables control of overflows entering the Jhenai river and at Islampur, and controlled flooding along the elongated strip of low-lying agricultural land on the right bank of the Old Brahmaputra. Further benefits arise from controlling floods entering the Project area across low-lying land between Melandaha and the Jhenai river inlet. Design standards are similar to the Jamuna embankment except that crest width is 4.5m and freeboard is reduced. The selected option for the Old Brahmaputra embankment has a minimum height of 0.95m, a maximum of 6.8m and an average of 3.48m.

Inlet Structures

22. To facilitate fish migration and to maintain flows for agricultural practices, inlet structures are provided in the main embankments to enable discharge similar to current levels to pass through the structure during critical periods up to the end of June. Thereafter the inlets would be normally closed, as sufficient rainfall usually occurs to meet agricultural needs. These structures are located at Islampur and at the offtakes of the Chatal River and the Jhenai River and are provided respectively with 1, 8 and 7 vents of standard size 3.35m wide by 2.44m high. Provision has also been made for 55 flushing sluices which will be located on natural drainage lines and will permit both controlled inflows and outflows.

Outlet Structures

23. The principal outlets for the mainland area are the Jhenai/Chatal River outlet and that existing at Bausi Bridge. In conformity with the Northcentral Regional Study (FAP 3) the outlet capacity at the Bausi Ridge is assumed to be constrained to a maximum of 50 cu.m/s. Analyses have been undertaken to assess the required dimensions of the Jhenai/Chatal outlet. With the Bausi Bridge

limited to 50cu.m/s, a structure with 25 vents (3.35m x 2.44m) would be required. If, however, the Bausi Bridge flow was unconstrained, similar afflux conditions would be possible with a Jhenai/Chatal structure 35% smaller. Assumptions regarding the Bausi Bridge and its effect on the Jhenai/Chatal outlet are to be reviewed during detailed design.

Drainage Works

24. Drainage works are expected to include 109 km of channel improvements, 70 new control structures, 150 culverts and rehabilitation of 50 existing structures under road embankments. A pilot drainage program is recommended covering about 5,000 ha gross to test out design and implementation procedures

Fisheries Program

25. The proposed measures for fisheries focus on three major areas:

- (a) Improved management of capture fisheries through stocking measures, appropriate design of the main inlet and outlet hydraulic structures and the provision of water retention structures within the minor river beds,
- (b) Assistance and support with the development of culture fisheries in ponds, borrow pit areas and Beels,
- (c) Institutional strengthening of the existing fisheries management and extension system primarily through the employment and support of NGOs.

Implementation will be in two phases. In the first, immediate steps should be undertaken to conduct a full baseline survey of fisheries resources and activities. This will be accompanied by NGO support teams working in parallel to a capital program to rehabilitate the Jamalpur Fish Seed Multiplication Farm (FSMF). In the second phase, a further capital works program would include construction of check structures and improvements to Beels (if found necessary), both components having an emphasis on local participation. The expansion of private and NGO mini-hatcheries will be encouraged together with the progressive stocking and management of beels, floodplains, minor and major rivers in

consultation with the local population.

Technical Assistance and Public Participation

26. A technical assistance program will strengthen all of the above activities and will be supported by recruitment of NGOs to facilitate public participation in the overall implementation program.

Non-Direct Beneficiaries on the Mainland

27. An additional program has been identified for non-direct beneficiaries of the project, many of whom are in the most disadvantaged groups. The project would involve three NGOs over 5 years and is estimated to cost Tk 40 million. It would specifically address the issues of income generating activities social services and awareness raising.

Flood Proofing in the Char and Setback Lands

General Concept

28. The proposals for flood proofing within the study area address the needs of the overall unprotected area of 114,038 ha in which 602,600 people are estimated to live. The area concerned is illustrated in Figure 2 and preliminary cost estimates are provided in Table 3.

29. Four main components are recommended which include provision of community infrastructure and refuges, minor works to provide flood proofing for selected individual; households, an NGO support program and a technical assistance program.

Community Infrastructure

30. Three types of refuge areas have been identified which would be used according to circumstance. These are:

Figure 2

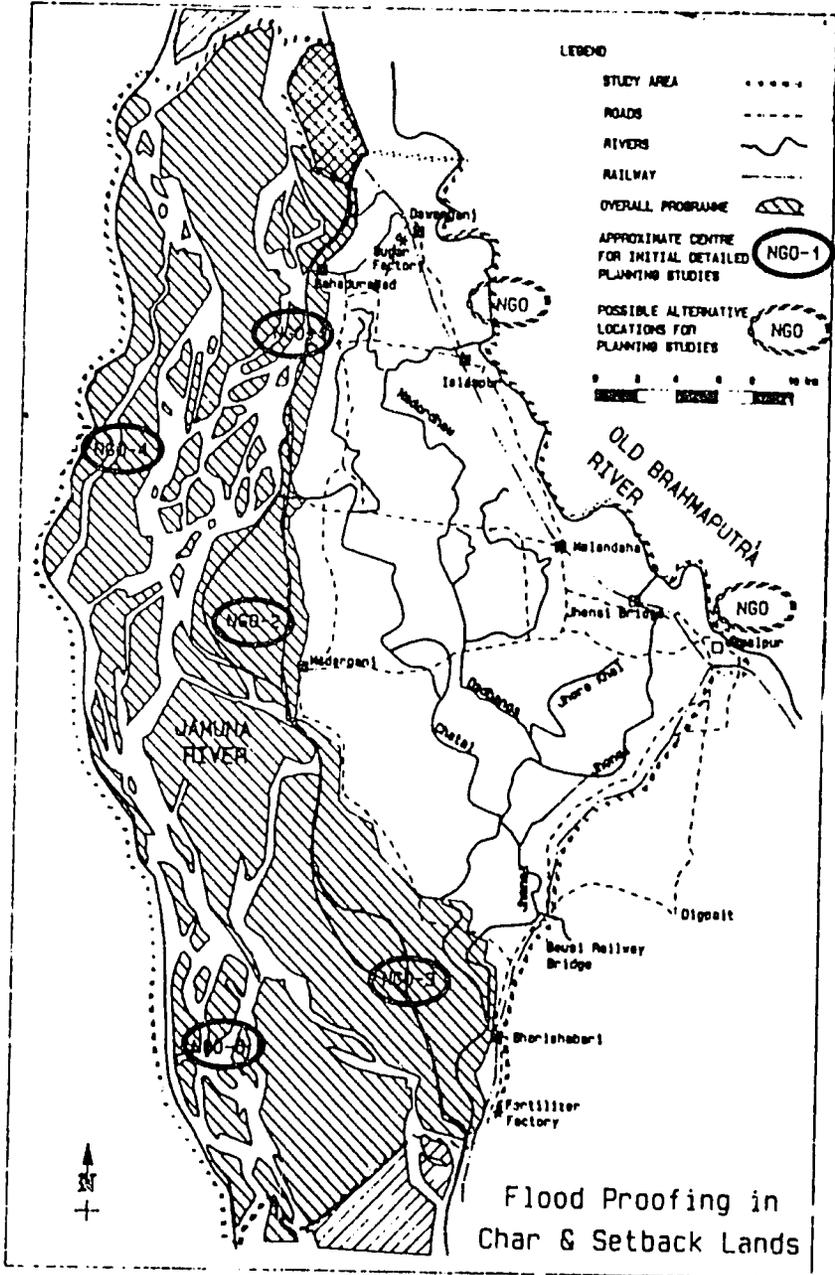


Table 3

**Summary of Cost Estimates
Char and Setback Land Flood Proofing Programme
Expressed in 1991 Taka (Financial)**

		Pilot Phase	Main Phase	Total Programme
Community Infrastructure				
	Rate			
(i) Clustered refuge, 50x80m	315,600			
(ii) Clustered Refuge 60x30m + livestock	468,740			
(iii) Road/Embankment/Refuge	560,000			
Weighted Cost of Micro Projects	500,000	25,000,000 (50 No.)	175,000,000 (350 No.)	200,000,000 (400 No.)
Minor Structural Flood Proofing				
	Total:H/H	Pilot:H/H		
Vulnerable Housing	57,000	2,500		
- Building materials			25,000,000	545,000,000
- Earth filling			8,250,000	179,850,000
Other Housing	57,000	2,500		
- Earth filling			14,250,000	310,650,000
Sub-total	114,000	5,000	47,500,000	1,035,500,000
NGO Support				
Establishment Costs			15,750,000	8,500,000
Recurrent Costs			28,820,000	29,000,000
Sub-total			44,570,000	107,500,000
Technical Assistance				
Staff Costs			8,700,000	11,700,000
Expenses			1,740,000	2,340,000
Surveys			435,000	585,000
Sub-total			10,875,000	14,625,000
Estimated Total Cost			127,945,000	1,332,825,000
Loans for building materials (30%)			(7,500,000)	(163,500,000)
Net Project Payment			120,445,000	1,169,125,000

Type 1: A clustered refuge area measuring 80mx50m, equipped with 2 tubewells, 2 latrine blocks and two community buildings, one to serve mainly as a school, the other mainly as a health center. Provision is also made available for tree planting.

Type 2: As type 1 but with a refuge area 60mx30m plus addition of provision for livestock sheltering.

Type 3: Provision of, typically, a 5 km road cum embankment between villages, 12 tubewells, a new fishpond, a catkin plantation for land stabilization and a ferry boat plus raising of at least one public building.

Design studies will investigate combining refuges with the proposed mainland flood control embankment to make multi-purpose use of the latter.

Minor Structural Flood Proofing

31. Provision has been made in the cost estimates for improvement of individual properties by providing a raised platform. It is expected that households will rebuild their houses after the platforms have been raised. However, it is proposed that in cases where people are unable to do this themselves then assistance would be given through the provision of materials for the construction of an improved house. Preliminary findings from other pilot schemes indicate that the beneficiaries can be called upon to provide their labor free of charge, and that for cases involving the provision of building materials, beneficiaries can be expected to repay 30% of the cost.

NGO Support

32. NGOs are to be employed to prepare detailed plans and to assist with implementation of the flood proofing program. In the first phase, which would take about 3 1/2 years, detailed plans, implementation strategies and budgets would be drawn up to form the basis for an investment strategy for the whole area. Planning would involve assessment of detailed criteria establishing the basis by which schemes should be selected and located, as well as definition of the actual works to be undertaken at each. Public consultations and participation will be an essential ingredient to specifying both works and selection criteria. Assistance will be given by the mainland TA team and FAP support studies,

whilst field level planning will be undertaken by the NGOs. A specific technical assistance team will oversee the activities of the NGOs and will also investigate the opportunities for income generating activities within the Char and Setback lands. To facilitate the Phase 1 planning, a program of pilot works will be undertaken on a trial basis to test designs and selection criteria. The feedback from these pilot works will be incorporated in the Phase 1 recommendations.

PROJECT IMPACTS

Agriculture

33. The agricultural sector is expected to be the greatest beneficiary of the proposed mainland development (Option B5). The controlled flooding and drainage measures together reduce the depths and duration of flooding within the embanked area enabling a change in cropping patterns to occur on the previously affected areas. In addition, with the extent of flooding reduced, decreases in crop damage are forecast, even in normal years, manifesting themselves in increased productivity. The risk of flooding from the Jamuna up to 1:100 year return is also removed, thereby eliminating from within this range of events instances of widespread damage from extreme flooding events. The presence of a more secure flood free environment is also likely to lead to an increase in investment in irrigation. The principal impact of Option B5 is the distribution of land types as a result of the controlled flooding and drainage measures. The new distributions are shown in Table 4 for the whole mainland area.

34. The main benefits are to the Aman crop and the different cropping patterns in which it is found. The benefits were evaluated on the basis of the existing yields apparent under the different levels of inundation before and after the project together with yield increase only on those crops which are damaged regularly at present.

Table 4 Distribution of Flood Impact (Mainland Area)

Class	Flood Depth (m)	Net Area (ha)	Area (%)
Without Project			
FO	0 - 0.3	14,703	20%
F1	0.3 - 0.9	24,745	33%
F2	0.9 - 1.8	29,560	40%
F3	above 1.8	4,977	7%
With Project			
FO	0 - 0.3	27,934	38%
F1	0.3 - 0.9	20,753	28%
F2	0.9 - 1.8	22,159	30%
F3	above 1.8	3,139	4%

Fisheries

35. Forecast impacts with and without mitigation measures for Option B5 in the present situation and after 30 years are:

<u>Tons per Year</u>	<u>Present</u>	<u>Without Project</u>	<u>Option B5</u>	
			<u>Without Mitigation</u>	<u>With Mitigation</u>
Floodplain	902	582	231	500
Beels	1,100	710	183	1,335
Internal Rivers	508	328	105	533
Ponds	408	653	870	1,930
Main Rivers	<u>1,445</u>	<u>932</u>	<u>952</u>	<u>932</u>
TOTAL	4,363	3,205	2,321	5,230

The without project situation supposes that, as observed, no new measures are proposed to mitigate against the decline in fish capture. Mitigation and

development measures in Option B5 not only redress the overall balance but also serve to maintain catches in all types of fishing except on the floodplains where some additional deterioration can be expected. This will be offset to a certain degree by the increase in Beel productivity.

Flood Damage Reduction

36. The aggregated annual value of flood protection up to 1:100 year standard for Option B5 is Taka 68.75 million (economic) per year inclusive of exceptional agricultural damage, themselves totalling Taka 13.15 million (economic) per year. This is based on analysis of past records of damage.

Social Impact

37. In the short term, the positive effects are expected from employment generation for laborers in particular during construction, and the knock-on effects this increase in incomes would generate. In the longer-run, social benefits are expected to be derived from the reduction in flood damages and increased agricultural productivity, leading to higher household incomes, savings, investment and consumption patterns which in turn will bring positive benefits to the non-agricultural sectors and poverty alleviation..

38. The potential disbenefits arising are the loss of land due to land acquisition for the civil works, loss or reduction of livelihood for those engaged in capture fisheries and a marginally increased risk of flooding in the Char lands. Mitigation programs are included to address as far as possible the latter two. The problems of land acquisition are to be addressed with the support of NGOs and these will identify appropriate measures. Residual concerns exist over the question of equity gap widening as although all sectors are forecast to benefit from the project, it is nevertheless anticipated that those already better off will benefit from the project, it is nevertheless anticipated that those already better off will benefit more than the poorer socio-economic groups. Separate income generating programs on the mainland would be required to address this and further studies are planned.

Environmental Impact and Management Plan

39. A summary is given in Table 5 of the principal negative impacts in order of severity supposing there had been no mitigation. This also indicates the

Potentially Significant Negative Impacts in the Overall Study Area

Category	Impacts before Mitigation	Proposed Mitigation	Residuals	Action Needed
Increased Flood Risk outside protected mainland	607,000 people by average 0.3m increase in depth in an extreme year.	Flood proofing and income diversification programme	Some increase in depth of flooding on agricultural land	Flood modeling and risk mapping Implement Flood Proofing Programme
Professional Fisheries	Production in boats and inland rivers would fall by an additional 47% over current trends, affecting up to 50 000 people	Fisheries Management Programme	Few	Pre - post flood mapping, baseline study Implementation programme
Common Good Fisheries	Flood plain production would fall by an additional 38% over current trends, affecting particularly landless people	Affordable nutrition replacement programme Targetted Fisheries Programme	Needs Study	Nutrition study flood mapping, design programme for management
Nutrition	Up to 33% of households could be affected.	Affordable nutrition replacement programme	Needs Study	Nutrition study and design programme for protein replacement
Waterborne Navigation	Unknown but suspected to be slight when compared to without project situation	Provide a navigation lock	Few, if any	Review whether a lock is really necessary
Ecology	Fresh Unknown, need flood mapping, possible net to medical plants	Water Management but priorities need to be defined	Expected to be very slight	Baseline Ecology Survey and monitoring Flood Mapping Assess consumption patterns
	Fresh Unknown but slight compared to without project situation			
Waterborne Diseases	Unknown but Malaria + cholera feared	Health Management + Education	Could improve on the without project situation	Review FAP 16 Results Health Survey and recommend programme, if required
Fishwood and Fodder Availability	Unknown but suspected to be slight when compared to without project situation	Community Forestry Programme	Could improve on the without project situation	Assess whether Forestry Programme should involve embankments
Soil Fertility	Unknown, but concern expressed by POE	Monitor and manage	Unknown possibly medium term only	Baseline and medium term data collection
Land Availability/Reclamation	Reduced as far as possible by careful embankment location	Integrated multi-purpose embankment use programme	Very little if well managed, could be very beneficial	Enumeration, study, policy decisions

Table 5

mitigation proposals and the residual impacts for which it is difficult to directly mitigate for. It also shows what data collection is required in the Detailed Design period for these to be addressed in a sound manner to produce an Environmental Management Plan as part of a full EIA within the broad framework of the FPCO approved Guidelines for Environmental Impact Assessment. It is proposed to address this as part of the Supporting Program for the subsequent Detailed Design Phase of the study.

PROJECT EVALUATION

Economic Analysis

40. The methodology for economic analysis adopted is that of the Guidelines for Project Assessment (GPA) dated May 1992 and issued by FPCO. A summary of the results is given in Table 6. Sensitivity analyses have been undertaken and the results are summarized in Table 7. The figures show that Option B5 is generally robust but most sensitive to capital costs, implementation delays and, to a lesser extent, agricultural gross margins. A number of supplementary tests examining alternative assumptions have been undertaken.

41. The GPA guidelines for civil works cost estimation require adoption of unit rates in line with BWDB schedule of rates as estimated for 1991. The base case described above conforms to this requirement. An alternative approach is to consider the likely costs if the civil works are let under international competitive bidding (ICB) conditions. Analyses undertaken indicate that under these conditions prices for earthwork fill could rise to between Taka 45 and Taka 60 per cubic meter at 1991 prices from the BWDB equivalent rate of about Taka 30. On the assumption that this price rose to Taka 50 and all other civil works items including fisheries structures and hydraulic structures, rose by 20% (corresponding to an overall increase of 28% on total basic capital costs), an EIRR of 11.7% is estimated.

42. A separate analysis has been carried out to assess the impact on EIRR of an alternative assumption for the without - project reference situation. In this alternative it is assumed that during the next 30 years the people within the

Table 7 Summary of Sensitivity Analysis

Parameter tested	EIRR	NPV 10 ⁶ Tk
BASE	14.0	135.6
INVESTMENT		
Variations in unit rates		
+ 15% Capital costs	12.8	56.9
- 15% Capital costs	15.5	214.2
OPERATION/MAINTENANCE		
+ 15%	13.7	115.3
- 15%	14.3	155.9
AGRICULTURAL PRODUCTION		
Variation of gross margin		
+ 10%	14.8	186.5
- 10%	13.3	84.7
- Macro-economic factors		
+ 20%	16.3	298
- 20%	11.6	-26.8
FISHERIES		
+ 15%	14.2	149.3
- 15%	13.8	121.9
DAMAGE		
Variation in return period estimate	13.3	85.3
Fall in value of damage reduction (-25%)	12.6	41.0
RICE CONVERSION FACTOR		
0.65 (export parity)	10.9	
1.11 (import parity)	17.7	
Implementation (2 years delays)	12.7	50
Delay in achieving Yields (3 years delays)	13.3	86.9

mainland area would have proceeded with flood proofing by themselves but that, with Option B5, they would not need to do so. Thus, in the analysis the cost of flood proofing, spread over 30 years, is included in the without - project situation. On this basis the base case EIRR is raised from 14.04% to 15.5%.

Multi-Criteria Analyses

43. Again in conformity with GPA guidelines, a multi-criteria analysis has been undertaken to review the overall impact of Option B5. Where quantitative analyses are not possible, a subjective ranking -5 to +5 is used. The results are given in Table 8 and highlight the generally positive outcome of Option B5. The effects as measured by scores of ± 2 or less may be considered marginal.

IMPLEMENTATION PROGRAM

Program

44. An overall program for implementation proposed in Figure 3 would be subject to a financing agreement between the Government and its development partners. The program is considered in two main phases. In the first phase detailed engineering planning and design should proceed immediately during 1993. During the later part of 1993 a start should also be made on the pilot flood proofing program and the fisheries program. Construction of the Jamuna embankment would start in 1994, commencing at the upstream end and continuing south to Sarishabari in a period of 4 years. The pilot drainage works would also start in 1994 with a full program commencing in 1995, depending on the evaluation of results from the pilot program. Priority would also be given in 1994 to construction of discrete sections of embankment in the Old Brahmaputra area to protect Islampur, Jamalpur and Dewanganj, as well as construction of the main structures in the Jamuna embankment. Phase 1 civil works would be substantially completed by the end of 1997 with work continuing thereafter on drainage works, the flood proofing main program and fisheries management project.

45. The second phase of the project would entail completion of the Old Brahmaputra embankment, with related structures, and construction of the last

Table 8
Multicriteria Analysis - Summary of Project Results

Data type	Variable/Measure/Units	PROJECT		
		WO	A	B
1. ECONOMIC				
	EIRR %	-	0.19	14.04
	NPV (Tk x 10 ⁶)	-	-170.2	135.6
2. QUANTITATIVE				
	Rice production increase(ton)	4109	10738	40577
	Employment increase(man-year)	403	1234	3250
	Fisheries production increase(ton)	-506	-506	667
3. QUALITATIVE	Hydrology			
	Surface			
	Flooding Damage to Land	-5	-5	+4
	Drainage problems	-4	-2	+4
	Erosion			
	Jamuna	-4	-4	-2
	Within Project area	-2	-2	+2
	Sedimentation			
	Jamuna	-2	-2	-2
	Within Project area	-2	-2	+2
	Clogging/Smothering	-2	-2	+2
	Soil Fertility	0	0	-2
	Freshwater Ecology			
	Water Quality			
	Domestic Water Quality	-2	+2	+2
	Agriculture Water Quality	+2	+2	+3
	Land Resources			
	Soil			
	Quality/Chemistry	0	0	-1
	Erosion	-2	-2	+2
	Ecology			
	Flora	-2	-2	-3
	Fauna	-3	-3	-4
	Economic Livelihoods			
	Risk	-5	+2	+4
	Settlement	-4	+2	+4
	Land Tenure			
Scarcity	-2	-2	-2	
Land Values	+2	+2	-3	

Table 8 (Cont'd.)

Common Resource Rights			
Fish	-2	-2	-3
Fuelwood	-4	-4	-4
Grazing	-2	-2	-2
Fodder	-2	-2	-4
Agricultural Output	+2	+3	+5
Fishing ('Professional')	-1	-1	+3
Forestry and Fuelwood	-2	-2	-2
Livestock	-2	+2	-1
Wage Paid Employment	+2	+2	+4
Industry	+2	+2	+4
Drinking Water Availability	0	0	0
Insect Borne Diseases			
Malaria/Kala-azar	-2	-2	-3
Japanese Encephalitis	+2	+2	+2
Filariasis	+2	+2	+2
Drinking Water Quality	-2	+2	+1
Sanitation	-2	+2	+2
Nutrition	-1	+1	-2
Mental Health	-2	+3	+4
Access and Transport Infrastructure			
Waterborne			
Jamuna	-2	-2	-2
Within Project area	-2	-2	-2
Railway	-1	-1	+5
Road	-4	-2	+4
4.FINANCIAL			
Investment costs (MTK)	0	396.7	1432.7
O/M costs (MTK/year)	0	14.6	37.3
Agricultural value added (TK/day)	101.0	101.3	160.1
Agricultural value added (W/WO)	0	+0.3%	+5.0%
Agricultural value added (TK/ha)	26842	27315	29630
Agricultural value added (W/WO)	0	+1.8%	+10.4%

Note: Marks for Common Resource right (fish), Fishing (professional), Water-borne transport differ from Matrix in Annex-3 on Environment.

Mitigation measures are taken into account in the matrix above.

Figure 3 - Jamalpur Priority Project Impl. Program

ACTIVITY	1993	1994	1995	1996	1997	1998	1999	2000
Engineering & T.A.	[Solid bar across all years]							
Contracts Tender & Award	[Dashed bar across 1993-1996]							

MAINLAND PROJECT	1993	1994	1995	1996	1997	1998	1999	2000
PHASE 1								
Drainage Pilot Project		[Solid bar]						
Jamuna Embk. Baha (w-Chetal)		[Solid bar]	[Solid bar]					
Jamuna Embk. Cheta-Madarypur		[Solid bar]	[Solid bar]	[Solid bar]				
Jamuna Embk. Madarypur-Cheta				[Solid bar]	[Solid bar]	[Solid bar]		
Probedak-3 Embk. Dwaraganj			[Solid bar]	[Solid bar]				
Probedak Embk. Jalampur			[Solid bar]	[Solid bar]				
Probedak Embk. Jamalpur			[Solid bar]	[Solid bar]				
Chetal Inlet Structure		[Solid bar]	[Solid bar]	[Solid bar]				
Jhawal/Chetal Outlet Structure		[Solid bar]	[Solid bar]	[Solid bar]	[Solid bar]			
Flushing Structures		[Solid bar]						
Drainage Improvement Project			[Solid bar]					
Flushing Project		[Solid bar]						
PHASE 2								
Old Baha, Embk. South Half					[Solid bar]	[Solid bar]	[Solid bar]	
Old Baha, Embk. North Half					[Solid bar]	[Solid bar]	[Solid bar]	
Baha-Ford, Factory Embk.							[Solid bar]	[Solid bar]
Jalampur Inlet Structure				[Solid bar]	[Solid bar]	[Solid bar]	[Solid bar]	
Jhawal Inlet Structure				[Solid bar]	[Solid bar]	[Solid bar]	[Solid bar]	
Flushing Structures				[Solid bar]				
% INVESTMENT PER YEAR (a)	7	12	20	21	20	9	5	4

CHAR AND SETBACK LAND PROJECT	1993	1994	1995	1996	1997	1998	1999	2000
Pilot Project		[Solid bar]	[Solid bar]	[Solid bar]				
Site Development					[Solid bar]	[Solid bar]	[Solid bar]	[Solid bar]

section of the Jamuna embankment between Sarishabari and the Fertilizer Factory. Phase 2 works would commence in 1996 (Jhenai inlet), with embankment construction starting in 1997. All works are expected to be completed by the end of the year 2000.

Implementation Arrangements

46. Whilst further detailed planning would be undertaken under FPCO, implementation of the main project is expected to be the overall responsibility of BWDB. It is anticipated that a Project Management Organization (PMO) would be established to coordinate the multisectoral interests and needs of the project. The PMO would come under Project Steering Committee, chaired by BWDB, with representatives of FPCO, the Ministries of Agriculture, Fisheries, Local Government, Finance, Transport and Environment as well as concerned NGOs. The PMO would be supported by an engineering and technical assistance team of foreign and local consultants. The recruitment of NGOs could be either through the PMO or directly by line agencies according to circumstance. Further studies and pilot work for the Char land area would be undertaken also the PMO, with arrangements for the main phase of this work to be decided in the light of experience gained. People's participation is stressed as an important factor in the scheme's future success and special provisions are incorporated to facilitate this activity. Future operation and maintenance procedures are also expected to conform to this principle.

DETAILED PLANNING AND DESIGN STUDIES

47. Project preparation is expected to go during the second half of 1993 and the year 1994. Detailed planning and design studies will enable refinement of the options for development on the mainland and on charlands in consultation with the local population and taking due account of the Environmental Management Plan produced during the feasibility study. The concept underlying these next studies is thus one of an integrated approach; it will associate in the preparation of detailed designs for the main water management project, the definition of several pilot programs for flood proofing, fisheries mitigation and development, drainage and agricultural improvements.

48. To achieve this objective, supporting activities will be carried out comprising:

- Supplementary field surveys for fisheries, ecology, socio-economic parameters (health, nutrition, sources of income), and agriculture.
- Flood Proofing trial activities with the help of interested NGOs.
- Definition of supporting programs with local authorities, NGOs and representatives of the beneficiaries in the fields of agriculture and fisheries - These programs will aim at ensuring achievement and sustainability of the expected benefits, and at targeting disadvantaged groups.
- Definition of a resettlement and rehabilitation program for the population residing on existing reused embankments or displaced by new land acquisition.
- Adjustment of engineering designs to minimize possible adverse impacts (fish friendly structures, refuge areas for people remaining unprotected)
- Definition of an implementation program to benefit landless people during construction and enable them to benefits from the structures (e.g. through involvement in their operation and maintenance)

The detailed planning and design studies, which thus take account of the existing results of the FAP supporting activities, will integrate their further outputs and lead to a final project packaging and assessment by the end of 1994. Construction works could begin in 1995, with appropriate institutional arrangements to ensure multisectoral coordination and involvement of the local population.

**Technical Session on
Jamalpur Priority Project (FAP 3.1)**

Answer given by FAP 3.1 Team Member and FPCO Staff

Mr. T. Herman, World Bank

Question: Why is Jamalpur a Priority Project ? It would seem that flooding in the project area is not as severe (in terms of agricultural and non-agricultural damage potential), as, say, the southern part of the North Central Area. Is the Project, in fact, the first stage of a proposed Brahmaputra Left Embankment ?

Answer: JPP has been designated a priority project for the reasons set out in the presented paper, namely that given the perceived needs for the project it was one that could be progressed relatively independently of others. The term priority was intended to imply its comparative strategic, rather than economic value. The studies undertaken under FAP 3.1 have not been concerned with the question of JPP's context within the greater question of a Brahmaputra Left Embankment.

Question: Are both public and private flood proofing costs included in the economic analysis?

Answer: Public and private flood proofing costs are included in the economic analyses.

Mr. S. R. Khan, FAP 21/22

Question: In Noakhali, Meghna cross dams connected and turned some charlands into mainland by creating situation for rapid siltation. Have you studied such option for charland in your project area ?

Answer: Preliminary studies have been made of the historical trends of char land accretion and erosion patterns. Outline proposals for development within the char lands have been put forward but are the subject of pilot schemes and further studies in the next phase.

Mr. Ross Hughes, International Institute for Environment and Development (IIED)

Question: Environmental impacts were mentioned as likely to occur as a result of the implementation of FAP 3.1. Please could the speaker elaborate as to what these may be, and also clarify what is meant by "marginal" in relation to losses to individual fishing communities.

Answer: The range of significant environmental impacts, the mitigatory measures and residual impacts are set out in both the paper presented and in the report. Marginal losses referred to are estimated differences in decline of flood plain production from current levels of 900 tons pa to 580 tpa without project or 500 tpa with project, set against projected improvements in production in beels, internal rivers and ponds.

Mr. Abu M. Sufiyan, Research and Advisory Services

Question: Public participation: Could you outline how NGOs are "to facilitate public participation in the overall implementation program". How would you define public participation in the context of FAP 3.1?

Answer: NGO's are expected to play an important role in promoting a better interaction between beneficiaries and planner, in clarifying community needs and preferences and in facilitating a greater awareness within the community of opportunities to be gained from the project. NGO's will also participate in disseminating information and advice concerning the non-engineering project components. Public participation is seen as essential ingredient to the future success of the project.

Mr. Shapan Adnan, Research and Advisory Services

Question: If the convenient division between Mainland and Charland had not been made, would you have had an acceptable EIRR for the whole impact area?

Answer: The distinction between mainland and charland in project terms reflects the distinctly different strategies proposed for areas inside and outside the embanked areas. Combining the two areas to compute an overall EIRR is meaningless in so far as no methodology is available within FAP to quantify in economic terms benefits arising from flood proofing measures such as those proposed at JPP.

Question: Is FAP 3.1 now moving on to the Detailed Design stage, even if under a different name (e.g. Jamuna-Dhaleswari Left Bank 1?) If so, was this publicly disclosed at this conference?

Answer: As noted in the paper FAP 3.1 is progressing to the detailed design stage, which incorporates additional and more detailed studies to enhance the overall package of measures proposed. No change of name for the project has been suggested.

Question: Will the magic formula of using NGOs be sufficient to prevent affected char-dwellers from making public cuts on the proposed embankments?

Answer: The detailed planing stage, in which NGO's will have an important role, is directed towards developing parallel programs inside and outside the embankments which are intended, inter alia, to minimize the risk of embankment cuts.

Mr. Abul Kalam Azad, MP, Jamalpur 1

Question: Most of the speakers mentioned about environmental problems in Flood Action Plan. None mentioned specifically the probable environmental problems which may arise after the implementation of FAP. Would you specify ?

Answer: The environmental issues are highlighted in the conference paper.

Engr. Md. Aminur Rahman, Consulting Engineer
Research and Advisory Services

Question: What is this unheard of "Controlled Flooding" ? - Has this concept been operated anywhere on this planet ? - if not, then Bangladesh is going to be a ground for experimentation. Comment please.

Answer: Controlled flooding is a term used to distinguish between full flood protection, which eliminates all flooding and inflows to the protected areas from the main river systems, and the situation where under controlled conditions limited but beneficial inflows are permitted in order to enable continuation of current husbandry and fishing activities that are largely dependent on such flows.

Question: What are the scientific rationale behind calling FAP 3.1 a priority project ?

Answer: The reasons for the term "priority" are explained in answer to question (1)

Question: For the benefit of 631,023 people, why one should sacrifice the 602,603 creatures called human beings living outside this "priority" project area including charlands.

Answer: JPP seeks to address the needs of both mainland and charland dwellers through parallel but different measures entailing broadly similar levels of investment per capita.

Mr. A.S.M. Abdul Khaleque, SWMC

Question: The alignment followed by the proposed embankment along the Jamuna and Old Brahmaputra falls in an area which, I presume, is mostly sandy soil. In that case would it be possible to build a stable embankment.

Answer: Extensive site investigations have already been carried out which indicate a stable embankment is possible to construct along the embankments proposed.

Mr. Rasmussen, FAP 25

Question:

- (1) Has an Environmental Review Report been prepared by FPCO, and subsequent review carried out by Dept. of Environment and local authorities in accordance with FPCO Guidelines ?

and If not :

- (2) Shouldn't this be done before proceeding to Detailed Design?
Answer: Environmental studies have been conducted in conformity with the TOR as set. In the intervening period since the TOR were written, greater awareness of the relevant issues has lead to more detailed guidelines having been prepared. Within the limited resources allowed to the Consultants, these issues have been addressed and it has been

concluded that it is unlikely that any major problems will face the project that cannot be overcome. It is recognized nevertheless that is necessary to fulfill the latest guidelines and it has been agreed to proceed with this and with more detailed environmental studies during the next phase of the work in advance of any major investment decisions.

Mr. Ross Wallace, World Bank, Resident Mission Dhaka

Question: Could you please elaborate on the activities of the design phase of FAP 3.1 which will not just involve detailed engineering but Environmental, Fisheries and Participatory Planning too.

Answer: A broad range of activities other than detailed engineering design are proposed in the next phase of the work. These include, as mentioned, environmental studies, participatory planning, fishery development programs, further studies in the char lands, pilot flood proofing schemes, pilot drainage schemes and strengthened planning, management and monitoring capabilities.

Mr. Abul Kalam Azad, Member of Parliament, Jamalpur-1

Question: After the construction of embankment on the Western Bank of Old Brahmaputra river, a large area on the Eastern side of the river such as Dewangonj and Bakshigonj P.S. will go under water during rainy season. What plan do you have for the people of those areas ?

Answer: The JPP studies do not specifically address the issues relating to the left bank of the Old Brahmaputra, which is covered by another FAP programme. Under JPP it is nevertheless proposed that attention should be given to the issues concerning those living outside the proposed right bank alignment and it is recommended that some pilot schemes and studies should be taken up.

Mr. Abu M. Sufiyan, Research & Advisory Services

Question: In preparing the fisheries programme did you have any inputs from the Fisheries Study (FAP 17)? If not, don't you think that adequate & timely information from FAP 17 was vital for FAP 3.1 in particular ?

Answer: Interaction between FAP 3.1 and FAP 17 occurred which was beneficial to FAP 3.1

Question: What are the vital things that you don't know from FAP 17?

Answer: Further studies are necessary to elaborate on the nature, productivity and trends of fishing within the JPP, as well as the interaction between the flood plain and main river systems.

Mr. Robert Reitemeier, Action AID

Question: The flood proofing on the char lands seems to be designed to protect families from increased water levels due to the embankment construction. What is your view concerning decreases in agricultural output on the chars (the reason, people are on the Chars)?

Answer: Flood proofing in the char lands is proposed to address the existing needs of the area as well as the relatively small incremental impacts arising from embankment construction. The current substantial dependence of char dwellers on agricultural activities is noted. Given the patterns of continuing accretion and erosion this dependence underlines the plight of these people. Programs involving alternative means of income generation may be considered a more sustainable approach.

Mr. Mostafa Kamal Majumder, The Telegraph

Question: Why implementation of the project has been deferred by Donors? Is it due to discovery of inadequacies in your study?

Answer: Implementation of the project is being progressed into the next phase of detailed planning on the basis of the recommendations set out in the Consultants report.

Dr. G. T. K. Pitman, ISPAN

Question: The cost estimate for the char setback programme is estimated at about \$30 million. What proportion of this cost is directly attributable to the proposed 3.1 project intervention? Was this included in the EIRR calculation?

Answer: The cost estimates of the char and set back area programme take account of the relatively small additional works necessary as a result of confining the river. These additional works represent an estimated average 10% increase in earthworks which amounts in cost terms to less than 2% of the total flood proofing measures. This incremental cost was included in the economic analyses for the mainland project.

TECHNICAL SESSION II

May 18, 1993

(14:00 - 15:45 Hrs.)

- Chair:** Mr. Akbar Ali Khan
Secretary
Internal Resources Division
Ministry of Finance
- Rapporteur:** Mr. M. H. Siddiqi
Chief Engineer
Flood Plan Coordination Organization (FPCO)
- Topic:** FAP 4 Southwest Regional Study
by Mr. L. R. Munshi and
Mr. R. I. Thiagarajah
FAP 4 Team Members
- (b) FAP 3.1 Jamalpur Priority Project
by Mr. Malcolm F. Wallace
FAP 3.1 Study Team
- Discussants:** Prof. Ainun Nishat
Bangladesh University of Engineering &
Technology (BUET)
- Prof. K. B. Sajjadur Rashid
Dhaka University

SOUTHWEST AREA WATER RESOURCES MANAGEMENT FAP 4

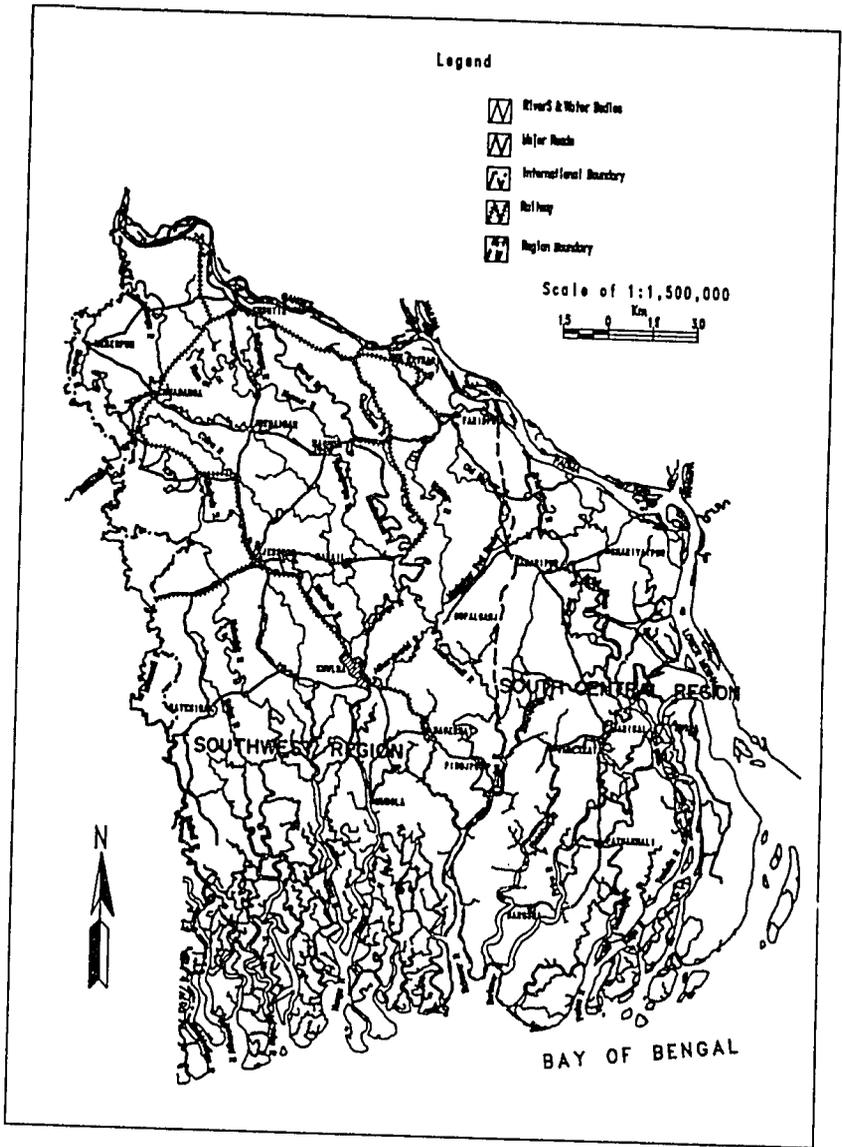
Introduction

1. The Southwest Area Water Resources Management Project is a component of the Flood Action Plan which was instituted in response to the disastrous floods in 1987 and 1988. The Project known as FAP-4, is financed by the Asian Development Bank under their Technical Assistance program in collaboration with UNDP. The Project commenced in October 1991 and with 19 months duration, is due for completion in May 1993.
2. The objective of the study is to assist the Government in formulating a comprehensive regional water resources development and management plan for the Southwest Area, thereby helping the Government achieve its long-term goal for sustained growth through the balanced, systematic development and management of the Area's land and water resources.
3. The outcome of the study will include:
 - (a) a phased, long term, land and water resources management plan aimed at sustained development of the Area's production potential
 - (b) a portfolio of identified priority projects and
 - (c) pre-feasibility study of selected priority projects.

Regional Overview

4. The Southwest Area (SWA) comprises the Southwest and South Central Regional (Figure 1) which together have a gross area of about 40,450 sq.km. The SWA is bounded by the three major rivers (Ganges, Padma and Lower Meghna) to the north and east, the Indian border to the west and the Bay of Bengal to the south. 10 percent or about 4000 sq.km. is covered with coastal mangrove forests known as 'Sundarbans' and about 13 percent is water areas including rivers and natural land depressions known as 'beels'.

Figure 1 - SOUTHWEST AREA MAP



Southwest Area .

5. The population of the Area is just over 26 million which is growing currently at the rate of 1.89% a year. Agriculture is the most important economic activity of the Area and currently a total of 2.5 m ha net are cultivated of which 1.1 m ha are provided with some measure of flood control and drainage and about 0.64 m ha are irrigated. On average nearly 12 percent of land is subjected to flooding each year (Figure 2). Aquaculture and fisheries are important in the southwest region. Fish provides the population with about 80% of its annual protein intake and shrimp is the country's third largest source of foreign exchange.

6. The climate in the SWA is typically similar to rest of the country with mean annual rainfalls ranging from 1500 mm in the north to 2900 mm in the south and temperatures ranging from 20°C in the winter to 38°C in the summer. Destructive cyclone storms occur frequently between October to November and April to May.

7. Most of the SWA is served by a reasonable network of roads, although a large part of the tidal areas in the south have only internal roads with no external linkages. Water transport is the principal mode of transport in the South Central Region making rivers and waterways the main arteries for transport in the tidal areas of the region. Mongla, the country's second largest seaport is located in the Project Area and is served almost exclusively by water transport

8. More than 70 percent of the population are living in conditions of absolute poverty. Whilst in some areas small food energy surpluses exist, both Regions are overall in deficit. Without actions now to improve conditions, the situation will be dramatically worse in 25 years time. The needs of the people are self-evident from the above. They need:

- (a) the facilities by which to significantly raise agricultural production
- (b) greater opportunities for employment and equitable growth in incomes

as well as secure and good quality potable water supplies, improvements to health and sanitation, a reasonable transportation system providing access to markets, and a safe and sustainable environment for the generations to come.

9. The development constraints faced by the people are many and diverse. As elsewhere throughout Bangladesh, water management is a key component to unlocking many of the constraints. It is not of course the only component, and any future progress must be based on a holistic approach that addresses and coordinates all relevant development issues.

Water Management Issues

10. The three major water management issues in the SWA are:

- (a) acute shortages in the Southwest Region of surface water resources in the dry season
- (b) widespread flooding, primarily from the Ganges/Padma and Lower Meghna
- (c) drainage congestion, mainly in the coastal polder areas but also in inland areas where natural drainage is inadequate.

To these may be added concerns over the availability and management of the groundwater resources, concerns about salinity intrusion and grave concerns of the sustainability of a number of important rivers. Deterioration of the Sundarbans due to diminution of fresh water flows from the north is also causing concern.

11. At present the main line of defence against flooding is the Ganges right embankment which stretches from close to the Indian border down to beyond Faridpur. This embankment requires only minor works to bring it up to an acceptable standard. Beyond this, the embankment is only partially complete along the Padma. With only moderate investment it can be extended to the Arial Khan and with further extension along the Arial Khan, it would immediately reduce the areas within the SWA as a whole at high risk of flooding by some 30 percent. To the east of the Arial Khan, a poorly constructed embankment is in existence which again could be upgraded relatively simply. Further development of embankments along the Lower Meghna right bank are risky before the impacts of left bank and upstream works are assessed.

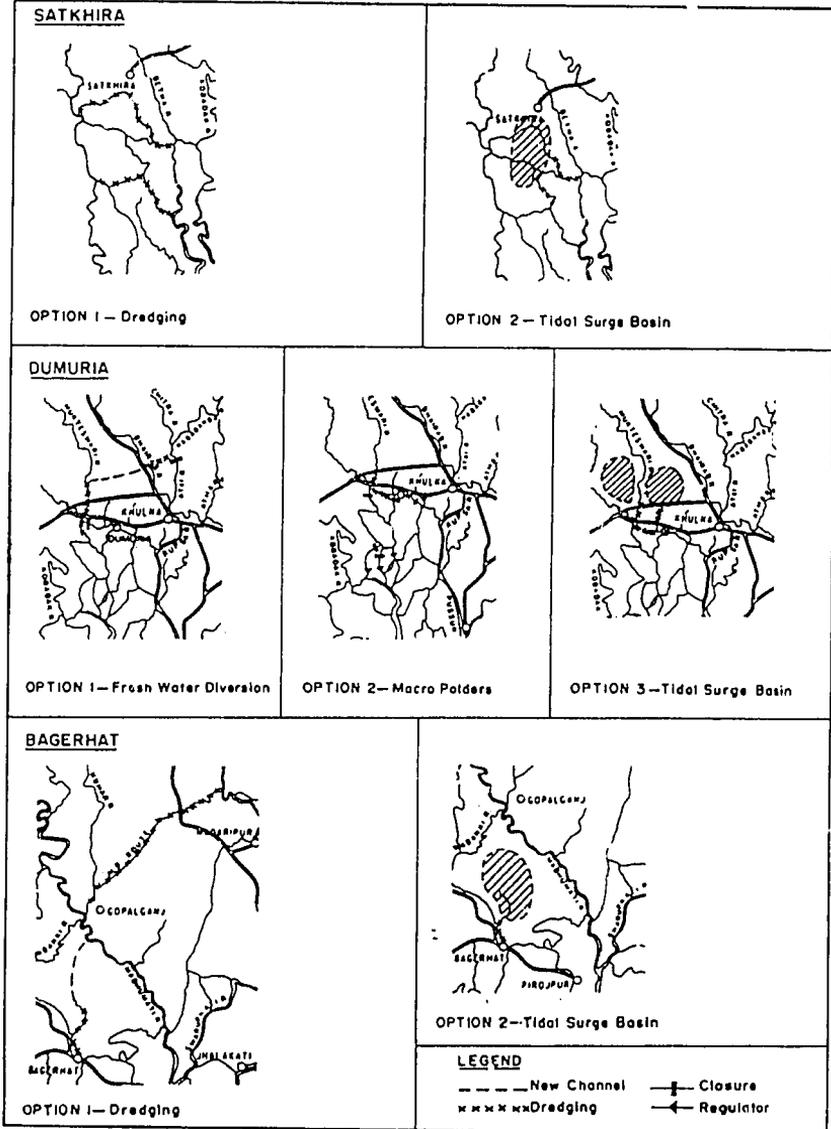
12. The problems of drainage in the coastal polder area are mainly as a consequence of the polders themselves, which have vastly reduced tidal cubature

and have prevented the natural processes of land building. The reduced cubature, exacerbated by lower regional inflows since construction of Farakka Barrage, is causing many rivers to silt up which in turn reduces the possibility of gravity drainage from within the polders. Pumped drainage is an expensive option and one that probably represents as a last resort. A preferable solution is to identify natural drainage lines which appear sustainable with a minimum of capital and maintenance dredging and to reorganize the polders and their internal drainage so that outfalls are to these sustainable channels. The interventions (Figure 3) considered have taken account of the maintenance of the main navigation routes and the impact on the Port of Mongla.

13. The Gorai river, the principal regional river which supplies the Southwest Region (SWR) is a spill river from the Ganges and in recent years has been totally dry during the dry season due largely to diminution of flows in the Ganges. The South Central Region (SCR) has relatively an abundance of water throughout the year.

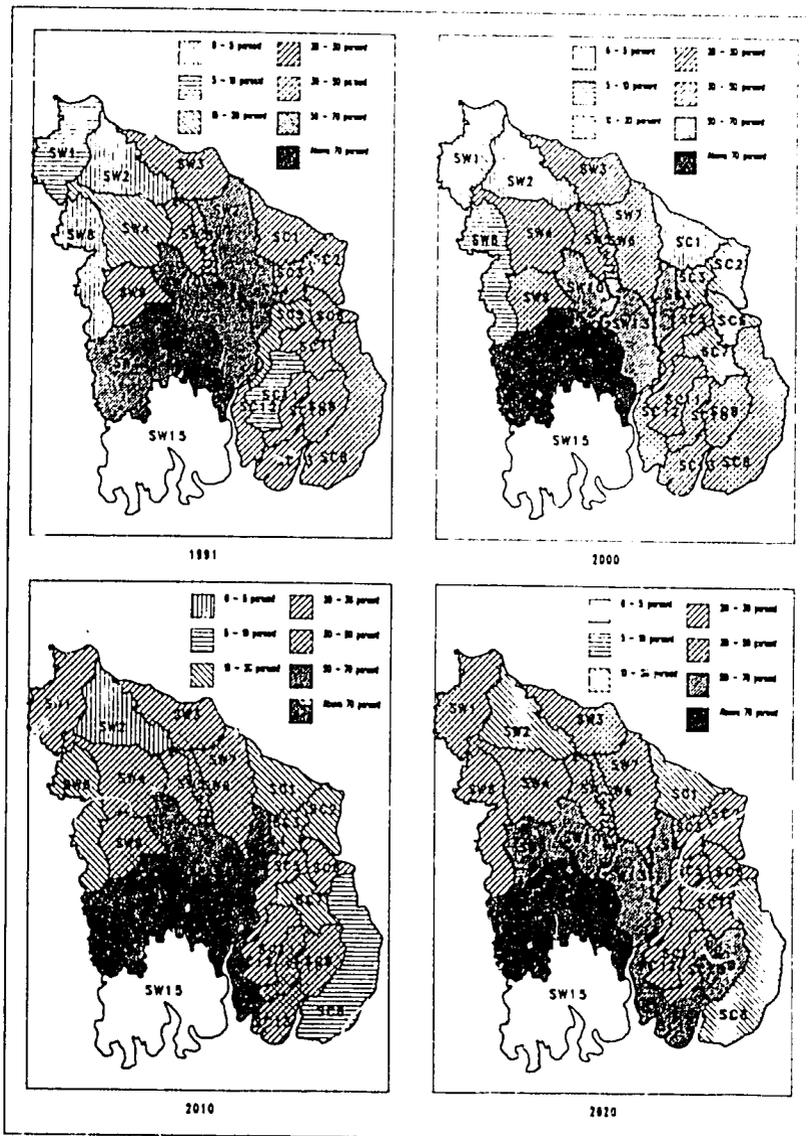
14. The shortage of dry season flows in the SWR can be alleviated by groundwater and/or surface water resources. Groundwater is a limited resource in the SWA and is available mainly in north and northeastern areas. However even with full exploitation of this resource the food grains sufficiency cannot be met (Figure 4) and reduction of Ganges flow has resulted in lowering of water table in the region. Therefore augmentation from surface water resources become even more important. Boundary rivers of the SWA are the main sources of this resource. The principal choices are from the Ganges and from the Padma. The latter is more reliable in the dry season but commands substantially less area. The Ganges dry season flows have been notably reduced since the construction of Farakka. The consequences of such reductions are that saline intrusion has moved inland within the coastal areas and opportunity to expand irrigation is much lower. In addition, the natural and progressively deteriorating cycles of dry season flows in the Gorai have been made worse. Morphological studies indicate that at some time in the future, the Gorai as a major spill river from the Ganges, will go into irreversible decline unless steps are taken to prevent this. The timing of such a decline however is very difficult to predict. Whilst loss of the dry season discharge of the Gorai would have relatively small impact, as it will not be worse off than the present situation, the loss of the wet season discharges could have major impacts on the ecology of the Southwest Region with disastrous consequences to the Region.

Figure 3 - External Interventions in CEP Polders



External Interventions in C.E.P Polders

Figure 4 - Food Energy Shortage (Development Without Augmentation)



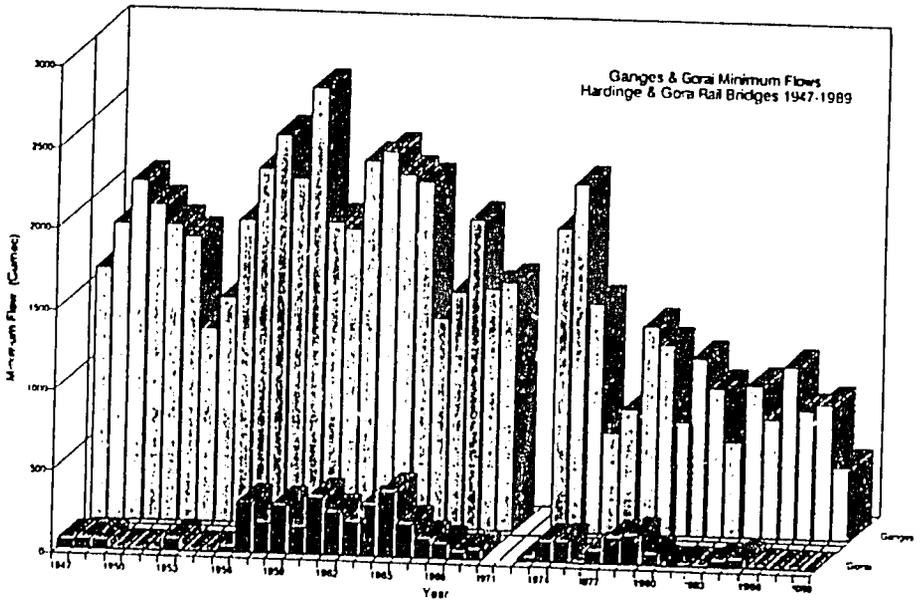
Food Energy Shortage (Development Without Augmentation)

15. Augmentation of dry season flows is required for the purposes of irrigation and salinity control. Indications are that without major interventions to enable widespread development of irrigation, there is no possibility of achieving Regional food security. From the studies made of all possible sites along the boundary rivers, the Gorai provides the best choice for diversion. Another reason for choosing the Gorai is the need to arrest the decline of the river, which is going through a cycle of low period.

16. As illustrated in Figure 5, in the pre-Farakka period the Gorai enjoyed a typical minimum flow of about 250 m³/s in the dry season. In more recent years as a result of both the lower flows in the Ganges and the cyclical decline of the Gorai itself, flows are very much lower and in some years zero. The impact on the saline front of reestablishing a 250 m³/s minimum flow is illustrated in Figure 6. It may be noted that freshwater would be restored with some confidence to the Khulna area, notably to the paper mills, and that some areas currently predominantly under a shrimp-rice rotation would revert to purely agricultural use. The value of the Sundarbans as a resource covers a multitude of sectors of which forestry and fishing are the most important. The impacts on these and on other sectors of a different water regime needs extensive study.

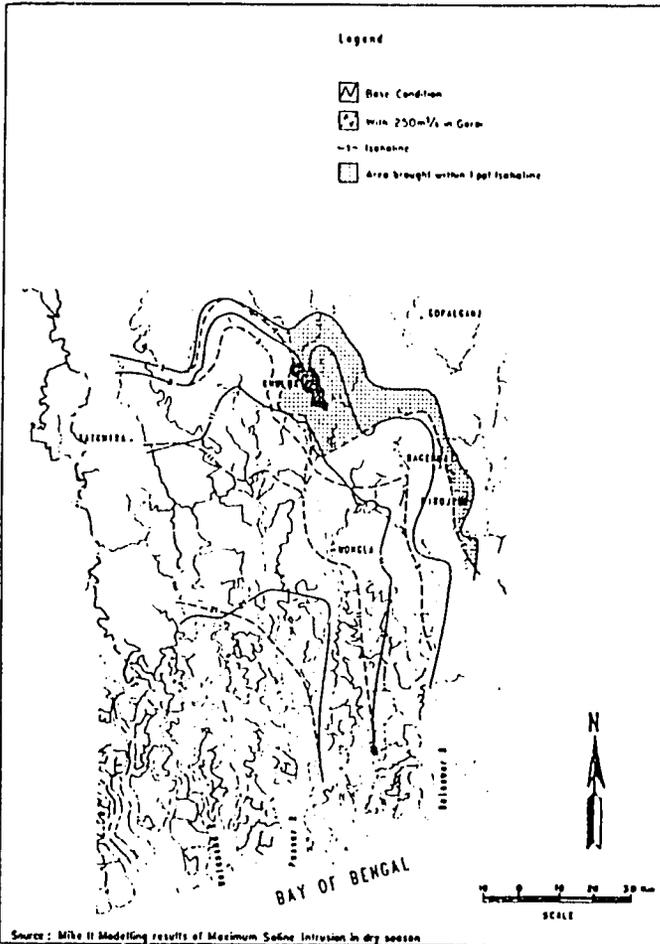
17. As stated earlier groundwater is an important but limited resource in the Southwest Area mainly available in the north and northeastern areas only. Since privatization of shallow tubewell (STW) installation in 1985 there has been a very rapid growth in numbers of wells. In a number of areas, mainly in northwest of the SWA, current abstractions already exceed calculated safe limits. For further optimal extraction, deep tubewell (DTW) technology is required. Government subsidies on DTW's have recently been lifted which will inevitably increase the demands for STW. In the rural areas in particular, potable water supplies are drawn from the shallow aquifer, in the most part by hand suction pumps (the cheapest technology available). It is essential that potable water supplies are given priority over irrigation. The growth of STW and particularly DTW numbers will severely jeopardize this, as is already the case in certain northern areas. There is therefore a strong case for enforceable regulation of all further tubewell development combined as necessary with mitigative measures to secure potable supplies.

Figure 5 - MINIMUM FLOWS IN THE GANGES AND THE GORAI



Minimum Flows in the Ganges and the Gorai

Figure 6



Saline Front with 250m³/s in Gorai

Related Sectoral Policy Options

18. Most of the water resource developments are targeted primarily at the agriculture sector and this sector would clearly benefit the most. The policy objectives set in the Fourth Five Year Plan target food self-sufficiency, crop diversification and general increases in productivity. The expansion of irrigation is a cornerstone of the agricultural strategy and the proposals reflect this. Other areas where investments are required are input supplies, research and extension, marketing, area development and targeted programs.

19. The fisheries sector is also intimately linked with water resources development. Government policies place emphasis on productivity increases, employment generation, improvements to the well being of fishing communities and increasing exports. Capture fisheries in the SWA have shown a marked decline attributed to a variety of reasons, including the loss of flood plains for spawning and growth arising from FCD projects. Whilst generally of low productivity, capture fisheries are nevertheless important, especially to the rural poor and landless. The expansion of FCD anticipated in the SWA will further depress capture fisheries despite the mitigating measures that can be introduced to the engineering designs. The possible improvements to culture fin and shrimp production can go a long way to offset these losses in terms of tonnages but such measures need to be accompanied by generation of employment opportunities for the disadvantaged capture fishermen.

20. There has been a rapid expansion in recent years of shrimp farms in areas with access to brackish water. A common practice is the combination of kharif rice with shrimp, reflecting the seasonal movement of the saline front. This has led to conflicts between shrimp farming and rice farming in terms of both water and land management. The pilot project in polder 20 shows that rice and shrimp farming can coexist without conflict and that solutions can be found.

21. As with agriculture the importance of credit, input supplies, extension and marketing are stressed for the fisheries sector.

22. Government policy in the forestry sector centers upon rehabilitation of existing national forests, expansion wherever possible of the area under trees including better integration with farm land, adoption of wood conserving techniques, creation of employment opportunities and general environmental improvements. Increasing emphasis is being given to social forestry (homestead

groves) as recognition of this important resource grows. In general, the water resource management options as described have a positive impact and greater opportunities exist for social forestry. A particular concern however is that during the course of construction the likely huge increase in demand for brick will consume substantial stocks of timber. Though wood burning for brick firing is illegal the practice is still widespread. The possible impacts on the Sundarbans, as previously noted, are a further cause for concern and mitigatory measures such as encouraging the use of coal for brick firing need to be considered.

23. River transport is an essential component of the SWA's economy. Both the formal and informal (country boats) sectors are very active. The informal sector, though much less well-documented, is particularly important to the poorer classes as a means of income, transport, communication and marketing. Because of the costs involved, it is not easily replaced by road transport. Any interventions will have to recognize this.

24. Mongla Port is a vital transportation hub for the SWA and, as envisaged, will be developed to take proportionately greater amounts of cargo currently passing through Chittagong. In this way Mongla will serve not only Dhaka but many of the northern areas of Bangladesh. Extensive studies have been made by other consultants on the siltation problems at the port. None of the interventions proposed would detract from what are seen to be the most favored solutions, and if anything would marginally improve upon these. Of the options for development of navigation routes, the one that is identifiable as most important is the route linking Mongla with Dhaka via the MB route. Further studies of this are needed.

25. The need for maintenance dredging has been recognized by Government though in practice the amount done in the SWA by BIWTA in recent years is very small. The problem appears to be annual budgets rather than capital budgets since the dredging fleet is currently not fully utilized.

Strategy

26. Strategic analyses have been undertaken which have examined all identified modes of development of FCD, surface and groundwater irrigation and augmentation choices for both the Southwest and South Central Regions. The general pattern that has emerged from these analyses is:

- (a) the rehabilitation of existing FCD schemes or the construction of new FCD schemes by themselves has only marginal impact on raising the value of agricultural land; on average this is only about 8% in economic terms, an amount which can be offset in some areas by potential fisheries losses
- (b) in contrast the introduction of irrigation is highly beneficial typically raising the value of that land on average by between 132% and 156%
- (c) other uses of land such as culture fisheries, shrimp plus rice farming and social forestry represent higher value land uses in general
- (d) taking the above into account and the regional variations in economic prices and costs of interventions, it is concluded that FCD alone is viable only in a few planning units whereas irrigation from surface water, with and without the costs of FCD, is generally very good and from groundwater is normally acceptable.

27. The analysis carried out indicate that the highest economic returns are possible by developing the best land first without augmentation. With augmentation the benefit/cost ratio falls initially, absorbing the high fixed cost of such an intervention, but thereafter increases with greater abstractions as this cost is spread over larger areas. There reaches a point however when less attractive land has to be taken up and at this point the benefit/cost ratio starts to fall. For the Gorai augmentation for irrigation purposes, the optimum augmentation flows is about 150 m³/s.

28. Analyses of the current flows in the Ganges since Farakka was constructed indicate that the lowest recorded flow was about 400 m³/s, the 80 percent dependable monthly flow for the driest month (April) is 517 m³/s and the average monthly flow in April has been 576 m³/s. If it is assumed that 70 percent can be extracted then the following could be abstracted in theory from the Ganges:

With minimum Ganges flow	280 m ³ /s
With 80% dependable Ganges flow	510 m ³ /s
Under average conditions	720 m ³ /s

Salinity control would require about 250 m³/s at Khulna and given the limitations of the amount of water that can be abstracted and that irrigation abstractions in the Gorai would be upstream of the requirements for salinity control, there appears at present to be greater benefits to develop irrigation than achieve salinity control.

29. The above highlights the limitations of securing the amount of water that can be reliably extracted from the Ganges for irrigation and salinity control and a barrage across Ganges would be necessary to achieve this. Ensuring adequate releases at Farakka for long term reliability is dependent on an Agreement between India and Bangladesh on the sharing of Ganges water.

30. The development strategy determined thus far may therefore be summarized as follows:

- (a) In order to achieve food security within SWA, widespread expansion of irrigation is necessary with accompanying FCD works where considered necessary
- (b) Whilst surface water resources in the South Central Region are adequate for the foreseeable future, both surface and groundwater resources in the Southwest Region are insufficient to support anything other than a relatively limited expansion of irrigation: consequently measures to augment the surface water resources of the Southwest Region require urgent attention
- (c) Augmentation of the Southwest Region from the Padma via the Arial Khan and MB route is possible but will have only limited impact on irrigation potential and salinity control and thus should be considered as a supplementary measure only
- (d) The prime source of augmentation must come from the Ganges: the preferred intake is the Gorai River and works on this will serve the dual purpose of boosting irrigation as well

as maintaining the sustainability of the river itself, which is currently in question

- (e) The current low flow regime of the Ganges, being significantly diminished since construction of Farakka Barrage, is inadequate to support both significant expansion of irrigation as well as allocation of sufficient discharge for salinity control at Khulna: it is therefore recommended that initially priority be given to irrigation. To satisfy the needs of both irrigation and salinity control a Ganges Barrage is required
- (f) Flood protection works are necessary particularly with respect to flooding from the Padma and the Lower Meghna: works on the former should proceed but protection from the Lower Meghna should be deferred until the consequences of works upstream and on the left bank are known
- (g) Relief of drainage congestion is required in critical areas and these works should be accompanied by improvements to internal drainage as well as water management within the polders : the program for coastal drainage improvement is expected to continue over a number of years as further deterioration in certain currently satisfactory polders can be anticipated.

In addition to the largely capital works programme implicit in the above, important parallel measures have been identified. These include improved planning and regulation of groundwater development, increased annual investment in river maintenance, improved O&M investment in flood warning and proofing in high risk areas, strengthening of extension and training, credit facilities and input supplies in the agriculture, forestry and fisheries sector, strengthening of project design and implementation procedures incorporating beneficiaries views and environmental awareness and institution of long term data collection and impact evaluation programs.

Regional Water Resources Management Plan

31. In line with the emerging strategy the Regional Water Resources Management Plan has been prepared. In preparing the plan, the policies of the

GOB as embodied in the FFYP (1990-95) and the National Water Plan have been taken into account. Due attention has also been paid to the Eleven Guiding Principles as provided in the FAP.

32. The Plan contains several development options and is structured into several phases linked to progressive increases in demands and to the necessity for major investments to create additional surface water resources in the Southwest Region.

33. The overall Plan is given in Figures 7 and 8 for the Southwest and South Central Regions respectively and the areas of development are shown in Figure 9.

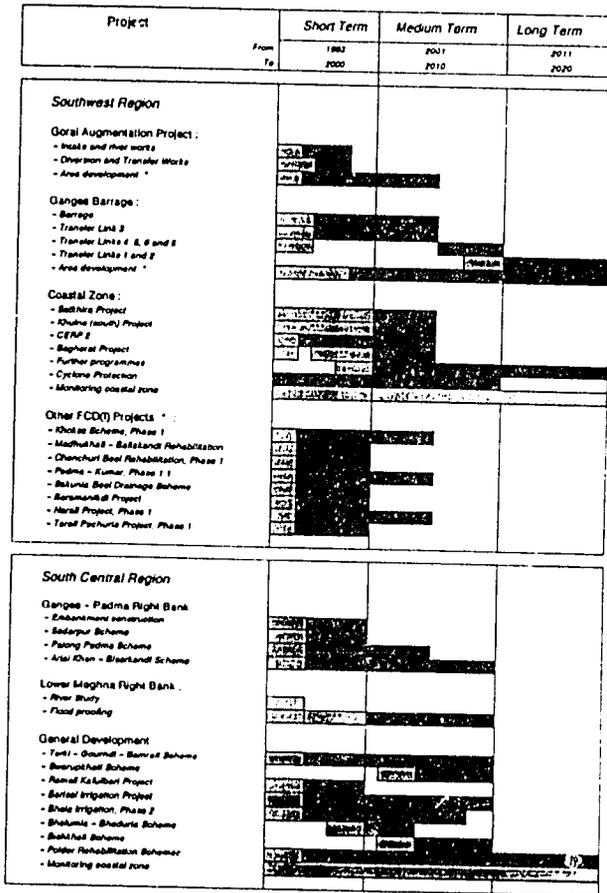
34. The augmentation of the dry season flows to the Area being of regional importance and a key to alleviating the present problems and in achieving food grain sufficiency in the Area is programmed to be developed in the short/medium term. In parallel with this development, other investments including improvements to the Ganges/Padma RB embankment, short term improvements in the CEP areas, other small to medium scale FCD/I schemes (independent of the augmentation project) can go ahead in the short to medium term.

Summary and Conclusions

35. SW Region suffers from serious shortage of water in the dry season, salinity intrusion in the south, drainage congestion in the polder areas and elsewhere and flooding in the east of the region from over bank spill of rivers. Capture fisheries have declined in the recent years and the Sundarbans is gradually deteriorating. There is already food deficit in the area which will increase as the population and demand increases unless large scale increase in agricultural production is attained. This can only be achieved by increasing the production in winter i.e. by augmentation of dry season flows as ground water has limited potential. Various options has been examined to achieve this. The Gorai river is declining and signs are that if no intervention is made now there is a real risk of the river becoming detached from the Ganges. If this happens the monsoon flows to the region will be denied which will have catastrophic effects on the region. Augmentation through the Gorai therefore offers the best choice. Augmentation of dry season flows is also needed for salinity control in Khulna and surrounding areas and may be required for environmental control

Figure 7

Regional Water Resources Management Plan Summary

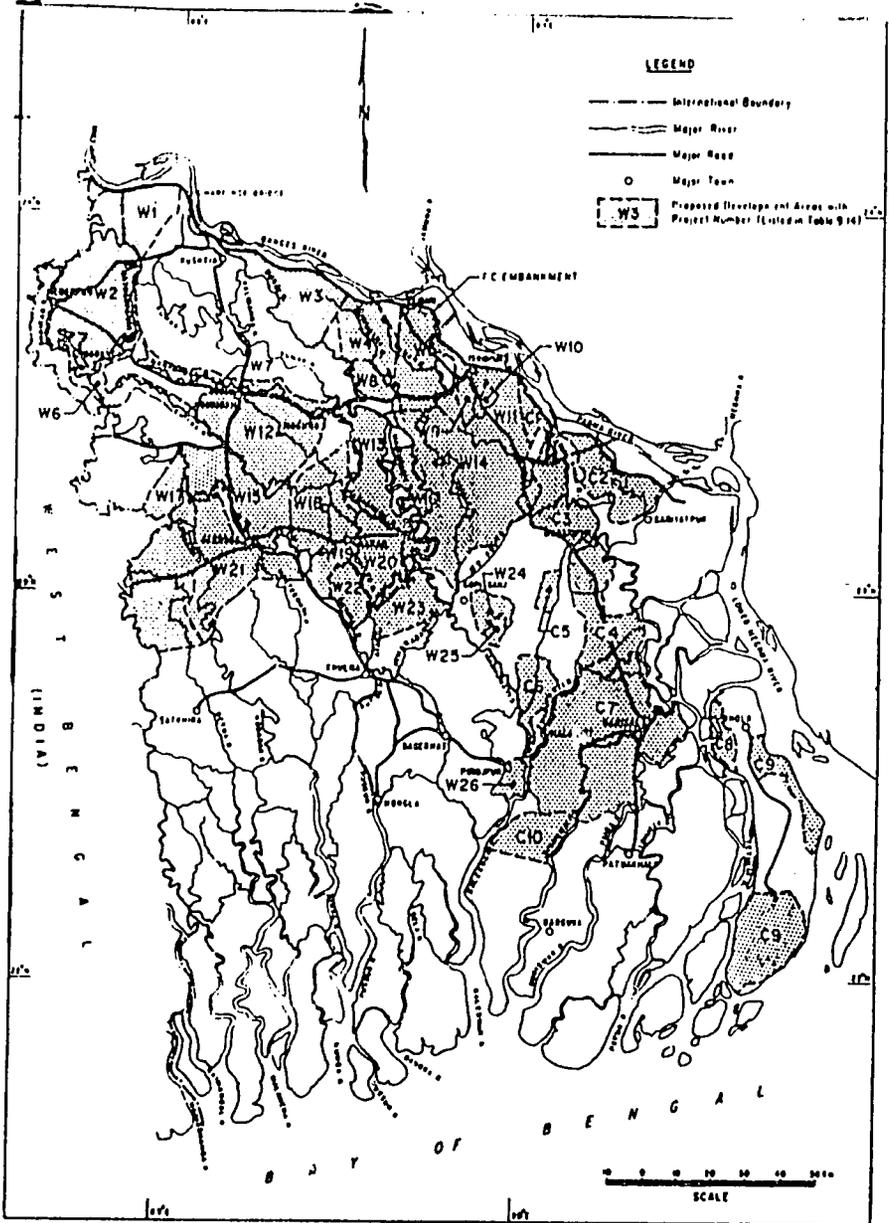


Legend :

Area development includes compartmentalisation measures where appropriate

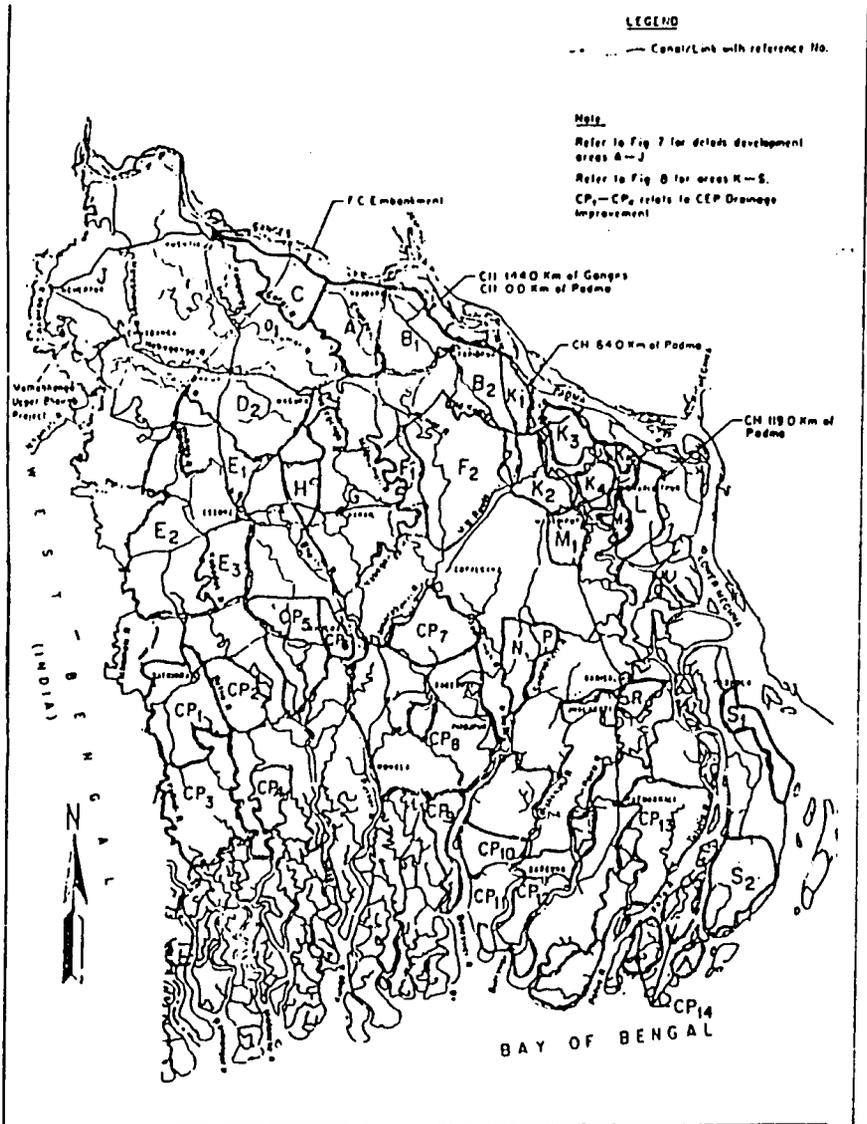
Study and design
Study and Plan Scheme
Construction

Figure 8 - Regional Water Resources Management Plan



Location of Proposed Development Areas

Figure 9 - Development Area Location



Regional Water Resources Management Plan
 Development Area Location

considering in particular Sundarbans. For long term reliability and to fulfil both irrigation and salinity control requirements, a Ganges Barrage is required. Gorai augmentation scheme will however form part of the overall Ganges Barrage Project and could be started as first phase of this. Although Ganges Barrage Project is considered as a medium/long term strategy, investigation and studies should start now in parallel with the implementation of the Gorai augmentation scheme.

36. Various options were considered for solving the drainage congestion and dredging coupled with amalgamating certain polders offers the best choice in the Bagerhat, Satkhira and Dumuria areas while internal improvement in water management will improve the south central polder areas.

37. Existing R.B flood embankments along Ganges and Padma are adequate and safe within the planning horizon. however with minimal investment these could be brought up to standard. Coupled with this, drainage management in the form of compartmentalisation behind the embankments would benefit nearly the whole of the north eastern part of the Southwest Region.

38. Increase in security from flooding cannot be attained by capital projects alone. Non-structural measures like flood proofing, flood warning, better internal water management (compartmentalisation) are also equally essential. Proper operation and timely maintenance are two key aspects to take account of. Beneficiaries should be consulted and their views incorporated in the development planning and should be regarded as part of the development process. They should be encouraged to participate in the operation and maintenance of the completed infrastructure. Institutions to manage these capital investments need strengthening if they are not to deteriorate.

SESSION TITLE : FAP 4
Southwest Region Water Resources

Answer given by FAP 4 consultants, FPCO staff and POE members

Dr. Shapan Adnan, Research and Advisory Services

Question: What is your strategy, if any, for reversing the process of drainage congestion and waterlogging in the coastal polders ? Beel Dakatia + others as well.

Answer: No single strategy can work in the coastal polder area. Different strategies are considered for different polders. Broadly speaking they include dredging and draining into sustainable rivers, internal drainage improvement and macro poldering. Details of these are given in the Draft Final Report. Beel Dakatia is being studied by another Consultant and recommendations have been made.

Mr. N. Chakravorty, BWDB

Question: (1) Do your EIRR's include private costs of irrigation on the cost side?

Answer: Yes. The rate varies but starts from about 6% of the total cost initially to about 18% at maximum utilization.

Question: (2) What is the size of capital and O&M cost of proposed project ?

Answer: Which Project ? If it is for the overall Regional Plan, the total capital cost is about 88,750 M Tk and the annual recurrent costs are in the order of 1950 M Tk.

Question: (3) Have you had any sensitivity analysis against such risks as: (i) Zero flow down Farakka (ii) higher costs on additional structures in the Ganges for Gorai augmentation, including dredging costs.

Answer: (3) No. This will be done during feasibility study stage.

Mr. G. T. Keith Pitman, ISPAN

Question: What is the cost of the capital investment program?

- Gorai augmentation
- Ganges Barrage and associated canals & development
- Ganges-Padma Right Embankment

Answer:

- Tk 13,038 M
- Tk 85,750 M
- This is not a project by itself but the cost of embankments and associated works is in the order of Tk 320 M.

Mr. Mustafa Kamal Majumder, The Telegraph, Dhaka

Question: In calculating the IRR of proposed Gorai and Ganges flow improvement projects have the environmental benefits that will serve as a result of those, been included ?

Answer: Environmental benefits have not been quantified in financial or economic terms and therefore not included in the calculation of the Internal Rates of Return. Under FAP's guidelines for project assessment, the expected environmental impacts (positive and negative) are qualified in a rating system. This is consistent with the latest international thought on the subject. subject

Mrs. Hasna Moudud, CARDMA

Question: The coastal area of Bangladesh is a compact, dynamic and fragile ecosystem and yet there is no independent study or enough focus on the coastal ecosystem or the area under EEZ. By dividing the coastal area into zones we are underestimating its entity as an unique ecosystem. The Sundarbans, world's largest compact mangrove and the Royal Bengal Tiger are under extreme environmental stress. It's ecosystem is critically linked to the water management practices in the catchment are as upstream and coastal area. Is FAP addressing these critical issues?

Answer: These are excellent points and they certainly warrant further study. The original FAP regional studies have naturally focussed on the pressing flood control and drainage issues but this work will contribute to the continuous and comprehensive review of water resources management as proposed in the National Water Plan.

Mr. T. Herman, World Bank

Question:(1) Have your regional proposals been subjected to environmental analyses (particularly fisheries impact and resettlement)?

Answer: Yes, the methodology adopted for environmental assessment has been directed at identifying the main environmental issues, isolation

of any major negative impacts of proposed actions and consideration of the potential for mitigating against these.

Question: (2) What is the rationale and justification for new FCD(I) projects ?

Answer: Increased agricultural production and protection of rural infrastructure.

Question: (3) What cost estimate was used for Ganges Barrage and canals ?

Answer: The 1984 study estimate was revised to current prices (Tk 85,750 M).

Dr. G. T. Keith Pitman, ISPAN

Question: Farakka has had very large environmental impacts on the SW region. Will not the proposed Ganges Barrage have similar effects downstream in Bangladesh ?

Answer: No environmental impact study of the Farakka Barrage has been carried out. It is recommended that this work should have high priority and it can be expected to provide useful information for future works.

Question: Have you undertaken an EIA to assess these impacts on the region and on the reach upstream of the barrage site ? If so, what are the results ?

Answer: No. This will be done during Ganges Barrage study if and when it is taken up.

Mr. Stan Hirst, ISPAN

Question: Why has so little attention given to the Sundarbans

- Minimum freshwater flows
- Maximum allowable salinity
- Sedimentation etc ?

Answer: The Sundarbans is a complex ecosystem and the lack of a recent environmental study is seriously limiting. We have looked at the flows etc. as far as we could within this limitation.

Mr. M. Mozzammel Hoque, BUET

Question: The hydraulic and morphological changes of the river Pussur-Sibsa, resulting from the various water resources development projects in the SWR will affect adversely the navigability for the sea going vessel to and from the Mongla Port. The Mongla Port authority is concerned about this problem and currently making study to find the appropriate measures to keep the navigability of the Pussur-Sibsa river system and the outer bar. Have you addressed the possible navigation problems (that may cause from the proposed development) in your study? Please comment.

Answer: We have looked at this problem within the context of our study and concluded that the proposed developments have very little or marginally better effect on navigation.

Mr. M. F. A. Siddiqui, MARS & Associates

Question: In your presentation Section 4 you have mentioned about Mongla Port. But Mongla is an anchorage serving only lighterage activities and the port facilities are at Chalna where navigation draught is maintained by dredging. You have not mentioned anything about Chalna and maintenance of the required draught. I understand you had run or to have plan to run mathematical model. If you have already run it what does it suggest on the steps to be taken for maintenance of the draught in front of the wharf or maintenance of navigability in the Rupsa-Pussur system?

Answer: We have not studied Mongla (Chalna) Port as such but assessed the effects of the proposed developments on the Port (see answer to Q 9). We have not carried out model studies for the Port.

Mr. Dick Aten, NEMIP

Question: Channel stability

Will sediment entrapment in Farakka in time alter d/s stability processes? Will increased flow sediment to Hoogley (with d/s development/encroachment) in time restrict its capability?

Answer: The lack of flow data from India makes it very difficult to make predictions but we dont think the effect would be substantial.

Dr. D. K. Barua, FAP-24

Question: You have looked into the upstream (offtake) control on the

morphological development of Gorai. What about the downstream control such as continued accretion (delta building) or sea level rise on the present development of Gorai.

Answer: There is very little delta building on the western side and the sea level rise will have very little effect on the Gorai during the planning horizon adopted.

Mr. S. R. Khan, FAP-21/22

Question: Re-vitalizing Gorai is beyond any question. But you predicted morphologically, that the Gorai is dying. Do you think dredging is a sustainable economic solution ?

Answer: No. That is why other measures including river training works are proposed.

Engr. Md. Aminur Rahman, Consultant

Question: The FAP-4 region calls for an urgent study of the water management in this area due to the unilateral withdrawal of water at Farakka. But it is seen from the progress report of FPCO that studies of this are lagging far behind those of the FAP-2 or FAP-3 region. What are the precise reasons for this ? Are the FAP proponents doing lip-service to this area for the public consumptions only ?

Answer: FAP-4 studies progressed according to the program and were completed on the agreed schedule. The relevance of the question as to why FAP-4 started after FAP 2 & 3 is not understood.

Mr. G. M. Shamsur Rahman, BWDB

Question: Have you studied salinity intrusion in sweet water area for pre & post construction of Farakka Barrage. If so

- (1) How much area covered ?
- (2) Intensity of salinity increased or decreased? What is the impact on Environment.
- (3) Water quality such as Ph value range. What is the impact ?

Answer: Very little authentic data is available on pre-Farakka period. What is important is that salinity has increased since the barrage has been constructed.

Mr. Md. Azizul Haque, XEN/JRC

Question: It is stated that the lowest recorded flow of Ganges was

about 400 m³/s which is not correct. The correct figure is 263 m³/s, recorded on 30th March, 1993.

Answer: This figure was not available when the report was written.

Mr. Shahidul Alam, XEN

Question: Deterioration of coastal polders, is it due to the reduction of Ganges flow due to FARAKKA?

Answer: This cannot be concluded with certainty but the indications are that the reduced dry season flows have had an adverse impact on the existing coastal polders.

Question: If the hydrologic regime of the Ganges changes due to Farakka and subsequently islands are formed is there a possibility of the Ganges shifting?

Answer: Ganges is still 'moving' but because of Hardinge Bridge (hard point) just d/s of the Indian Border the shift is small.

Mr. S. N. Anwar, FAP-2

Question: Many rivers which were sustainable in the past area now dead. In Satkhira area all rivers, even, Sibsa is likely to have such a fate. So, is there a real sustainable river in that area?

Answer: In relative terms, yes.

Mr. Md. A. T. Khandakar, BWDB

Question: (1) The paper presented indicated that lowest recorded flow of the Ganges since Farakka was constructed was about 400 m³/s. The Consultant allotted 120 m³/s for the G-K Project, 100 m³/s min. safe flow and 180 m³/s abstraction through the Gorai. It seems that the said 400 m³/s Ganges flow is sufficient for us. This gives a wrong idea and logic for arrangements for the other side. Hence I recommend these statements should be deleted totally.

Answer: The analysis shows what can be done realistically with the present situation. The paper does not conclude that 400 m³/s is adequate.

Question: For augmentation of the Ganges flow, transfer from the Brahmaputra has been cited in the paper. Since the Bangladesh side had rejected this proposal, we think that this reference should be deleted.

Answer: This possibility must be considered for completeness. Our understanding is that the transfer has not been ruled out by the Bangladesh Government.

Mr. Tim Martin, ISPAN/FAP-19

Question: Are there significant increases in upstream water uses or diversions additional to Farakka ? If so, what contribution are these uses on the decrease in minimum flows of the Ganges?

Answer: Although no data are available, indications are that less water is now available at Farakka than, say 10 years ago.

Mr. M. A. Rashid, BWDB

Question: In the report, flood protection from Padma has been suggested while a vast area of Shariatpur district has been left out. Please state the reason.

Answer: This requires protection from Lower Meghna which is not recommended.

Mr. Badiuzzaman, Ministry of Irrigation

Question: FAP-4: Southwest Area Water Management study has just completed. What recommendation/comment has been made about construction of the Ganges Barrage or Barrage over the Ganges or Gorai?

Answer: The recommendation is for the implementation of the Gorai Augmentation Project with parallel investigations/study for Ganges Barrage.

Question: Before FAP came into operation, Matabhanga/Upper Matabhanga Sub-basin study was taken up by ADB. But subsequently, this study was merged into FAP-4. What recommendations have you made to augment the flows of the rivers, Matabhanga, Bhairab, Chitra and Kapotakhi all of them have been fully or partly dried up?

Answer: Augmentation of these rivers are not cost effective or realistic.

Question: There are no water resources development projects in the district of Meherpur, Chuadanga, Jhenidah except part of G-K (which is more or less inoperative in those districts). Are you going to identify any development project for these districts ?

Answer: Some projects have been identified in the study.

Question: Have you any suggestion for clearing the silt deposited in the river, Fatki, the main drain of many rivers of concerned area ?

Answer: This has not been studied.

Question: Did you have any interaction with the consultants of Khulna CERP II Project ? Do you suggest its implementation?

Answer: Yes we did work closely with these consultants and we do recommend implementation of the project.

Begum Matia Chowdhury, MP

Question: Small dredgers are available now for which capital costs are very small and also the cost of their are small. We read about this in the papers. Have you any idea to use these types of dredgers for solving river problems.

Answer: Small dredgers will be useful in some instances but experience has shown that dredged areas quickly become silted up again. Also the disposal of the dredgings (spoil) can become a problem as farmers, in particular, do not want it dumped on their land.

Dr. A. L. Sarker, FPCO

Question: You think, dredging coupled with amalgamating certain polders offers the best choice in areas like Dumuria for solving the drainage congestion. What would be the choice for solving the drainage problem in Beel Dakatia? And what do you mean by internal improvement in water management ?

Answer: Yes, drainage can be eased with dredging and linking up some existing polders. There is a separate study just completed on Beel Dakatia which we would refer you to. Internal improvement of water management is achieved by improving the internal drainage and outfall.

Mr. Steve Jones & Dr. K.M. Rahman, Panel of Experts, FPCO

Question: The GPA clearly indicate that environmental benefits and disbenefits should be included in the economic analysis if they can be quantified and valued. If this cannot be done they should still be included in the multi-criteria analysis.

Answer: Noted and Agreed.

Mr. Abu M. Sufiyan, Research & Advisory Services

Question: Interventions by Farakka, Barak, etc from India deserve significant attention by the policy makers in Bangladesh. Is there any effort to ensure timely flow of water ? Given the vast activities and long term program envisaged by FAP, one wonders whether "good forces make good neighbors" continues to be the motto.

Answer: It is agreed that the issue of water sharing is of great importance.

Mr. Amjad Hossain Khan

Question: Consultants are concerned about death of Gorai. We (Bangladeshis) are more concerned with death of the Ganges due to unilateral withdrawal of water by India. Priority now should be given to Ganges Barrage than other peripheral developments in SW.

Answer: Gorai River is wholly within Bangladesh and therefore interventions can be made if this is the right answer. Although reduction in flows in the Ganges is the main problem, unfortunately there is no easy answer.

Mr. G. T. Keith Pitman, ISPAN

Question: The plan proposes to adopt enforceable regulations to curtail further groundwater development. Given that groundwater is now in the private sector, is it not sufficient for the market to determine the economically viable resource ?

Answer: Not really. In the SW Area the problem is not just confined to quantity. Quality of GW will be threatened if no regulatory provisions are made.

Dr. R. Galappatti, SWMC

Question: If regime analysis showed that some South Central Region polders will also deteriorate. Does this not mean that the main rivers are also deteriorating ? (Not only an internal drainage problem).

Answer: This is strictly right. However, the drainage congestion in SCR is predominantly caused by internal drainage problems.

Mr. Murshed Ahmed, Chief Economist, WARPO

Question: The acute shortage of dry season flows in the SWR can never be alleviated without the speedy construction of Ganges Barrage Project. A separate and specific study should be made for the Barrage concept design and strategy under FAP-4 for alleviating the adverse environmental impact and for removing a formidable set of socio-economic constraints.

Answer: Agreed, but the TOR for FAP-4 do not cover this nor were adequate resources allocated.

Mr. A. A. Ansari, BWDB

Question: What is the critical water level of the Ganges at Gorai offtake below which flow through the Gorai would cease even after interventions at Gorai offtake. What was the lowest water level at Gorai offtake in 1993.

Answer: The preliminary designs for the structure is based on a sill level of +2.00 M PWD.

The lowest water level at Gorai offtake in 1993 is 0.0 M. The limitations are discussed in the Draft Final Report.

Question: Is diversion through Gorai feasible and dependable without a diverting structure across the Ganges.

Answer: The limitations are discussed in the Draft Final report.

Mr. Md. Altaf Ali, Joint Rivers Commission

Question: To overcome the adverse effects of various sectors such as Agriculture, Fishery, Forestry, Industry, Drinking and Municipal water supply and navigation in SW Region of Bangladesh due to unilateral withdrawal of dry season flows of the Ganges by India through Farakka Barrage, construction of the Ganges Barrage is a must and this is the only answer.

The Gorai Augmentation should be treated as a vital component of the Ganges Barrage Project itself. Gorai Augmentation scheme should not be taken up separately and without the Ganges Barrage Project. If the Gorai is taken up independent of the Ganges Barrage, it is apprehended that the fate of Ganges Barrage would be

uncertain and the Gorai would also have its natural death in due course.
Answer: The intervention at the Gorai is for sustaining the river during the dry season. Agreed Ganges Barrage is the answer for the SW Regional water resource problems. However its viability is dependant on many factors including guarantee of minimum flows in Ganges.

Mr. Azizul Haq, WARPO

Question: SW region is facing serious threat of salinity and desertification due to upstream withdrawal of Ganges water. Unanimous slogan for solution is the immediate implementation of Ganges Barrage. But you have recommended Gorai augmentation on priority and Ganges Barrage later which will replace : We have limited resources and want Ganges Barrage first ? Please justify your recommendation. We feel investment on Gorai will be useless when Ganges Barrage will follow it.

Answer: Please refer to the answer given to the preceding question.

Question: Coastal embankments and polders are giving very good results for safe crop production in saline zone. Why have you not recommended for extensive polders in the region for multiple cropping?

Answer: CEP area has severe drainage problems and part of the area is becoming saline. Therefore this must be looked at first before recommending further large scale poldering.

TECHNICAL SESSION II

May 18, 1993

(11:15 - 13:00 Hrs.)

- Chair:** Dr. Harun-ur Rashid
Member, Planning Commission
- Rapporteur:** Mr. Aminul Huq Shah
Executive Engineer
Joint River Commission
- Topic:** FAP 5 South East Regional Study
by Mr. Mohsinuddin and
Mr. M. J. Politzer
FAP 5 Study Team

South East Region Water Resources Development Programme, FAP 5

Introduction

1. **Project Area:** The study area encompasses the greater districts of Comilla and Noakhali, being bounded approximately by the rivers Feni to the south-east, Meghna and Lower Meghna to the west, the Titas to the north, and the Bay of Bengal to the south.

Objectives

2. The study, which is to be completed in 1993, is assigned the task of producing a regional development plan at the prefeasibility level for the development of water resources to support enhanced agricultural production. For one of the most favourable development identified at the prefeasibility stage a more detailed study has been undertaken at the feasibility level.

Scenario

3. The area, like much of Bangladesh, is intensively cultivated. However further agricultural development is to a certain extent constrained by the water resources of the area. The major determinant factors are problems of flooding, scarce fresh surface water resources in the dry season, groundwater limitations and impaired drainage. The dominant constraints vary from area to area as indicated in the centerfold.

Present Status

4. Detailed investigations have already been undertaken in relation to the agricultural characteristics of the area and the agricultural constraints which exist. Parallel studies have provided estimates of the areal extent of flood depth-duration-frequencies and groundwater utilization and availabilities. Surface water availabilities, particularly in the dry season, have been determined whilst the likely impacts of development interventions on the environment and in particular fisheries have been given significant emphasis.

5. In order to facilitate the planning process the area has been divided into 13 Planning Units (see Figure 1) within which potential development projects have been identified. Close liaison is being made with the Flood Action Plan Coordination Organization and the Eleven Guiding Principles are being followed.

6. Considerable use has been made of the hydraulic modelling facilities which have been developed in the Surface Water Modelling Center.

7. **Interdependence with Other FAP Studies:** This Regional Study has maintained close links with other FAP studies and has taken note of works proposed for this region by other FAP studies. In particular:

FAP 7 - The planning units 1 and 2 are included in the programme of works for cyclone protection under the CERP programme.

FAP 5B - The estuary study will in due course, provide additional knowledge about how the southern coast affecting planning units 1, 2 and 4 is likely to develop. Long term recommendations on drainage proposals for these units must await the results of these studies.

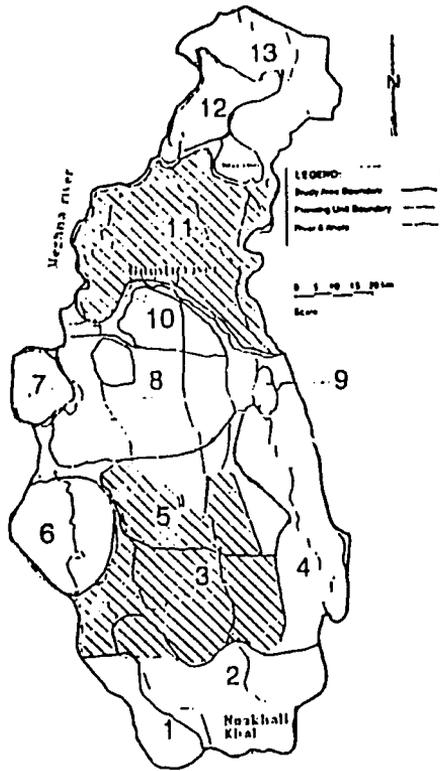
FAP 9B - This project has studied a number of locations on the east bank of the Meghna river and two locations are of particular importance. The draft plan includes for the construction of protection works for Chandpur Town as a matter of high priority and also the protection works for the bridge at Bhairab Bazar. Other sites are considered with alternatives.

FAP 17 - Our fishery specialists have coordinated closely with FAP 17 staff to ensure that questionnaires and survey locations give the most effective results for the limited resources available. Also exchange of the latest available data has contributed to our understanding of factors affecting the fishery environment.

Development Strategy

8. **General:** The development of the regional water resources must be arranged to serve the principal needs of the local population. The present and likely future development of the Southeast region will be dominated by the

Figure 1 - Centerfold Figure



Existing Projects
 Ongoing Feasibility Studies

Units

- | | |
|---------------------|----------------------|
| 1. Polder 59/2 | 2. South Sudharam |
| 3. Nankhali North | 4. Little Feni River |
| 5. Dakatia | 6. Chandpur |
| 7. Meghna Dhinagada | 8. Dhinagada |
| 9. Sonachari | 10. Gumil Phase I |
| 11. Gumil Phase II | 12. Ashuganj |
| 13. Titas | |

agricultural sector. There is virtually no water consuming industry in the region and therefore the primary requirements for water use are for consumptive domestic supply and for irrigated agriculture.

9. The present water resource situation in the region is similar to that of all regions of Bangladesh with an over abundance of water during the monsoon season and severe shortages in the dry season. There are no opportunities for seasonal storage in any significant quantities. Thus all potential future development must involve improved water management through flood control, drainage and irrigation. Also all future water utilization will require pumping of surface or groundwater resources since gravity supplies during the dry season are generally impossible due to the low river levels.

10. The first component of the proposed strategy for development of the region's water resources comprises improvements to land productivity, through the implementation of cost-effective flood control and drainage schemes. This will improve the productivity and profitability of both irrigated and rainfed agriculture. The second, related component, is the optimal development of irrigated areas through the provision of surface water-where economically viable - to supplement available non-saline groundwater resources.

11. The strategy must take into account that there are a number of factors which will change the region whether or not a regional plan is developed and implemented. These factors include for example:

- (a) Increasing population with the consequent need for additional food production additional housing areas and the consequent increasing stress on land and water resources.
- (b) The recent and continuing accretion of new land in the southern part of the region with its consequent effects on drainage of nearby areas.
- (c) Development of other water resource schemes both in Bangladesh and in other regions and the resulting effects within the southeast region.
- (d) The possible effects of a rise in sea level on the coastal polders.

Figure 2 - Monsoon Season Problems and Possible Measures

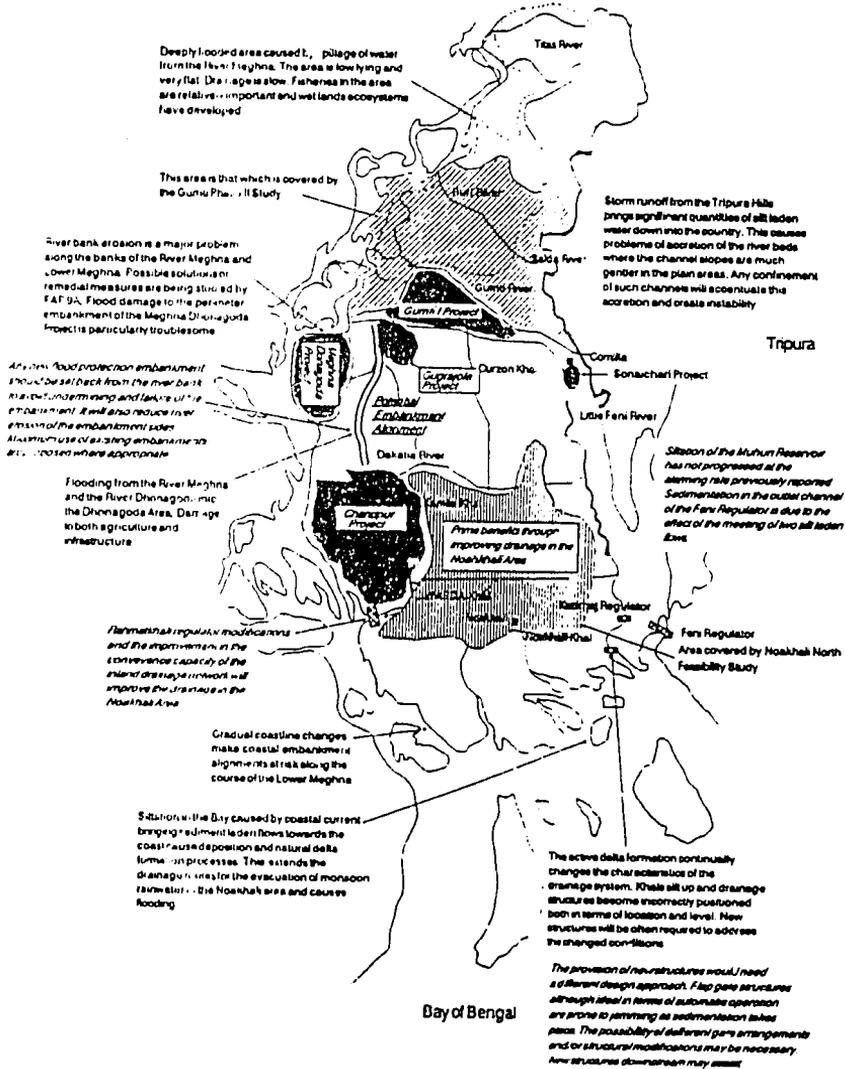
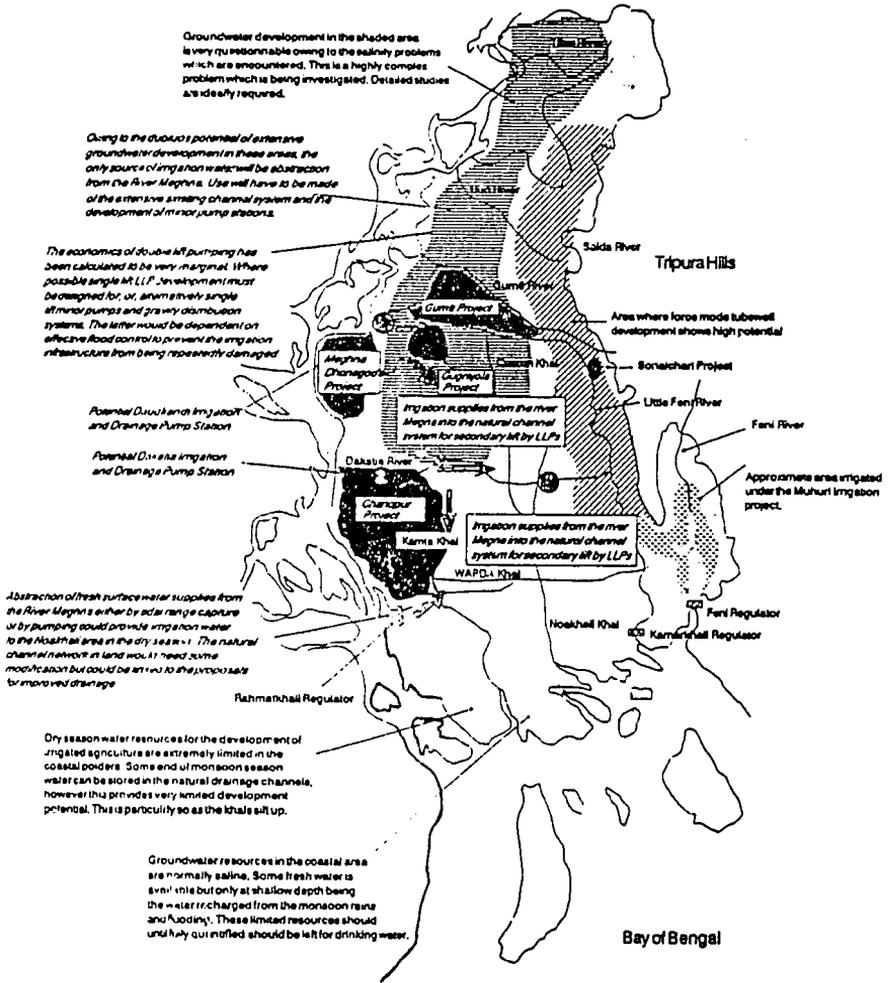


Figure 3 - Dry Season Problems and Possible Measures



12. These factors have been taken into account as appropriate when considering proposals for each part of the region.

13. The strategy must also take into account the impacts of water resources development for the agricultural sector on other economic sectors, and the social and environmental implications of potential development options.

14. The Initial Environmental Evaluation (IEE) has identified a large number of aspects which could be critical for any proposed scheme. The single most important message of the evaluation to date is that any proposals for future development must be approached with the utmost caution and that at feasibility stage every effort must be made to ensure that a realistic programme of data collection and analysis is undertaken to allow future project designs to include effective mitigation and enhancement measures in a cost effective manner.

15. There are a number of identified potential negative environmental impacts which need to be considered for all the projects in the region.

16. Many of these aspects are interdependent and there are no projects of any kind, structural or non-structural which do not involve trade offs amongst these aspects.

17. Perhaps the most critical effects are likely to be felt in terms of capture fisheries and the survival strategies of disadvantaged groups. The potential damage to capture fisheries has been identified as having the largest single directly negative impact in social, environmental and economic terms and could be brought about directly as a result of physical changes to water systems or indirectly through consequential actions by farmers through increased application of agrochemicals. This same factor is also potentially the most serious in terms of its effects on the livelihoods of subsistence fishermen and on the diet of the rural poor.

Constraints to Development

18. There are physical constraints particular to each of the 13 planning units of the region and in general terms they can be described as follows:

- i. Climate
- ii. Water Resources
- iii. Topography
- iv. Drainage
- v. Flooding

19. **Climate:** All planning units receive heavy rainfall in the monsoon period from May to September. The coastal parts of the region receive the heaviest rainfall (units 1, 2 and the Southern Part of Unit 4) and are also subject to the effects of cyclones principally in the months of April and May. Rainfalls in the months from October through to April are much lighter and more unpredictable and from November to March the one in five dry year effective rainfall is nil.

20. **Water Resources:** The principal physical constraint to water resources development in the south east region is the limited amount of surface water available to the region for future development of irrigation. Indeed almost the whole of the internal surface water resource is fully developed and any increase in irrigation will have to come from the Meghna. This shortage of water is limited to the dry season when the potential requirement for irrigation is at its maximum and available supply of surface water is at its minimum. The critical month for planning purposes is March and the National Water Plan Phase II allocated 204 m³/s for the region. For planning purposes it is necessary to consider the maximum long term potential for irrigation development in the region and then to compare this requirement with the resources available and the existing requirements.

21. **Topography:** Almost the entire region is very low lying and flat. The very slight slopes which do exist are generally from east to west and from north to south. The overall situation can be described as follows:

	Level in West (Meghna) (masl)	Level in East (Indian Border) (Masl)
24°00' N	4	12
23°45' N	3	6
23°30' N	3	7
23°15' N	3	6
23°00' N	3	5
22°45' N	3	4

Natural ground levels adjacent to the Meghna river vary hardly at all over a total length of more than 150 km. This produces the generalized flood regime outlined in section 1.

22. The northern part of the region is dissected by a number of rivers which carry waters from the hills above the Indian border to the Meghna. These rivers flow in well defined channels but are very flashy and carry substantial quantities of sediment.

23. These conditions are a severe constraint to both irrigation and drainage development. Gravity irrigation over substantial areas is impossible because of the combination of dry local rivers, low levels in the Meghna during the dry season and very flat gradients.

24. **Drainage:** The main drainage pattern in the northern part of the area is from east to west but river migration of the Meghna and the Titas has caused difficulties for the planning of drainage schemes in this part of the region.

25. Further south the drainage was to the south in the Little Feni river and the Noakhali Khal. However over the last 50 years accretion of land in the estuary has lengthened drainage routes causing congestion and prolonged flooding in some localities. Some efforts have already been made to alleviate this situation by the construction of the Rahmatkhali regulator some 20 years ago. In the south, drainage is generally a more severe constraint to development than river flooding.

26. **Flooding:** As already described a large proportion of the south east region is subject to seasonal flooding but the timing and duration of floods are different in the various parts of the region. Flooding of agricultural land from whatever cause imposes severe constraints to both rainfed and irrigated cropping patterns depending on its depth, duration, frequency and timing. The flood planning criteria developed for the National Water Plan have been used as the basis for planning purposes at the regional level. However, at the feasibility stage, with the development and refinement of the south east regional model (SERM) and the ability to define more accurately the limits at which farmers make decisions to change from one rice variety to another, allows a more sophisticated approach to evaluation of the cropping patterns to be expected under various flood conditions at the critical periods of the cropping calendar.

Development Proposals

27. **Planning Unit 1 - Polder 59/2:** This polder is comprised of relatively recently accredit land and the older Ramgati Island.

28. The polder comprises recently accredit land and the old Ramgati island. Although the polder is embanked there are still recurring problems caused by erosion of both land and embankments from the river Meghna and by lack of structures at some points in the embankments.

29. The ongoing Coastal Embankment Rehabilitation Project (originally FAP 7) is already scheduled to undertake substantial improvements to the main embankments of polder 59/2 and to complete new structures at various locations. There are also provisions within the already allocated funds for substantial additional works. Although these are described as minor works they could include resectioning and completion of the old embankment and the two or three structures required in this section and the regional plan will recommend this.

30. However it is important to identify that the area of recently accredit land in the north west of this unit is under attack by erosion from the river Meghna and this is likely to progress southward. Viable protection of this land is not considered possible. For this reason the consultants propose that, if possible, under the CERP some of the funds are used to retire the northern end of the existing embankments to ensure that the effects of protection provided further south are consolidated.

31. The consultants have also presented proposals for pumped irrigation for parts of polder 59/2. The pump station would be located just south of the Rahmatkhali regulator and would follow the route of Musar khal south towards the Cross-dam and then parallel to the cross-dam with distribution through enlarged existing khals. This scheme could be economically attractive but requires substantial land acquisition and satisfactory arrangements for payment of O&M costs. Also the scheme is entirely dependent on a secure environment for the project infrastructure.

32. For these reasons it is proposed for development only after completion of the protection works described above.

33. It may also be mentioned that the already proposed construction of cyclone shelters in this subregion is a vital element in providing a more secure environment which is essential to continued development of the area.

34. **Planning Unit 2 - South Sudharam:** This planning unit comprises polders 59/3A, 59/3B and 59/3C. Many of the problems of this unit are similar to those of unit 1 but whereas unit 1 is under threat of erosion this not so here. This area is presently still subject to accretion and settlement of new populations. The area is central to the proposed studies under FAP 5B. (The Meghna Estuary Study) which is due to start later this year.

35. The consultants examined proposals for both improved drainage and irrigation but due to the remoteness of the area from freshwater irrigation supplies and the marginal benefits attributable to drainage these proposals are unlikely to prove attractive for financing at the present time. Revised more modest drainage proposals are currently being studied which may prove more viable. In any event developments in this area are likely to be substantially affected by any proposals coming from the FAP 5B study and therefore further study and any consequent implementation must await the outcome of that study.

36. The CERP has already made proposals for improving the security of these polders against cyclone damage and the cyclone shelter programme is also already under-way. These works will help to provide a more secure environment for these polders in the near future.

37. **Planning Units 3, 4, and 5:** These planning units are taken together because in some respects they have been studied as a whole. The units comprise the areas drained by the Dakatia and Little Feni rivers and also by the old Noakhali Comprehensive Drainage Scheme.
38. The consultants have examined and tested a number of possible developments both to improve drainage and to increase irrigation in these areas and also possibly to provide additional water to the Muhuri scheme to the east. The drainage of this sub-region has been studied as a whole as far as is possible with the current state of knowledge of the surface water system. Various options have been tested with a view to developing a strategy to gradually improve the drainage of the area. The drainage problems developed partially as a result of the construction of the cross-dams Nos. 1 and 2 in the late 1950s and early 1960s with the consequent accretion of land and silting up of the old southern drainage routes. The Noakhali Comprehensive drainage scheme has proved to be inadequate to drain the area and further measures are needed.
39. Also the Kazirhat regulator constructed many years ago suffers severe siltation downstream every year which is costly to remove and delays good drainage in the early monsoon months with consequent drainage congestion upstream.
40. The consultants tested a variety of options as follows:
- (a) Enlargement of WAPDA and Rahmatkhali khals (both deepening and widening).
 - (b) Enlargement of Rahmatkhali regulator.
 - (c) Addition of a new structure downstream of Kazirhat.
 - (d) A regulator on the Dakatia river.
 - (e) Addition of pumped drainage and irrigation at Rahmatkhali khal.

These analyses showed that a regulator on the Dakatia (4) was ineffective in providing drainage benefits through excluding Meghna flows except in

exceptional floods such as those of 1988 and these benefits are insufficient to justify its considerable costs on their own. The Kazirhat regulator performance would be greatly improved by the addition of a new regulator downstream however no benefit occurs to the Noakhali area since modelling shows very low transfer volumes between the Little Feni and Begumganj catchments. However the local benefits may well provide justification for this structure and it is included in the Regional plan.

41. However the main proposals for this area comprise the enlargement of existing khals and the Rahmatkhali regulator and the drainage benefits of these improvements are considered in conjunction with consequent improved opportunities for irrigation. These two aspects are inseparable since both the same structures and the same khal system would be used for both purposes.

42. In the monsoon season the area will drain through the modified khals to the regulator which is also modified by the incorporation of a gate system which permits better access for fish than the present structure. In the dry season the drainage gates are raised clear of the water and a second set of counter weighted flap gates will allow access of water at high tide to fill the khals with water. As the tide falls the flaps close thus holding the water in the system for use by Low lift pumps for irrigation. Studies show that there will be sufficient water for at least 30,000 ha of irrigation from deepened existing khals.

43. The present irrigation proposals are confined to deepening those khals which are wide enough to accommodate the proposed section without requiring land acquisition.

44. Existing irrigation outside these areas would continue as at present with their more limited seasonal supplies.

45. Drainage benefits extend throughout the area from the Dakatia river down to the coastal embankment and from east of Begumganj to the regulator at Rahmatkhali. Obviously the degree of benefit is variable and we are not contemplating total drainage which would not only require extensive land acquisition but would also result in much greater fisheries losses.

46. The northern part of the area will not benefit from the irrigation proposals described above and therefore the consultants have re-examined proposals for pumped irrigation from the Dakatia with the regulator mentioned

previously (Option 4). This regulator would be closed from December to mid-April to allow pumping back up the river from near Chabagadi. The regulator would remain open throughout the monsoon except during extreme floods. This would allow fish to migrate normally and maintain existing access for all fish types.

47. The first area to benefit would be the area between the Chandpur-Laksham road and the Ramganj-Chatkhil road. A second pump station could lift water from the Dakatia river through Mellar khal into the Little Feni for distribution to adjacent lands and for transfer to the Muhuri reservoir. Careful consideration needs to be given to prioritising how this water should be utilized since some of this area has ground water potential.

48. Also the issue of management and payment for primary pumping costs are major issues which need to be satisfactorily resolved prior to development of such a scheme. It is primarily for this reason that this major project is scheduled for later in the plan period.

Planning Units 6 and 7

49. These two units comprise the existing Chandpur and Meghna Dhonagoda projects. No further development of the units is proposed but there are important issues and requirements if these major investments are to be preserved and effectively used. These two projects could provide useful testing grounds for the implementation of improved irrigation charge collection and the incorporation of improved O&M systems as proposed under the Systems Rehabilitation Project.

50. The main project embankments are repeatedly under threat from erosion from the Meghna. FAP 9B has proposed major works at Chandpur and later at Eklaspur. However it is understood that no finance for these has yet been obtained. The consultants view is that retirement is a viable alternative at Eklaspur and this is recommended in the plan but if the Chandpur works are not implemented the CIP must be considered to be at risk. Even if these works proceed there will be a need for constant vigilance and appropriate retirement of embankments is the only reasonable course of action. Such proposals are included in the plan.

Planning Unit 8 - Dhonagoda

51. A variety of proposals have been examined for this area but with limited success in terms of economic viability. Now that the consultants have obtained better quality agricultural and cost data these proposals are being re-examined.

52. However the primary problem in terms of flood control is that protection from Meghna flooding by embankments yields little benefit since rainfall produces almost as much flooding behind the embankments unless pumped drainage is used which is very costly. The possibility of irrigation from deepened khals in the west of the area is being considered and in the eastern part of the unit there is substantial ground water potential and this is included in the plan.

Planning Unit 9 - Sonaichari

53. This small area is dominated by Comilla town and the existing Sonaichari irrigation scheme. The existing scheme is in a natural depression surrounded by higher ground on all sides. A progression of measures have provided this area with first ground water supplies, then later with surface water diverted from the Gumti river and using low lift pumps and more recently, after construction of regulators and embankments, part of the area is now fed by gravity. However there have always been some drainage problems and these have been increased by the more recent developments of surface water supply.

54. Virtually all the previous measures have been undertaken without adequate survey investigation and analysis of the principal causes of drainage congestion. These causes are not only the naturally poor drainage of a low lying area surrounded by higher land but also the impact of a succession of structures (Bridges, regulators etc.) and embankments and also extensive sediment deposition in the rivers which carry the run-off from the Tripura hills in India.

55. Until a thorough and intensive period of investigation is undertaken by a properly staffed and equipped team it will not be possible to identify a sensible and viable method of improving the situation. There are several options which should be studied and the consultants have prepared a set of recommendations which should ensure a proper investigation and analysis of this complex drainage system.

56. There have recently been proposals both to extend the surface irrigation to the east by construction of further structures and to embank other khals to prevent local flooding. The consultants are opposed to both these proposals. In the first case the additional structures proposed could cause further flooding unless considered as part of the recommended study and in any case the most sensible extension of surface water irrigation is by direct abstraction from the diversion canal by low lift pumps. Other areas could use Shallow tube wells (STWs) or small capacity shallow force mode wells as there is plenty of potential. Either would be cheaper and safer than the construction of new structures and embankments.

57. In our view the proposals to embank yet more khals should not proceed until the recommended study has reported because this could result in even worse siltation in the main rivers which is one of the principal causes of impeded drainage in this area.

Planning Unit 10 - Gumti I

58. This unit comprises the Gumti Phase I scheme which was recently completed. A pumped surface irrigation option was investigated to increase irrigation benefits in the area but this did not produce good economic results. No further development of this unit is proposed other than additional ground water potential in the eastern part of the unit.

Planning Unit 11 - Gumti II

59. This large planning unit was previously investigated at feasibility level as a very large polder project. These proposals are being revised and are reconsidered for a number of reasons as follows:

- (a) The financing agency wished other options to be studied.
- (b) The area of existing irrigation development in this area has considerably increased since the original study was carried out.
- (c) Concerns of possible environmental impacts have increased.
- (d) The original proposals were too large to obtain funding as the package and phasing of development needed to be considered.

60. The restudy of this area has been carried out in parallel with the regional plan and the draft final report of this study is due now. The results of the study are to be incorporated in the final version of the regional plan.

61. In summary the present study has re-examined the previous proposals which in the current circumstances no longer seem attractive. In addition the study has examined other smaller initiatives in each of four zones in the area including gravity drained polders, pump drained polders with pumped irrigation, khal deepening, dredging and ground water development. Not all of these are considered viable but there are some very promising elements to be included in the plan. It may be mentioned here that this area is a highly productive fishery area and all interventions need careful design to minimize and mitigate impacts on capture fisheries. The general approach on fisheries for both feasibility studies and indeed for the regional plan has been to evaluate existing flood plain conditions to assess the present status of impact on fisheries and then to examine how projects may further affect these conditions.

62. The two principal factors affecting fish are:

- (a) The area of floodplain available to fish for development during the monsoon and
- (b) The accessibility of areas to fish, fry and spawn during the spawning migration.

63. There are many other considerations in terms of special habitats, depth, duration and timing of floods and their reliability but it is considered that for the Gumti II area and possibly for most of the South East Region the dominant factors are those given above with access being of paramount importance in most cases because flooding comes from rainfall in this area as much as from the main rivers. The Gumti II interventions have taken this into account both in the conceptual design of structures and in the method and timing of system operations.

64. The lessons from examining the Gumti area have been applied both in the Noakhali area and also in the reevaluation of options in other units for the regional plan.

Planning Unit 12 - Ashuganj

65. This unit contains an existing area of surface irrigation and this has been recommended for further expansion using available effluent from the power station cooling operations. Other parts of the area have substantial ground water potential which is only partly utilized at present.

66. Flood control in this unit is not proposed owing to the need for pumped drainage if it is to be effective. Since the area is already substantially irrigated such drainage could not be viable.

Planning Unit 13 - Titas

67. This area is similar in nature to the southern part of the north east region. The area is already highly developed in terms of irrigation with over 53% of the NCA irrigated at present. Ground water potential is quite high although mostly by force mode wells. It is anticipated that LLPs will continue to be the dominant irrigation method.

68. Originally the draft regional plan envisaged a submersible embankment project for part of this unit to protect boro crops. However this is currently being reviewed in the light of experience gained during the Gumti feasibility study where submersible embankments are now seen to have virtually no benefits.

Local Participation

69. During the preparation of the Regional Plan and also the feasibility studies for Gumti II and Noakhali North areas a great deal of effort has been given to meetings and discussion at village, union and Thana level. Discussions have been held with officials at all levels and with staff of many ministries. The sociologists and staff members of every discipline on the project have attended meetings and discussions with individuals to hear their principal problems and views in relation to water and their own particular livelihood or circumstances.

70. There has also been extensive discussion with a number of NGO's active in the region to identify how they may be helpful in communicating with, informing and in organizing participation of local groups. All these activities have the objective of trying to make proposed initiatives conform with peoples wishes and to try to identify how best the local people can be involved at all stages from planning through to operation so that they become true beneficiaries and participants.

South-East Regional Study, FAP 5

Answer given by FAP 5, Team Member and FPCO Staff

Md. Sariat Ullah, CIDA

Question: You have recommended khal desiltation/reexcavation (250 km). What will be the interval of continued such desiltation in future to achieve optimum use of the 24 vent Rahmat Khali regulator. Is not maintenance of drainage khals going to be recurring and costly future programme under the project.

Answer: The existing 14 vent regular has never suffered from siltation and the main khal system has not required maintenance. Erosion has been the more serious problem. The water being drained is not Meghna flood water nor hill stream run-off but direct rainfall. Measurements of sediment in the khal system show low sediment concentrations. Certainly maintenance will be required on a continuing periodic basis but should not be too heavy a burden.

Dr. D. K. Barua, FAP 24

Question: Are the morphological consequences properly considered (particularly siltation on the seaside) when a regulator is proposed downstream of the present Kazirhat regulator. Rapid siltation in that area suggests that this regulator ;too will be redundant in a few years.

Answer: This has been considered. The coastline at the junction of the Little Feni and Feni river estuaries has not moved during the last twenty years and it appears that the Sandwip channel is preventing further accretion in this area. However our recommendations will draw attention to the need for this to be re-considered when the Meghna Study makes any recommendations which might change the situation.

Mr. Mesbahuddin Ahmed, Chief Engineer, Monitoring, BWDB

Question: How much area is expected to be irrigated during dry season, by flushing water to project area through Rahmat Khali regulator?

Answer: The Rahmatkhali regulator will admit sufficient water to irrigate at least 30,000 ha using conservative design assumptions. If the water were to be used as sparingly as farmers currently use it this area

192

could be as much as 45,000 ha. The project analysis will use the lower figure and makes allowances for the fact that even some of this area is already irrigated. The net increase will be about 20,000 ha.

Mr. Ahmed Ali, CPP-FAP 20

Question: We are reading in the newspaper about the negative effects of MIP, and Chandpur Project, specially the disadvantages to farmers and fishermen of both inside and influence areas (outside).

Answer: Do not believe all you read in newspapers.

Question: Have you assessed these impacts, and whether you are going to suggest mitigation plans for them and how?

Answer: It is assumed the questioner means MDIP (not MIP). Farmers inside the areas have generally benefitted. There is no evidence that farmers outside have suffered dis-benefits. Fishermen inside did suffer dis-benefits and mitigation measures have already been taken. Fishermen outside seem mostly unaffected. We have identified further possible improvements to these schemes and these recommendations are in the report.

Mr. Khorshed Alam, WARPO

Question: Its proposed to drain flood water from Noakhali North area through Rahmat Khali Regulator by increasing its capacity and by improving the existing drainage channels. But there is possibility to drain the flood water of this area through Noakhali Khal, with its outfall (new one) at lower Meghna river southside of Ramgati. Whether this alternative is studied/investigated? If not, why?

Answer: This alternative has not been studied in detail. Initial studies showed this possibility to be much more expensive and gave no irrigation benefits. This proposal offers no hope of an economically viable solution.

Dr. Tofail Ahmed, BARD, Comilla

Question: While examining the situation around the Gumti, did you try to relate the experiences of early sixties, especially what Akhter

Hameed Khan did with people at Comilla in collaboration with WDB. By digging the canal Sonaichari a new irrigation scheme was also developed. The adjacent areas were also made free from flash flood.

Answer: In terms of water resources the Gumti is already fully utilized by Sonaichari and other LLP schemes. The change of repeating what was done then is not a possibility. It must also be pointed out that Sonaichari and adjacent areas are not free from flash floods - indeed they have got worse. We have made proposals both in Gumti Phase II area and for Sonaichari to improve this.

Mr. Paul Christensen, Danish Embassy

Question: To what extent has the project (FAP 5) dealt with the land reclamation issues, and what is the outcome?

Answer: New land reclamation and related issues are specifically within the TOR of FAP 5B (Meghna Estuary Study). However our proposals and recommendations for the southern polders represent a more secure environment for the existing accredit land. We are drawing attention of FAP 5B to possible effects were more accretion is to be recommended.

Mr. Shahidul Alam, FAP 2

Question: In Noakhali Project a large area will be drained through Rahmat Khali and another new regulator. Why drainage sub-unit/compartments are not planned.

Answer: In this area drainage is stored rainfall not river flooding. The project is conceived as a sub-regional drainage scheme not compartmentalisation. There is no negative downstream effect. Construction of compartment embankment here could lead to public cuts. With no new embankments or structure locations this possibility is avoided. It is a different concept which is appropriate to this location.

Mr. S. N. Anwar, FAP 2

Question: With total withdrawal of Ganges water and probable construction of Brahmaputra and Ganges barrage what is the expected salinity level at the Rahmatkhali regulator. Would it be above 2000

µmhos.? would irrigation possible in such situation?

Answer: Salinity in the Meghna estuary at Rahmatkhali has greatly declined over the last 20 years despite lower flows from the Ganges which now supplies less than 10% of dry season Meghna discharges at Rahmatkhali. Lengthening of the estuary over the recent past may have contributed to this trend and further land accretion could extend this trend. FAP 5 is not in a position to know how much water would be available in the Lower Meghna if Brahmaputra barrage were to be constructed. However if Bangladesh continues to supply the quantities allowed for the NWP Phase II then the salinity level will remain below critical levels for irrigation.

Mr. Meser Ali Khan, CE/Project IV, BWDB

Question: NGO's are not helping to identify the local problems and people's participation in project making. Rather they are misleading the people and giving misinformation and misgivings about some projects. Recently such an NGO "Proshika" has made a film against Meghna Dhonagoda, Muhuri Irrigation Projects.

Answer: This not a question but a statement. However the consultants believe that in some circumstances NGOs can be helpful in promoting successful project development.

Mr. M. A. Quassem, BWDB

Question: You must be aware of the proposed "Sandwip-Noakhali Cross-dam Project". This project was finalized for construction at a cost of lot of money. Why this project has not found importance if not gone un-noticed, in your deliberation.

Answer: We are aware of this proposal. However it is to be studied by FAP 5B and is not included under FAP 5 TOR since the SE region stops at the coast. We are commenting on possible effects of this cross-dam on the existing coastal areas.

Question: Do you have any proposal to distribute "khas" lands among the landless co-operatives, instead of those being grabbed by land-grabbers. You did not refer to this issue in your presentation.

Answer: We have no such proposals. FAP is a water resources development plan not a land reform plan.

Mrs. Hasna Moudud, Coastal Area Resource Development and Management Association

Question: By the year 2000 the population of Bangladesh would be 955 persons per square K.M. Since we must look around for additional spare what about land accretion in the coastal area? What about implementing Sandwip Cross Dam Project and Hatiya-Nijhum Dwip Cross Dam project?

Answer: Land accretion is to be studied by FAP 5B using new modelling techniques. They will also study the cross-dam possibilities which are outside FAP 5 region. However these projects could cause severe drainage problems for the existing polder areas and for the Little Feni rivers. This will be examined by FAP 5B.

Mr. M. F. A. Siddiqui, MARS and Associates
Consulting Engineers

Question: Mr. Mohsin's delineation of the Noakhali area is factually not correct. We did not keep the Noakhali Khal open to drain the North Noakhali area. We had a plan to put a regulator at its outfall when progradation of shore line ceases. We knew that natural drainage except in the SE area would be better drained by the Meghna and therefore we were to put a regulator at the outfall of the Rahmat Khali. Of course we created a new problem in respect of shortage of fresh water as the people started pumping last drop of the fresh water but this was visualized by us. We planned to pump fresh water at the offtake of the Kamta and Send it down to make up the deficiency. We did not excavate Rahmat Khali khal. We excavated Pearapur Khal. Rahmat Khali regulator was not designed to drain the whole area as it is doing now apparently without additional strain. Mr. Mohsin should have stated the present salinity observation results at the Rahmat Khali outfall during the dry season instead of summarily saying that salinity had gone down by 50 km. Our information in otherwise. We felt the need to building another regulator further down across the little Feni. Sorry to exceed third words.

Answer: Mr. Mohsin meant that it had been expected that Noakhali khal would continue to effectively drain part of the area but it no longer does so. As a result we are agreed that Rahmatkhali regulator is now required to drain an area larger than that for which it was designed.

Dry season salinity is generally below 1000 $\mu\text{s}/\text{cm}$ during irrigation season. It has not been recorded significantly over 2000 $\mu\text{s}/\text{cm}$ for 10 years.

Question: Sonaichari unit: The drainage congestion in the area is due to non-maintenance of Dakatia khal.

Answer: This is not proven. We believe these are several contributing factors including newly constructed works.

Question: Are not the No. (i) and No. (iv) reasons the main contention for reviewing the earlier feasibility study of the Gumti Phase II sub-project?

Answer: No. All the reasons are valid. In fact the changes in irrigation area, fisheries losses and revised estimates of drainage capability of the original proposals are the main factors affecting its viability.

Question: Do you think that the measures you have taken or planned to take substitute adequately the existing legal procedures for the purpose.

Answer: This question is not understood. What legal procedures are referred to?

Dr. Kazi Sadrul Hoque, ISPAN, FAP 16

Question: You have mentioned that "you are not happy" about some of the points/issues in the Guidelines for People's Participation (GPP) in the FAP prepared by FPCO. Would you please specify your main points of disagreement or elaborate on what specific points you disagree and why? Please offer concrete suggestions for review before effective field-testing of the GPP by other FAPs.

Answer: In some cases we personally believe the guidelines to be too specific.

- (a) Specific of percentages of work to be undertaken by LCS and proportions to be undertaken by women are in some cases both inappropriate and unhelpful both to project and to women.

- (b) There is too little encouragement to develop new initiatives. The guidelines tend to assume present ideas are and will always be right.
- (c) There needs to be more acknowledgement of other ongoing initiatives (e.g. under SRP).

Mr. Amjad Hossain Khan, Consultant

Question: There is shortage within SE. But Meghna has enough water. Are we limiting utilization of surface water just because pumping is expensive?

Answer: Meghna does not have enough water for everyone. We propose using surface water as cost effectively as possible. Pump schemes are included in the plan but linked a viable cost recovery system.

Question: Regarding use of ground water, is it the options imposed by donor agency? What GOB thinks should be done to develop surface water or ground water?

Answer: The consultant's view is that all viably exploitable water resources should be utilized. This is not imposed by donors. Groundwater development is now in the private sector whereas large scale surface water schemes are still in the public sector but must respond to peoples needs.

Mr. Khondker A. Hafiz, UNDP

Question: As one of the formulators of the Public Participation Guidelines, how do you evaluate the application of the Guidelines in the FAP 5 vis-a-vis other regional studies.

Answer: We have used similar participation methods to those used by some other regional studies and they are in accordance with the new guidelines for planning studies. What can be achieved is both a function of the time and physical resources available and of the type and size of project under consideration. Public participation at regional planning level cannot be carried out in a similar manner as for project planning since project concepts are not yet defined at this stage. Only needs

assessment priorities, problem identification and "perceived solutions" are realistic objectives at this stage.

Mr. Mostafa Kamal Majumder, The Telegraph, Dhaka

Question: Do floods pose a serious threat to development of the region as a whole. Are measures taken within Bangladesh adequate to contain flash floods coming from transboundary rivers?

Answer: The cause of flash floods on the many streams coming from the Tripura hills lives in India and Bangladesh cannot affect this. However by careful assessment of sediment flows and delineation of how the floods attenuate it may be possible to alleviate some of the consequences. However great care is needed since construction of embankments on such streams can be counter productive. We have proposed both further studies and some interventions for improvement.

Mr. Ahmed Ali, CPP-FAP 20

Question: The area happens to be cyclone and salinity prone, and it is thought if these major factors are not effectively handled, making development exercises on the area, specially the bottom southern parts, might result in a fiasco.

Answer: We agree that these aspects require effective handling.

Question: What are your proposed interventions to that direction.

Answer: The CERP is already undertaking works designed to provide more security against cyclones and we have proposed some additional works to be carried out under that programme. Soil salinity does not appear as a major problem in this area since monsoon flushing is good. Water supply needs must be met from careful utilization of scarce surface water and from deep groundwater where this is fresh. Irrigation development must rely on imported water from further north and this is difficult to justify.

Dr. Syed Waliullah, FPCO

Question: Local Participation:

Did you have any visit from intellectuals from home and abroad who

are interested to learn about people's participation in your project activities?

Answer: We have had a number of visitors interested in this aspect of the studies although I do not know of their status as intellectuals!

Engr. Md. Aminur Rahman, Consulting Engineer

Question: The progress report of FPCO (March, 1993) shows that FAP 5 has already produced two reports. But the bandwagon of the FAP is iron-curtained and people do not have any access to such reports. So, naturally we are here to do the charity of participating in discussion based on a few-paged write-up dished out. Can such discussions be meaningful?

Answer: I regard this conference as just one component of public participation and it is certainly meaningful in that respect. Shapan Adnan has recently issued a paper on FAP containing over 200 references to FAP reports and documents. Clearly they are available. FAP 5 reports were produced in over 70 copies and circulated in accordance with the agencies wishes.

Mr. Zaman, Ministry of Irrigation, Water Development & Flood Control

Question: FAP 5 is the Southeast Regional Study covering the rivers Feni to the SE, Meghna and Lower Meghna to the west, the Titas to the North and the Bay of Bengal to the south. After completing this study, why do the consultants recommend for further study as Meghna Estuary Study (S/B)?

Answer: The consultants did not recommend the Meghna Estuary Study (SB). This is a separately funded study under the FAP with different TOR covering areas beyond the FAP 5 boundaries.

Mr. Emaduddin Ahmed, FAP 25

Question: Have you considered pumped drainage for Begumganj depression through Old Noakhali Khal and using the drainage water to spread over planning unit 2 to see the cost effectiveness of pumped drainage over the FAP 5 proposal which will have limited efficiency in drainage improvement and also problem of channel siltation.

Answer: This proposal is not considered a viable option. The farmers of planning unit 2 would not want additional flood water pumped over their land. The FAP 5 proposals involve no pumping which makes them more cost effective. They provide substantial drainage improvement, irrigation benefits and have less channel siltation problems than the solution proposed in the question.

Mr. Zaman, Ministry of Irrigation, Water Development & Flood Control

Question: From the map of the paper, it is seen that 3 major projects (e.g. MDIP, CIP & Gomti) have been implemented without regional study rather under different studies by different consultants. As consultants of regional study, do you think that those projects have not been implemented perfectly? If so, did you recommend any corrective measures?

Answer: It is doubted that any project could be said to be perfectly implemented. It is also easy to criticize with benefit of hindsight. There were changes in these projects between study, design and implementation often due to activities of local pressure groups (eg wanting an embankment nearer the river to project additional area). These changes were sometimes ill-advised. We have recommended some improvement in O&M of these schemes.

Question: As the concerned consultants, what is your recommendation about the next promising projects to be implemented?

Answer: The plan includes priority recommendations in planning units 12, 11, 5, 3 and 2 as described in the paper.

Mr. Mike Smith, FAP 17

Question: The drainage flapgate design you recommend does not appear to be "fish friendly" as fish migrate against the current through the drainage system at the beginnings of the flood. Please comment.

Answer: The counter weighted flap gates proposed open wide under minimal head difference allowing wide openings for fish movement even with relatively low discharges. The level of the bottom of the gate when open should also allow some floating spawn and fry through. These gates are a vast improvement for fish compared to the existing

gates. At the beginning of the monsoon season they can be lifted completely clear of the water as drainage is not required at that time.

Mr. Philip Townsley, FAP 17

Question: The design of flood control structures may have less impact than the way in which they are managed. Have you considered how sluice gates could be managed better to respond to local needs?

Answer: Yes, we are convinced that many flood drainage control structures could be kept open to allow normal water flow and movement up until such time as the lands intended for protection actually require such protection. Quite simple operating rules could usually be devised to achieve this. Such rules should be established clearly at the design stage through consultation with the affected groups. The project coordination committee could be responsible for this as recommended in the participation guidelines.

Mr. K. M. Zulfiqar Hossain, C. E. N. E. Zone, BWDB, Comilla

Question: Pre-monsoon drainage problem in Burichang, Debidwar, Muradnagar, Homna and Daudkandi Thanas in proposed Gumti phase II area is very acute. What is your suggestion in this regard? Have you identified projects or sub-projects to be implemented on priority basis? If yes, what are those projects or sub-projects?

Answer: Pre-monsoon drainage has been already improved by the construction of the Gumti embankments and our proposals include further measures which will help many of these areas. Two Sub-Projects in Gumti area have been identified which will reduce floods due to flows coming from the Tripura hills and down the Gumti river. These projects are recommended in the Gumti Phase II Feasibility Study.

Mr. Shamsur Rahman, Engineering & Planning Consultants Ltd.

Question: Final feasibility report was earlier prepared for Gumti Phase II Project under IDA financing. This is being revised and reconsidered under South East Regional Study. What is the position of this project in order of priority in the revised study? Is there any probability of its implementation in near future?

Answer: The original proposals are no longer considered a viable option. However, parts of this area are now proposed for smaller projects and these may go forward for early implementation if the responsible agencies given them high priority.

Mr. A. A. Ansari, BWDB

Question: In Planning Units 3, 5 and partly 4, prospect of GW is not good. Then what is the alternative but to use surface water by pumping Meghna Water, for irrigation.

Answer: Pumping of Meghna water is being considered for units 5 and 4. Units 3 gains from the proposed tidal scheme under the Noakhali North Project.

Question: Is cost recovery the only issue to defer irrigation pumping plants?

Answer: It is one issue but not the only one. A second issue must be the overall viability of the scheme which is shown to be less attractive than some others.

Mr. Fazlur Rahman Molla

Nature Conservation Movement (NACOM)

Question: Have you been carrying on prefeasibility level study in the context of merits and demerits of past floods have taken place in South east Region and the cultural relation of the peoples of the area to those floods.

Answer: This is not just a flood study. FAP 5 has been concerned to identify people's concerns with regard to all aspects of water resource development of course this includes floods but it also includes other aspects such as irrigation, water supply and health. It is clearly understood that floods being both benefits to some and disbenefits to others. It is necessary to try to achieve a balance or trade off in these areas.

Mr. Mohammed Mozzamel Hoque

Bangladesh University of Engineering & Technology (BUET)

Question: In the coastal area of SER, a conjunctive use of available freshwater and saline water, by mixing them at crop tolerance level may help in dry period irrigation. Have you considered this aspect? Please comment.

Answer: This would be extremely difficult to manage and for any fresh water to arrive in the coastal area, it must be imported from the north.

Question: In the North Western side (shaded area in page 4) of SER believe that there is a fresh water body above the saline water body, or this area a conjunctive use plan, similar to (a) may be drawn by simulating the situation with the help of mathematical model. Please comment giving a highlight of your current investigation in this area as you mentioned.

Answer: The groundwater potential in this area has been studied in some detail for the Gumti II feasibility study. Proposals have been made which will allow much more extensive development of this resource. We do not recommend mixing saline and non saline waters and it should not be necessary for irrigation development in this area.

Mr. Md. A. T. Khandakar, BWDB

Question: Please refer the last para on page 10.

The consultants opined that retirement is a viable alternative at Ekhaspur. But BWDB already implemented a costly protection work at this location. If retirement is the viable option then how the investment already made is justified? Or is it that the consultants are not aware of the activities at this area and their recommendations are to be up-dated?

Answer: The consultants feel that in the long term the existing protection may prove non-viable. Unless the more extensive works recommended under FAP 9B are implemented retirement is likely to be required.

Question: The consultants say even if the Chandpur (Town Protection) works proceed, the CIP will not be totally risk-free (from the Meghna erosion) and "hence appropriate treatment of embankment is the only

reasonable course of action". This means we will have ;to sustain loss of land (which is limited) and there will be increase in number of landless and floating people giving rise to problems of various nature and dimensions. In such a situation should not the consultants examine the viability of constructing some groynes to mitigate the erosion problem and prevent loss of land and dislocation of the population?

Answer: The cost of constructing groynes is not an economically viable solution and is also doubtful on technical grounds where the river is so deep.

Dr. Suzanne Hanchett, ISPAN

Question: In what ways have women joined in your participatory planning activities? Did any women get involved at the thana level meetings? What has women's contribution been, and what could it be in such processes?

Answer: All our participatory planning activities involved women both as members of the field teams and as participants at the village level (either as separate groups or individually by interview). Women were also present at some thana level meetings usually representing NGO's. Women's concerns are often different, centering on water supply and health issues.

Mr. Ranjit Galappatti, SWMC, Fisheries

Question: Do you feel that hydraulic models should be used more widely in studying flood plain fisheries in Bangladesh?

Answer: Yes. We have used the model extensively to evaluate changes in extent and duration of floodplain. This seems to us a useful tool for such a purpose.

Mr. Nazrul Islam, Department of Fisheries

Question: Chandpur Irrigation Project area is the lead area of Aquaculture, which is due to development of fisheries by establishing Raipur Fish Hatchery and Training Centre in the CIP. Do you suggest similar aquaculture development project in all major FCDI to mitigate fisheries loss due to FCDI.

Answer: The Raipur hatchery was extremely useful as a catalyst in promoting the development of culture fisheries in that area. However private hatcheries are now well developed and better able to meet the requirements of the market. Projects should be designed so that such hatcheries are not required from the public sector.

Mr. Gazi Nurul Alam, FAP 20

Question: Ref: Water Resources

Capture fisheries has declined in the study area as assessed by feasibility study. Please could you give any quantitative figure to this effect and whether there is any development option from your end to improve the capture fisheries status. Thank you.

Answer: It is not clear what feasibility study has stated that fisheries have declined in the South East Region. Capture fisheries declined after implementation of MDIP and CIP. Subsequent mitigation measures have improved aquaculture but do not adequately replace capture fisheries. This has been evaluated by FAP 12 and others. Recommendations to sustain capture fisheries are included in the study reports.

Mr. Gazi Nurul Alam, FAP 20

Question: Ref: Fisheries Mitigation Measures

How khal re-excavation can bring positive impact to beel fisheries (capture fisheries) rather it will deteriorate the beel fisheries as the re-excavated khal connecting the beel and its outskirts will drain out water and thereby destroying the nursing and feeding ground of fish fry during early monsoon. Your comment please. Thank you.

Answer: Re-excavation of Khal/Beel connecting channels is only recommended where siltation has resulted from poor operation of existing structures and would be done to restore/improve access to the beel. This needs to be combined with improved operating procedures. Also Khal excavation or re-excavation does not always affect beel fisheries at all since they are not necessarily connected. In fact often the Khal deepening increases the depth and duration of water availability in the khals increasing benefits both for farmers and for fishermen.

TECHNICAL SESSION II

May 18, 1993

(09:00 - 10:45 Hrs.)

- Chair:** Mr. A. Z. M. Nasiruddin
Secretary
Ministry of Fisheries & Livestock
- Rapporteur:** Mr. A. T. M. Khorshed Alam
Principal Scientific Officer, WARPO
- Topic:** FAP 6 North East Regional Study
by Mr. Mujibul Huq and
Mr. H. D. Weibe

NORTHEAST REGIONAL WATER MANAGEMENT (FAP 6)

1. The Northeast Regional Water Management Plan — consisting of a development strategy and a prioritized portfolio of policies, programs, and projects — must be grounded in a broad perspective of the region. This document, prepared for the Third Flood Action Plan Conference summarizes that perspective, distinguishes major driving forces (dynamics generating or impeding change), and identifies the types of proposed initiatives that the NERP team is currently subjecting to pre-feasibility level investigation. Related information on the regional planning process, policy context, development issues, and other matters are available in other NERP reports.

INTERPRETIVE DESCRIPTION OF THE REGION

The Natural Resource Base

Land Forms, Soils, and Land Use

2. The Northeast Region (Figure 1), with an area of 24,200 km², is comprised mainly of six landforms: the Sylhet Depression, lowland floodplains, piedmont floodplains, alluvial fans, terraces, and uplands. Most of these landforms are of fluvial origin, although some have been modified by tectonic subsidence or uplift. Land use relates closely to topography, soil, and flood depth, time, and duration. Approximately 50% of the region lies below 8 m elevation; 25% lies below 5 m (PWD datum).

3. The *Sylhet Depression* is a low-lying bowl-shaped basin covering about 25% of the region or 6,000 km². Virtually all of this land is below 8 m and is flooded to depths of 5 m and more during the monsoon. Saucer-shaped, seasonally-flooded, interfluvial areas called *haor* characterize this unit; the small permanent lakes in the lowest pockets are called *beels*. The main rivers traversing the Depression include the Surma, Kalni, Kushiara, Baulai, and Dhanu. These rivers are characterized by highly sinuous, meandering sand-bed channels with cohesive banks. Channel shifting occurs erratically, and consequently the Depression is covered by a maze of ancient channel scars, abandoned distributaries, and oxbow lakes. Soils consist of grey or bluish grey

clay, black herbaceous peat and yellowish grey silt. Alternating beds of peat and peaty clay are common in *beels* and *haors*. Historically, much of the depression was forested with *hijal* *Barringtonia racemosa* and *koroch* *Pongamia pinnata*, a key habitat for many species of fish, waterfowl, and other species. During the last two centuries, land use has been altered to meet the needs of an ever-expanding human population. The forest has been consumed and in its place, winter season rice is now being cultivated. Submersible embankments, which confine the rivers within their channels during pre-monsoon storms, have been constructed to protect some of this rice. However, the combination of embankments, deforestation, changes in sediment deposition patterns, and poor biological management have adversely affected fisheries production.

4. The *Lowland Floodplains* were created as a result of deposition and erosion from the Surma, Kushiya, Meghna, Old Brahmaputra, and Jamuna Rivers. This landform covers about 55% of the region or 13,260 km². Land elevations typically range from 16 m to 9 m on the Surma/Kushiya floodplain, from 22 m to 9 m on the Old Brahmaputra floodplain, and are less than 7 m on the Meghna floodplain. This landform includes channel deposits such as point bars and fills, overbank deposits such as natural levees and crevasse splays, and fine-grained flood basin and back-channel deposits. The soils of the Surma/Kushiya floodplain are mainly alluvial silts and clays while the Old Brahmaputra floodplain consists of poorly stratified fine sandy to clayey silt. The main cropping pattern within the Surma/Kushiya floodplain is at least one, and often two, rice crops annually. In the Old Brahmaputra and Meghna floodplains, the dominant cropping pattern is at least one rice crop in combination with a *rabi* crop. To improve monsoon crop production on this landform, river control works including full flood embankments with drainage regulators have been constructed at various locations. The infrastructure has disrupted easy and timely fish migration which has adversely affected fish abundance.

5. The *Piedmont Floodplains* are found along tributary streams that join the larger mainstream rivers and cover about 4% of the region or 960 km². Land elevations range from 24 m to 9 m. Principal piedmont streams include the Khowai, Manu, Sutang, Dhalai, and Juri Rivers which flow northwards from the Tripura Hills in India to join the Kushiya River. Gradients of the streams are generally steeper than the mainstream rivers and are characterized by meandering sand-bed channels which have often developed natural levees of sand

and silt. The dominant cropping pattern is two rice crops annually.

6. The *Alluvial Fans* are found along the foot of the Meghalaya Plateau and cover about 6% of the region or 1490 km². The fans result when steep mountain streams exit from their canyons and spread over the flat, unconfined land of the Lowland Floodplains and Sylhet Depression. The decrease in channel gradient and reduction in velocity as the streams leave their canyons causes deposition of sand and gravel sediments which take the form of a "fan-shaped", conical delta. The long-term aggradation on the fans appears to be more or less in balance with the lowering of the land due to subsidence. Principal streams which have developed alluvial fans include the Someswari River, Jadukata River, Umium River, Jhalukhali River, and Dauki/Piyain River. Typically, elevations range from 16 m to 12 m in the west and from 11 m to 9 m in the east. The dominant cropping pattern is two rice crops annually.

7. The *Terraces* occur along the western edge of the region and confine portions of the Old Brahmaputra River. This landform covers about 2% of the region or 500 km². It has been raised by uplifting and faulting so it is no longer subject to inundation by normal flooding. Elevations range from 10 m to 8 m and the soils are comprised of Madhupur clays. The dominant cropping pattern is two rice crops followed by a *rabi* crop.

8. **Uplands** occur as outliers extending into the region from the Tripura hills and cover about 8% of the region or 1970 km². These hills are composed of weathered and poorly consolidated sandstone, siltstone, and conglomerate. Where the land has been left in its natural state, it has a cover of upland forests, thickets or grasses. Cultivated areas are predominantly used for tea, although some rubber, pineapple, and citrus fruits are produced here.

9. **Water** An estimated 95% of the total surface water supply moves through the region from 1 May to 30 November, inundating almost 60% of the region to depths exceeding 1 m. This creates an aquatic environment which supports a vibrant open water fishery, an extensive inland water transport system, and numerous other products and services. These conditions however constrain agricultural development where land is flooded too deeply to produce monsoon season crops, where boro crops are damaged by pre-monsoon flash floods, and where sand deposition renders agricultural land unfit for any purpose. Floods also encroach on homestead space, damage infrastructure, and

at times take human lives.

10. During the past two decades, water resources infrastructure has been provided to about 30% of the agricultural land or 3950 km² to facilitate flood management; some of this area is provided with major surface water irrigation as well. The singular focus of these schemes was on increasing rice production, but the projects also disrupted fisheries migration routes, reduced wetland habitat, and hampered navigation.

11. An estimated 5% (8.5 km³) of the total surface water supply is available in the region from 1 December and 30 April. During these months, water is required for irrigation (rice and *rabi* crops), for some domestic uses (washing), for some industrial use (cooling), to provide an overwintering habitat for fish, to sustain biodiversity within the wetlands, and to maintain navigation routes. The volume of water used to provide irrigation during these months is 3 km³ (an estimated 4500 km² are irrigated) and indications are that there is little scope to expand further the surface water irrigation volume. So doing would result in small incremental gains in rice production and have significant adverse impacts on all other uses.

12. Total surface water supplies to the Meghna-basin portion of the region (84% of total area) are 173 km³ (estimated annual mean). Of this, 40% originates as rainfall over the region and 60% as rainfall over the upper portions of the Meghna River basin lying in India. Almost all (93%) exits the region as surface water outflow at Bhairab Bazar (161 km³); the rest (7%) returns to the atmosphere by evapotranspiration (13 km³).

13. Ground water is used for irrigation, potable water, and industry in the region. Annual available ground water recharge is estimated at 3.16 km³. At present, about 1.52 km³ is being utilized annually to irrigate about 2130 km² of land. A further 0.29 km³ is used annually for potable water and industrial supply. Irrigated area could be significantly increased overall, but signs of over-abstraction are present in particular locations.

Water Quality

14. Surface water quality is of serious concern. The most urgent concern is the public health impact of domestic waste contamination of surface water.

Water-borne disease is common; so much so that it is the main cause of death of children under five years of age. The reasons for this are clear: the prevalence of sanitary latrines in rural areas is low (15% of households), and sewage collection, wastewater treatment, and properly-managed municipal garbage disposal sites in towns are non-existent.

15. The surface waters of the region also suffer from industrial pollution. There are many industrial facilities in the region that discharge untreated liquid effluents into surface water: textile industries, oil and gas facilities, fish- and tea-processing plants, a Kraft pulp and paper mill and an ammonia fertilizer plant at Fenchuganj. Discharges from these last two facilities are known to have caused fish contamination and kills in the deep water upper reaches of the Surma and Kushiya Rivers. In particular, the mill reportedly discharges more than 550 kg per year of mercury, a highly toxic heavy metal. Pollution control is the responsibility of the Department of Environment, and pollution control legislation does exist, but DOE's enforcement capabilities are very weak. For the future, industrial pollution need not increase as fast as the industrial sector itself, but this would require shifting to a preventative approach emphasizing the use of cleaner process technologies.

16. Ground water quality in the region is suitable for irrigation, but high concentrations of manganese and iron in some locations affect potable water supplies.

Fisheries

17. Fisheries is a major economic sector of the region generating about Tk 2400 million annually. The general perception is that overall fish catch and fish biodiversity have been declining in the region over the last half century. The reasons for this are:

- (a) Resource access and tenure regimes that provide little incentive for biological management practices oriented to medium- and long-term returns.
- (b) Modification and containment of the aquatic environment through infrastructure designed to increase agricultural production, to facilitate road and water transport, or to control the lateral movement of rivers but which almost entirely lacks

provision for fisheries needs.

- (c) Industrial effluents from Fenchuganj fertilizer factory and Chhatak pulp and paper mill which are discharged into the Surma and Kushiyara Rivers, contaminating and killing fish.
- (d) Extensive deforestation of *hijal*, *koroch*, and other inundation-tolerant wetland trees which are a key support of high fisheries production in this environment.
- (e) Sedimentation of many *beeis* has converted them from permanent to seasonal status thereby reducing fish production.

Significant improvements in these trends will be required to avert continued deterioration of fisheries productivity and diversity.

Forestry

18. Trees are found in four basic settings: upland natural forested areas, lowland natural forested areas (swamp forest), upland tea gardens, and on homestead high land. The latter two types are cultivated. Trees of all types provide nesting and roosting sites for many of the remaining wildlife species of the region, and are key to their continued survival.

19. Natural forested areas throughout the region are under increasing pressure, due to expansion and intensification of agriculture and the growing demand for and monetization of forest products. The extent and condition of natural forest for the region as a whole is difficult to characterize. A 1979 review indicates that the Forest Department has jurisdiction over 1200 km² of Sylhet and Mymensingh Districts — all of this is upland area — but most has been encroached upon by agriculturalists, degraded by wood gathering and grazing, or 'monetized', sold off to an interested party; processes which continue. In addition, upland forest trees are found on higher lands under other government agencies and on private land.

20. Remnant stands of lowland forest species (mainly *hijal*, *koroch*, and *barun crataeva nurvala*) are still widely distributed and common in the wetland areas, as they provide several highly valued services. None are on Forest

Department land, though Department permission is required — in theory — for felling *any* mature tree. Stands of swamp forest trees protect homestead and embankment highlands from wave erosion — a serious problem, especially around the larger *haors* where larger waves can be generated. They provide shelter and feeding areas for fish, both directly and indirectly when coppices branches are placed in fishery areas. And they produce a sustainable (if correctly managed) harvest of branches and leaves for use or sale.

21. Swamp forests, like upland forests, are under pressure from agriculture, gathering and grazing, and monetization. These processes appear to be very rapid and accelerating for lowland forest remnants. Some are still under traditional community tenure, which is proving to be vulnerable to economic and outside pressure. Natural regeneration is quite rapid, however: one area that has been totally protected from human activity for nine years is in excellent condition, with many established trees of half mature height. And afforestation is technically possible and evidently can be economically attractive, judging from the very recent development of private nurseries and plantation programs by fisheries lessees in a few *haors*.

Other Biological Resources

22. The region's wetlands support large natural wetland plant communities. These are extensively exploited by local people, particularly the poor, and provide significant amounts of food, fodder, fuel, building material, and medicines to them. Quantification of this production and its socioeconomic distribution is still needed.

23. The wetlands also support an internationally significant population of migratory waterfowl (384,479 individuals were counted during the Jan 93 migration peak). Populations of many other terrestrial and semiaquatic wildlife species, including a number of threatened species, are also found. Stocks of both waterfowl and other wildlife are declining generally, with hunting (for sport and for domestic and international trade) and habitat destruction being the main threats. The strong international demand for some wildlife species presents both a threat and an opportunity, depending upon whether yields and populations can be managed sustainably for each valued species.

Natural Gas

24. Known recoverable reserves of natural gas in the region are 242 thousand million m³ which is 81% of Bangladesh reserves. The total value of this gas to the region at current prices is estimated at Tk 675 thousand million. Known recoverable reserves will last an estimated 20 years. Estimated total reserves in place in the region are 559 thousand million m³ which is 93% of the Bangladesh total.

25. About 35% of the natural gas produced in the region is utilized in the region. The remaining 65% is piped to other parts of Bangladesh (see Table 1).

Table 1

Natural Gas Utilization within the Region

Name	Annual Volume (Mm ³)
Chhatak Cement	36.79
Sylhet Pulp Mill	26.87
Kumargoan Power	31.01
Tea estates	10.34
Domestic and commercial	26.46
Outside of region	244.16
TOTAL	375.63

Two cement factories — at Ampur and at Jalalabad — will come on stream in the region during the next several years though utilization rates have not been forecast. Table 2 presents natural gas consumption by category for all of Bangladesh.

Table 2

**Natural Gas Utilization
(Nationally by Sector)**

Sector	Consumption (%)
Electricity	39.6
Fertilizer	32.9
Industry	9.5
Commercial	1.9
Household	6.1
Total	100.0

Quarrying and Gravel Mining

26. The largest quarry in the region is at Bholaganj on the alluvial fan of the Dhalai River north of Sylhet. The gravel pit was first opened in the early 1900s for construction of Chittagong harbour and construction of Kaptai dam. It is reported to have supplied on the order of 500,000 m³ of stone material for the dam. The quarry extends over an area of about 2.5 km² and consists of gravel from 600 mm diameter down to sand composed of granite, gneiss, chert and greywacke. In the 1970s the quarry was expanded and an 11 km long ropeway transport system was constructed to move materials from Bholaganj to Chhatak. The project was intended to produce 170,000 m³ per year. However, during the Independence War the facilities were damaged and manpower and barge transportation were used when operations resumed. In 1974 the volume of materials in the quarry were estimated as shown in Table 3.

Table 3

Quantities at Bholaganj Quarry

Class	Gradation (mm)	%	Volume m ³
Pitching stone	>225	3.6	330,000
Gravel	100-5	49.2	4,470,000
Sand	<5	47.2	4,300,000

27. Similar large sand and gravel deposits can be found on other large alluvial fans in the region, notably on the Jadukata River and the Dauki/Piyain River fan near Jaflong. Exploitation of these sites is occurring by manpower and small boat transportation. Operations on the Jadukata River were observed in October 1992 where sand and gravel from near the fan apex at the Indian Border was transported by *barki* boats down to Fazilpur. Here it is stockpiled for transport by larger deep draft vessels. At the time of the site visit there were in the order of 5,000 to 6,000 *barki* boats working on the river. It was estimated that 71,500 m³/month of sand and 32,500 m³/month of gravel were being produced at this time. This represents a direct income of Tk 17 million to the local economy. However, operations are seasonal due to restricted navigation during the dry season.

The Human Resource Base

Basic Demography

28. The Northeast Region has 17% of the total population of Bangladesh or an estimated 17.66 million persons. The region's population increased by 23% during the last intercensal period (1981 to 1991). Low population densities occur in the Sylhet Basin and the hilly areas; high densities occur in and around urban centres.

Table 4

Gender Distribution of Students

Level	Male Students (%)	Female Students (%)
Primary	55	45
Secondary	64	36
College	74	26

29. The average household within the region contains 5.34 and the male to female ratio is 105 which is slightly lower than the national average. The average household size increased during the period 1960 to 1981 and then declined slightly between 1981 and 1991. It is still higher than in 1960. The

proportion of population younger than 14 years of age is high, more than 46% in the 1981 census, which characterizes a very high dependency ratio. The high proportion of people now of reproductive and working age has profound implications for the fertility and employment situation. The proportion of younger population is somewhat lower in the 1991 census. In the lower age groups, females outnumber males, while for higher age groups the reverse is true.

30. The Crude Birth Rate per 1000 population ranges between 35 and 50 in most parts of the region; this is very high. The Total Fertility Rate at more than 5 is also very high. The Crude Birth Rate and the Total Fertility Rate have however shown a declining trend since 1975. Average life expectancy at birth is 56 years, a marginal increase — of about one year — since 1981. Difference in life expectancy by sex is negligible.

Educational Levels

31. The level of literacy is very low. According to the 1991 census, in most districts of the region the literacy rate is less than 20% for all age cohorts. The school attendance rate (1981 census) was less than 20% in most parts of the region for those aged 5 to 24 years.

32. School enrolment of girls is low at all levels (see Table 4) and decreases at higher educational levels. Girls constitute 45% of the total number of students at the primary level, 36% at the secondary level, and 26% at the higher secondary (college) level. The enrolment rate of females has increased significantly during last ten years, particularly at the secondary and the college level.

33. The government aims to achieve a gross enrolment rate of 85% by 1995 and 100% by the year 2000. Many of the schools are privately funded, and this trend is continuing. Principal deterrents to schooling appear to be economic (the need to assist the family in economic activities) and distance to school.

Health Levels

34. The overall health situation is poor. Relevant indicators include the region's Crude Death Rate which is more than 11 per 1000 population, the Infant Mortality Rate below one year of age which ranges from 106 to 138 per

1000 live births, and the Child Death Rate which is as high as 15 per 1000 children aged one to four in some parts of the region. The Child Death Rate is higher for females. The situation improved marginally during the eighties, but in some areas it is still worse than the national average ten years ago.

35. In order to reduce the Infant Mortality Rate and the Child Death Rate, an Extended Program of Immunization is being implemented nationally in collaboration with UNICEF. Under this programme, children are vaccinated against six measles, tetanus, whooping cough, polio, diphtheria, and tuberculosis. This has helped in bringing down the mortality rate among children in many areas. Still, more than 75% of children under two years of age have yet to be immunized in about half of the region. The government has set a goal under the Extended Program of Immunization to cover as much as 85% of children by 1995.

36. Nationally, government expenditures for social services account for less than 20% of the development budget, of which one-quarter is for health and family planning. Public health infrastructure is mainly oriented around government hospitals at the district and *thana* levels. These facilities were decentralized in the 1980s. At present, each *thana* has one health complex with several graduate physicians, some laboratory facilities, and a few beds for in-patients. In addition, family welfare centres are gradually being set up in all the unions. Currently, there are 5256 persons per government hospital bed in the region, which is almost the same as ten years ago. Population per health worker is shown in Table 5.

Table 5

Population Per Health Worker

Indicators ^{1/}	Number
Population per doctor	21,596
Population per nurse	27,470
Population per hospital Bed	5,256

1/ Includes Government Hospitals and Thana Health Complexes.

37. Private health services and facilities in the region are at least as important as those provided by government, and most are located in areas having large numbers of people who work abroad. This highlights the significance of foreign remittances to the region, and the plausibility of private sector participation in providing social services as envisaged in the national development strategy.

Cultural Traditions and Values

38. Rice, pulses, and fish are the main food items. The diet is dominated by rice which is generally consumed at every meal. With increasing poverty and landlessness, wheat has replaced rice at one or more meals in many households. Cereals account for more than 80% of energy intake, more than 70% of protein intake and more than 60% of fat intake.

39. People grow their own food in rural areas where subsistence farming is still the dominant mode of production. Agricultural activities are undertaken mostly using family labour. The household is the basic economic unit where all members participate according to roles defined by societal norms and traditions. Male household members usually work in the field, preparing the land, tilling, sowing, planting, weeding, and harvesting. Female members work at home performing mainly post-harvest activities which include threshing, drying, husking, winnowing, and storing. Women also grow fruits and vegetables in and around the homestead and look after poultry and livestock.

40. *Purdah* restricts women's activities outside the home. The dominant view is that women do not need higher education, and should devote their life to cooking, rearing children, and other home-building activities. With increasing economic hardship, women are engaging themselves in extra-household economic activities, particularly those women from the lower income strata of the population. Women's gainful employment is also being promoted by the NGO community.

41. Male domination is socially and legally protected and promoted through laws of inheritance, marriage and divorce which favour men. Polygamy is still in practice. These values are being challenged by educated youth and new values are slowly emerging as increasing urbanization and mass media penetration.

1.3 Infrastructure Base

42. This section describes the infrastructure base, an understanding of which is essential to planning further investments in water management. This description covers existing infrastructure and planned infrastructure — where the information is available. The infrastructure described here includes roads, rural electrification, communications, water transportation, potable water, sanitation and water management works.

Rural Electrification

43. The Rural Electrification Board functions through consumer owned autonomous co-operatives (PBSs). At present, programs are being implemented to extend the distribution grid and to construct and upgrade sub-stations in various districts in the region, including Sylhet, Moulvibazar, Habiganj, Netrokona, Sherpur, and part of Mymensingh. The length of existing lines in the distribution system by PBS is provided in Table 6. Plans to extend the rural power grid further are not yet final.

Table 6

REB Power Distribution Network

PBS ^{1/}	Existing Line (km)
Habiganj	1244
Moulvibazar	1129
Narsingdi I	998
Narsingdi II	713
Sylhet	621
Kishorganj	848
Sherpur	250

^{1/} The Power Development Board (PDB) services the remaining areas within the Region but with much less intense coverage. Data from PDB is at present unavailable.

44. The Power Development Board (PDB) maintains a grid within those areas not covered by the REB but it is much less extensive, serving mainly larger communities. Comprehensive information on PDBs distribution network was unavailable at the time of writing this report.

45. The primary end use for this power at present is irrigation. Consumption for this use peaks in March at about 85% of total consumption.

Communications

46. Telephones are the region's primary existing communications infrastructure. At present there are 9306 lines, of which 8424 are connected to subscribers and in use. There is an existing, unfulfilled demand for an additional 8767 lines; 8000 new lines are planned and have been approved. The status of these lines, by exchange, are presented in Table 7.

Table 7
Regional Telephone Status

Exchange	Total	Connected (lines)	Demand	Planned
Fulpur	150	79	35	
Netrokona	400	385	130	1000
Kishorganj	400	400	288	1000
Bajitpur	200	134	43	
Sherpur	400	18	98	1000
Shaistaganj*	10	10	68	
Rajnagar*	10	10	53	
Barlekha*	16	16	6	
Tajpur*	20	20	123	
Habiganj	400	395	277	1000
Chhatak	200	184	35	
Srimangal	400	380	97	
Sylhet	5600	5337	6037	
Sunamganj	400	371	120	1000
Moulvibazar	700	685	1357	3000
Total	9306	8424	8767	8000

* These exchanges include extensions on the existing lines.

Potable Water

47. Access to safe drinking water has improved considerably in recent years. Efforts are being made to ensure rural water supply through sinking of three types of tube wells: shallow, deep, and deepset Tara pumps. In 1985, there was one tube well for about 150 persons, now there is one tube well for about 122 persons. In 1981, only about half of the households in the region had access to potable water. Presently, more than 80% of the population has access to potable water according to official statistics. Tubewells however tend to be associated with wealthier and more influential households. Parts of the region essentially do not have access to tube wells, and potable surface water is scarce, difficult to obtain, and of poor quality. Universal access to potable water has been set as a target to be achieved within the Fourth Five Year Plan period (1990-95).

Sanitation

48. Primary sanitation facilities consist of sanitary latrines. Waterseal latrines, using low-cost concrete ring and slab, are being promoted by the Directorate of Public Health Engineering (DPHE). Presently, only about 15% of the households in the region possess a sanitary latrine. In some parts of the region, this proportion is less than 4%. However, considerable improvement has been observed during the last decade. The production index of DPHEs sanitary latrines has quadrupled and the number of production and sales centres has doubled since 1981. In addition, many NGOs and private firms are now in the business.

49. By 1995, sanitation coverage of 35% of all households has been targeted by Government. Planned actions include the promotion of do-it-yourself (home-made) pit latrines and low-cost waterseal (concrete ring and slab) latrines on the one hand, and advocacy and social mobilization activities on the other.

Water Management

50. During the past two decades, there has been considerable progress in providing infrastructure for improved management of water resources in the region. A summary of the current development status is provided in Table 8.

Table 8

Water Resource Development Status

<u>Project Type</u>	<u>Project Number</u>	<u>Net Benefitted Area (ha)</u>
<u>Flood Control & Drainage</u>		
Full Flood Control	27	96,000
Partial Flood Control	33	172,000
Drainage Improvement	5	18,100
<u>Surface Water Irrigation</u>		
Large Scale Irrigation		6,000
Water Retention Structures		4,200
Low-Lift Pumps		154,000
Traditional		286,000
<u>Ground Water Irrigation</u>		
Manually Operated Shallow Tube Wells		5,300
Shallow Tube Wells		126,000
Deep-Set Shallow Tube Wells		700
Deep Tube Wells		80,000

51. A total of 66 major surface water resource projects have been constructed or are nearing completion. These include full flood control projects, partial flood control projects, drainage improvement projects, and major surface water irrigation projects. All are administered by BWDB; their potential net benefitted area is estimated to be 395,000 hectares. Nearly all were constructed during the past two decades.

Water Transportation

52. Water transport is essential to the region's transport needs. Boats are more than twice as fuel-efficient as trucks and, at prevailing freight rates,

mechanized boats yield high rates of return on capital. Thirteen *thana* centres depend solely on waterway communication and many of the rural market places in the region have grown up along waterways.

53. The Inland Water Transport Authority (IWTA) under the Ministry of Shipping, Ports and Inland Water Transport administers navigation and water transport. There are about 1400 km of classified navigation routes in the region. These are used by larger commercial boats — carrying passengers or freight — operating in the formal sector.

54. Changes are taking place in the region's river network. Sedimentation has reportedly reduced the navigability of the Surma River. The lower Kushiyara River is infilling with sediment and the Kangsha from Gaglajor to Mohanganj can no longer be used for navigation by the larger commercial boats.

55. Country boats make an important contribution to the rural (informal sector) economy of the region. The Country Boat Pilot Project estimates^{1/} that as much as 60% of all employment in transport is in country boats. This employment is predominantly rural and under relatively equitable conditions. In much of the deeply flooded area, inland waterways are the only form of transport for goods and passengers and with the mechanization of country boats people now travel more than before. It enables them to find employment in urban centres while still living in nearby villages. Boats thus enhance rural mobility and contribute to alleviating the problem of rural unemployment. They also provide direct and efficient market access for rural people and their goods.

56. There are operational problems. Infrastructure obstructs navigation routes. For example, submersible embankments are not always sufficiently submerged to allow boats to pass and it was observed within Shanir Haor that 14 of 17 embankment cuts were made to facilitate navigation. Aquatic grasses create navigation problems and the absence of landing facilities hamper efficient country boat operation.

^{1/} Experimental Project for Improving the Efficiency and Profitability of Country Boat Operation. Draft Report of Country Boat Pilot Project. BIWTA, Dhaka 1992.

Roads and Railways

57. The Roads and Highways Department (RHD) is responsible for national highways (374 km in the region) that connect regions; regional highways (165 km) that connect major towns to each other and to national highways within a region; and most Feeder Roads Type A (1395 km) that connect thana centres to the highways. The Local Government Engineering Department (LGED) is responsible for Feeder Roads Type B (870 km) that connect rural growth centres to thana centres or higher-order roads; and Rural Roads Types 1, 2, and 3 (length unknown).

58. In 1990, the proportions of total freight (tonne-km) and passengers (person-km) moving by road were 50% and 60% respectively. By 2000, these are expected to increase to 60% and 70% respectively. Current estimated annual traffic growth rates in the region are 6.3 to 6.8% for trucks and buses, and 7.7 to 10.9% for minibuses, cars, rickshaws, and motorcycles.

59. No new roads are planned for the region, but several ongoing and planned projects address road improvement and maintenance. The Dhaka-Sylhet-Jaintipur national highway is to be improved under the Second Road Improvement Project (estimated cost US\$90 million, ADB/Japan financing under discussion). Six contracts are ongoing under the Feeder Roads Improvement Project (US\$35 million for the six contracts, ADB funded). In addition, a GOB project addresses maintenance and improvement of Feeder Roads, Type A (US\$4.45 million per year from 1993). Several projects under LGED include study or implementation of road improvements in the region; the value devoted to Northeast Region roads is substantial but difficult to estimate (well over US\$4 million per year).

60. Investments for the region proposed by the Road Master Plan include US\$2.6 million per year for 1991-1996 and US\$7.8 million per year for 1996 to 2000, focused mainly on the Dhaka-Sylhet highway, the routes radiating out of Sylhet, and the Bhairab Bazar-Kishoreganj-Mymensingh-Netrokona routes. Investments proposed by RHD include straightening of the Dhaka-Sylhet highway, a new route from Joykalah-Mohanganj to link Sylhet to Netrokona, and a bridge at Bhairab Bazar. Existing roads in the Sylhet basin have very high maintenance requirements due to wave erosion, but current and proposed projects do not really address this problem.

61. Railway lines servicing the region run from Dhaka to Sylhet, and Dhaka-Mymensingh-Bhadurabad. Their proportion of freight carriage is small (nationally, about 2%).

1.4 Agriculture and Fisheries

62. The economy of the region is based almost entirely on agriculture and fisheries. Both have relatively low productivity, accounting for 70% of the regional labour force but producing less than 40% of the gross regional product. As a result, gross product per person is about 10% below the national average. Both also have relatively low economic growth rates (the national agricultural and fisheries growth target is 3.6% per year, while the overall national target is 5% per year), with the result that the region's overall growth probably cannot keep pace with national growth unless there is a shift from agriculture and fisheries to activities with more growth potential.

Crops

63. The contribution of crops to the gross regional product is estimated to be Tk 31,346 million. Total agricultural production in the region is increasing gradually, but not as fast as population. Declining production per person is impacting most seriously on poor people. There is some inter- and intra-regional movement of foods, but it appears that the poor are becoming worse off nutritionally. Nationally, daily intake represented 91% of calorie requirements in 1965, and only 83% in 1988. Girls and women suffer the most, and the situation is worst during the pre-monsoon months when prices are higher. This situation is aggravated by the inability of the poor to take precautionary measures against food shortages.

Livestock

64. Livestock contribute an estimated Tk 3840 million to the gross regional product. In terms of working animals, the most important livestock are cattle, which provide the necessary draught power for ploughing, threshing, road and farm transport, and crushing of sugar cane and oilseed. There are an estimated 3.8 million head of cattle within the region, 0.1 million buffalo, 1.0 million goats, 0.1 million sheep, and 11 million poultry. While there have been small increases in all livestock populations over the past 25 years, on a per person basis, only poultry has increased.

Fisheries

65. The contribution of fisheries to gross regional product is estimated at Tk 2400 million. While there appears to be potential for expansion in fisheries and in value-added related to this sector, the trends to date are not encouraging. For reasons described above (see Section 1.1), fish catch as well as fish biodiversity has been declining. Since fish provide a significant source of protein (and the largest source of animal protein), the consequence is reduced per person protein availability.

Land Distribution and Carrying Capacity

66. In 1977, the number of farm households in the region was 1.1 million and average farm size was 1.5 ha. By 1983-84 (the last available year of record), the number of farm households was 1.7 million and average farm size 0.9 ha. This trend would suggest that the number of farm households is now about 2.6 million and average farm size is about 0.6 ha. The per person availability of cultivable land is estimated to be slightly less than 0.1 ha. While agriculture production has been increasing over this time frame, it has not kept pace with population increases.

67. However, the production potential of land changes over time. Large increases in rice production have resulted in recent years from technological change, coupled with liberalization of agricultural inputs, and favourable flood conditions. Opportunities for further production increases through technology improvements are unknown. In many developing countries, average annual production increases exceed those currently achieved in Bangladesh (about 3% per year).

Industrialization

68. Industry in the region is predominantly small-scale, notably rice milling. There are, however, large-scale industries in the Sylhet region in tea, sand and quarrying, oil and gas, and textiles. There are two cement plants and a bleach Kraft pulp and paper mill at Chhatak; an ammonia fertilizer plant at Fenchuganj; private sector fish processing and export plants at Ajmiriganj and Sunamganj, as well as a BFDC (public sector) facility at Dabor; and a garment industry in Dhaka region. The large-scale industries are in various states of economic health; it appears likely that the fertilizer plant at Fenchuganj will be replaced

by a new plant at Chittagong. Two new cement factories — at Ampur and Jalalabad — are scheduled to come on stream during the next several years. A ball pen manufacturing plant is presently under construction near Moulvibazar. Construction and industry account for about 6% each of gross regional product.

Urbanization/Settlement System

Form and Dynamics

69. Urban areas as defined by the Bangladesh Bureau of Statistics include municipalities, *thana* headquarters and other urban centres around industrial complexes. Urban centres develop around sites of administrative and economic importance, and where public utilities and services (roads, electricity, communications, and so on) are available to support non-agricultural economic and other activities.

70. The rate of urbanization accelerated during the 1980s, partly as a result of the upgrading of *thanas*. The *thana* (for a time called *upazila*) was made an important establishment in the local government system, and *thana* upgrading included transferring to them government personnel from most of the line ministries. Although the system was changed in 1992, *thana* physical infrastructure was substantially developed by this time.

71. The employed urban population is mainly composed of government employees, professionals, industrial workers, workers in the service sector, and traders. Urban-rural economic and cultural links are still very strong. A considerable proportion of urban dwellers have homestead and cultivable land in rural areas. It is common for men to stay in the towns for employment while wives and children stay in the village, which has contributed to the higher male/female ratio in towns.

Key Settlements

72. While settlements are spread quite uniformly throughout the region, the most densely populated areas are municipalities; all are legally constituted urban centres. Presently, the region has 14 municipalities out of 95 in the whole country. Among these are eight district headquarters and six *thana* headquarters where 6% of the total municipal population of the country reside. They account

for 4% of the region's population. Among the municipal towns in the region, two have populations of more than 100,000, whereas five have populations below 25,000. The eight largest municipalities with their populations are presented in Table 9.

Table 9
Populations of Largest Municipalities

Municipality	Population 1991
Sylhet	114,284
Narsingdi	100,120
Narayanganj	95,778
Bhairab Bazar	75,747
Kishorganj	64,676
Sherpur	63,030
Netrokona	46,203
Habiganj	42,898

Migration Patterns

73. Migration reflects the state of employment and social mobility of an area. In the past, some districts of the region, particularly Sylhet and Sunamganj, were gaining population by net in-migration. However, since 1974, most of the region, except Dhaka region, has lost population to net out-migration.

74. Nationally, among the different types of migration, urban-to-urban accounts for the highest proportion. This is followed by rural-to-rural and rural-to-urban. While the urban-to-urban migration rate is highest for the male population, the opposite is true for females, for whom rural-to-rural and rural-to-urban migration are higher. Migration rates have been increasing.

2. DRIVING FORCES

75. This chapter outlines major driving forces that are apt to significantly affect development in the Northeast Region of Bangladesh over the next two decades. International, national, and regional forces have been identified based on the source of the force in question. However, in many cases, the same forces are occurring at different scales (for example, population pressure or communication system changes). To improve readability, data sources and footnotes are not given; detailed backup documentation is available in the FAP 6 office.

International Forces

76. *Globalization* World trade barriers are likely to fall through the next decades; this may take the form of three trading blocks (centered in eastern Asia, western Europe and North America) with barriers separating them or overall liberalization of international commerce (through GATT mechanisms). This driving force represents an opportunity for Bangladesh in that other countries will be spinning off opportunities as they develop into areas of new comparative advantage; in addition, populous markets should become more accessible. However, products will have to be competitive in price, delivered in a timely fashion, and be of consistent quality among other things if suppliers are to survive in the emerging highly competitive globalized economy.

77. This force is likely to have a differential impact on the region, affecting urban areas and the Dhaka-Sylhet corridor most because it is in these areas that non-agricultural activity is most likely to emerge. Indirect impacts on the region could also surface from this force. For example, demand for market garden products in Dhaka, through increased prosperity generated by taking advantage of global forces, could result in high value agriculture such as fruit, vegetables, and poultry becoming important in those parts of the region closest to Dhaka.

78. *SAARC* It is likely that SAARC will continue to give more priority to issues with a goal to reduce tariff barriers between South Asian nations.

79. This development would have a mixed impact on the region. On one hand, it might reduce the price of consumer goods; on the other hand, it could create more competition for producers of agricultural produce and processed goods in the region.

80. *Climate Change* Climate change over long periods, a century or more, may be an important driving force affecting the region's development. Current models of anthropogenic climate change are not yet accurate enough to provide useful information relevant to the planning time frame being utilized by FAP 6 (For example, current models do not agree on whether or how much the monsoon circulation will intensify.) However, regional data suggest that rainfall has been increasing for the past 30 years; it is not clear whether this increase is part of a long-term cycle, or a transition to a new climatic regime. Hydrological changes add urgency to the need to mitigate impacts associated with excessive rainfall.

81. *Deforestation and Development in Upstream Areas* Although there is considerable debate on the impacts of upstream deforestation on the region (some argue significant soil erosion in the Himalayas has historically occurred for geophysical reasons and that deforestation is a minor factor in siltation), continued deforestation of the Meghalaya and Tripura hills is likely to result in more extremes in river flows making water sector planning and management more difficult, probably less effective than would otherwise be the case, and almost certainly more expensive.

82. Large scale development projects in upstream areas which affect water flows can also impact significantly on the region. An important example is the proposed dam at Tipaimukh, India.

83. *Biotechnology* Enormous strides are being made in biotechnology; such research and development is occurring primarily in the developed countries. Since primary agricultural activity still accounts for over one third of Bangladesh's economy (as measured by gdp), biotechnological advances will very much affect Bangladesh. This force could be positive for Bangladesh, application of biotechnology is more research than capital intensive.

84. *Remittances* Remittances from temporary labour and permanent residents abroad is an important source of capital for Bangladesh. (An estimated 500,000 people, mostly men, work outside the country.) Opportunities for temporary labour abroad may stagnate for reasons such as geographic changes in fossil fuel production patterns, increased competition from other labour supply sources, or more restrictive immigration policies. On the other hand, emerging labour shortages in ASEAN may compensate for stagnation in the demand for

labour in the Middle East. (For example, 67,000 Bangladesh citizens currently work in Malaysia.)

85. This driving force is of particular significance because the region has historically been, and continues to be, an important source for overseas labour with associated remittance benefits flowing back to the region.

86. *Changing Export Mixes* Bangladesh has been affected by decreased demand (and/or prices) for key traditional exports, in particular, jute and tea. (The price of tea [.84 US per pound] is virtually the same as five years ago [.83 US per pound] while the current price of jute [\$260 US per ton] is considerably less than the price five years ago [\$370 US per ton].) Jute is increasingly being replaced by synthetics while taste preferences in tea are changing.

87. Although these trends could be perceived as threats, Bangladesh is showing considerable promise in restructuring its export base to items such as garments, leather goods, and frozen seafood products; potential exists in terms of electronics, electrical goods, extruded plastic goods, toys, and shoes, among others, to further diversify the export mix.

88. Since the region is the major tea producing area in Bangladesh, it will be affected by decreases in tea demand or prices; however, the region is much less sensitive to falling prices for jute because the major jute producing areas in Bangladesh are outside the region. As noted earlier, export mix shifts to manufactured goods will affect subregions differentially.

89. *Communications* The growth of Asian-wide satellite TV services is removing national barriers to information flows. (Five channel Star TV, broadcast throughout Asia, is doubling its audience every few months. Currently 45 million people in Asia receive Star - four times those accessible in June, 1992.) During the planning period, virtually all households (all classes) in urban areas of Bangladesh will have access to cable networks which will relay programs from these satellite stations. In most of Asia, videos have permeated virtually all rural areas as a source of information and entertainment.

90. These international communication forces will increasingly affect Bangladesh in rural areas as well as urban ones; the impact will be (is being) felt first in urban areas such as Dhaka.

91. *Development Assistance* Development assistance to Bangladesh is very important, particularly in terms of Bangladesh's development budget (in the 1980s, the development budget was virtually entirely funded by foreign assistance, now approximately 75 to 80% of the development budget is funded by development assistance). Development assistance pledged to Bangladesh totals US \$2.15 billion in 1993; although this is down from last year's US \$2.5 billion; it is an indication that Bangladesh still has the confidence of donors, given current stiff competition for aid. (The 1993 development assistance allocation is US \$120 million more than the Government of Bangladesh had requested.)

92. The Bangladesh Aid Group (formed in 1974) has given some temporal consistency to development funding, donor assistance is subject to the vagaries of developmental fashions. Although it is impossible to predict future developmental assistance priorities of the international community, any changes that do occur will have a significant impact on Bangladesh.

93. Since the region benefits from international development assistance flows along with the remainder of the country, changes in levels of developmental assistance or priorities associated with aid flows will affect the region.

94. *Asian Region Geopolitical and Economic Change* China is likely to have one of the fastest growing economies in the world during the planning period. The growth of a large middle class in China will have enormous implications on world consumption and production. From the point of view of Bangladesh, this force may be perceived as a threat in that China will be producing many of the same goods ("low end" manufacturing) as Bangladesh, such as garments, leather goods, and high volume mass produced consumer items (toys, extruded plastic items, electronics, electrical goods). However, the fact that Bangladesh has traditionally had good ties with China may mean that Bangladesh can become vertically linked to some production opportunities in China.

95. Although South Asia is unlikely to grow economically as quickly as China and South-East Asia, there is evidence that the two largest nations of South Asia, India and Pakistan will grow more quickly economically than they have in the past because of structural changes in these countries which are

making them more attractive to private enterprise. If this growth is coupled with lowered tariff (and non tariff) barriers within SAARC, a large middle class market could open up for Bangladesh goods (and possibly services in certain niche areas) in neighboring populous South Asian countries.

96. As was the case for globalization, communications, and other driving forces discussed above, the emergence of Asian regional powers is more likely to affect those areas in the North East Region where local economies are less agricultural in nature.

National Forces

97. *Population Growth* Population growth is a key driving force affecting Bangladesh's development. Depending on source, population growth in Bangladesh is estimated at an annualized rate of 2.1 or more. The current population is approximately 117 million up from 71 million measured in the first post independence census in 1974. (The population could reach 235 million by 2025.) Because virtually no new land is available for cultivation, and 10 million of 18.5 million families are already landless (although approximately 20% of families are now urban), population growth has enormous implications for the types of developmental policies that should (must) be pursued.

98. *Urbanization* Bangladesh is still largely rural (about 80% of the population); however, in absolute terms Bangladesh already has a large urban population — approximately 27 million people. Urbanization is occurring at a very rapid rate — approximately 6% per year. This rate is unlikely to be less than 4.8% by 2000 and less than 3.6% by 2015. By 2015, it is estimated that the urban population will be approximately 65 to 70 million.

99. Bangladesh is at an early stage in the rural - urban migration cycle. The Dhaka mega urban region may have added three million people since 1990. If so, it experienced one of the fast rates of growth (if not the fastest) of all global mega cities during the 1990 to 1993 period. It would appear that Bangladesh is now entering the period of most rapid urbanization that it will experience in its history. Although data on intermediate and small cities is much less available and reliable, these smaller centers are also probably currently entering (or about to enter) their fastest periods of growth.

100. *Non-Agricultural Employment/Economic Restructuring* Bangladesh's non-agricultural economy is restructuring rapidly; as noted earlier, this is reflected in its rapidly changing mix of exports. This restructuring is occurring primarily in the formal sector; however, the informal sector continues to be very important in terms of production and employment.

101. In the formal sector, the trends toward garment manufacture (employing perhaps 500,000 people and still growing quickly), leather goods production, and frozen seafood preparation have been well documented. However, potential exists in other manufacturing areas as noted earlier. Ironically, some potential industries, for example shoes, are being lost to competitors such as Vietnam and Sri Lanka because of purported lower real wage rates in competitor countries. (Bangladesh wage rates are high relative to the country's overall economic situation.) Local service industries such as finance, have considerable potential for growth.

102. The informal small business sector continues to grow. This includes small manufacturing shops, repair shops, rickshaw drivers (employing 500,000 to 800,000), small boat operators (employing 2,000,000), and small retailers, among others.

103. The informal sector accounts for two-thirds of the employment in manufacturing and one-half of the output of the sector. Real earnings in the informal sector are, on average, much higher than in agriculture and frequently compare favorably with formal sector non-agricultural employment.

104. Given the non-agricultural sector's (i) promising track record in terms of employment creation, (ii) potential for production and employment growth (through diversification and growth in existing activity areas), and (iii) relatively high wage levels (or informal earnings); this sector represents an enormously powerful driving force in Bangladesh. Although non-agricultural employment is still in early stages of development in the North East Region, the potential for large scale increases in such activity are considerable.

105. *Human Resource Development* Human resource development is a key driving force reshaping Bangladesh. Approximately 35% of the population is literate; however, the literacy rate for men is approximately double (although the ratio is narrowing through time) that for women. (Given the fact that females

dominate employment in the formal industrial sector, this driving force is related closely to restructuring issues discussed above.) Education receives a fair share of fiscal year routine or operating budgets (approximately 17-20%) but a small share of development budgets (less than 5%).

106. Enormous strides were made in child immunization during the 1980s which have lowered child and infant mortality and sickness substantially. Real, but lesser, progress was made in terms of delivering health care to adults. The government's goal of universal health care access by 2000 may be achievable then, or in the early years of the next century.

107. The improvement of health and education levels in Bangladesh represents a key driving force. If human resource development continues to improve, additional developmental opportunities will open up and restructuring of the socio-economic system will be more rapid.

108. The region generally has lower levels of human resource development (particularly in terms of literacy and education) and well-being than for the country as a whole. However, through time, it is expected that the gap between human resource development levels in the region and Bangladesh as a whole will narrow. If this occurs, there will be significant developmental implications for the region associated with this change.

109. *Environment* Many of the environmental driving forces affecting Bangladesh are global, multilateral, or bilateral in nature and were identified above. However, other environmental forces are driven by national forces with impacts in terms of erosion, soil quality, and changes in biodiversity.

110. Because Bangladesh is still highly dependent on its rural areas for support of most of the population, any deterioration in environmental quality can undermine the ability of the land to support the very large populations dependent on it.

111. Deforestation is virtually complete in Bangladesh (6% of the country is forested) with associated diminution of fauna. Wetlands pose a complex developmental challenge in terms of balancing food needs with biodiversity objectives; and soil erosion is a problem in some areas as a result of agricultural pressures.

112. As elsewhere in much of the world, concern with environmental issues is becoming a higher priority in Bangladesh as is indicated by Bangladesh signing international environmental agreements such as the Ramsar Convention, by the increasing numbers of environmental NGOs operating in Bangladesh, and by the acceptance of donor country environmental reports and guidelines. As rapid urbanization occurs over the next two decades, urban environmental issues will become increasingly important and the object of much greater attention.

113. *Privatization* Contrary to some stereotypes, Bangladesh has a small public economy which is becoming smaller in relative terms through measures such as privatization and loosening of controls. For example, over 60% of industrial assets are in private hands, almost the entire agricultural sector (which accounts for over one-third of gdp) is in private ownership, and the civil service is relatively small. (Although the Bangladesh Aid Group argues that 20,000 public sector jobs should be cut in this fiscal year [to June 30, 1993] and a further 25,000 in the next fiscal year.) This situation and trend is a key driving force behind restructuring of Bangladesh's socio-economic system.

114. This driving force is being slowed by a very significant lack of private capital, both from national and international sources. (At the micro, informal sector level, the Grameen Bank, developed by Dr. Muhammad Yunus has attracted positive attention by addressing this need.) The lack of capital is one of the strongest forces working against more rapid restructuring in Bangladesh. (Private investment is currently 5 - 6% of gdp; the Bangladesh Aid Group argues it should be 9 - 10% of gdp to finance the feasible developmental opportunities that exist.)

115. Lack of capital could be a significant constraint to development in the North East as regions remote from the primate city tend to have more difficulty raising capital. On the other hand, there is considerable private capital in the Sylhet Region which could possibly be mobilized for developmental purposes.

116. *Land Availability* Landlessness is a major characteristic of modern Bangladesh. Even if agricultural productivity increases substantially (which will probably be the case), it is unlikely that substantially more people will obtain land because of constraints related to ownership and inheritance. Thus a key driving force in Bangladesh is the fact that the land will probably not absorb many more people in terms of significant positive marginal economic returns to

labour and certainly in terms of land ownership. This situation (the end of absorption of population through new rural land owners) has extremely important ramifications for Bangladesh development policy.

117. *Revenue Collection* A key driving force, probably negative, in Bangladesh is the very low levels of public revenue collection. Bangladesh collects only about 10% of gdp annually in public revenues (primarily from customs duties and sales taxes rather than income taxes). This is less than half the norm for developing countries and less than one third the norm for developed countries. This lack of public revenue collection constrains strategic actions that could be taken by the government in terms of developing key infrastructure in support of private enterprise, supporting key sectors, or delivering accelerated human resource development programs.

118. If Bangladesh were to collect more public revenue, a secondary issue would be the extent to which such incremental revenues would flow to remote regions, such as the Northeast Region.

119. *Telecommunications* As noted above, international communications forces are reshaping Asia. Internally in Bangladesh, similar forces are at work. For example, although there is still only one telephone per 465 people; this is up dramatically from 1988 when the ratio was one telephone per 1,000 people. Similar dramatic growth rates are being exhibited in terms of ownership of televisions, radios, and video machines. As telephones increasingly become available in smaller centers, making fax connections possible, rural industrial opportunities will increase significantly (Mobile telephones are currently being introduced in Bangladesh).

120. This is a key driving force affecting Bangladesh; rural -urban distinctions (in terms of information, behavior, values, and attitudes) are breaking down, the population is becoming better informed, and modernization dynamics from telecommunications processes are supportive of economic restructuring.

121. *National Political Changes* The change to a democratically elected government in 1990 has opened up public discourse and policy in a variety of areas, among them are water resources development, economic policy, and environmental management. This situation affords an opportunity to re-examine

entrenched policies and attitudes toward development. The democratic government is more supportive of public participation.

Regional (Internal) Driving Forces

122. *Pressure on Rural Land* This is the most significant driving force affecting the region. Natural population increase in the region is greater than for Bangladesh as a whole (although net rates are mitigated by higher mortality and out-migration). The mean farm size in the region is already approximately .6 hectares and farms are becoming smaller through inheritance and other processes; with the technology presently available, at approximately .4 hectares (depending on soil fertility, application of technology, and other factors), the ability of farms to support a household (let alone create an exportable surplus) becomes problematic.

123. Functional landlessness in the region amongst the rural population already exceeds 50% and will increase rapidly because of the lack of new land to develop agriculturally, the small size of existing farms, existing land ownership patterns, and rapid population growth.

124. With existing technology, agricultural productivity can be increased to levels three times higher than is currently the case in the region. (That is, yields similar to those achieved in Asian countries practicing extremely intensive agriculture such as Japan could be achieved.) However, it does not follow that three or four times as many people would or could be absorbed on the land because of human factors noted above, such as ownership patterns, or the desire of landholders to translate higher yields into higher household incomes (rather than the support of more people).

125. *Pressure on Fragile Regional Eco-Systems* As land becomes scarcer, farming is being carried out on fragile ecosystems. Of particular concern are:

- (a) *Wetlands* Wetland areas are increasingly being encroached upon and drained to support agricultural activities. In addition to serious environmental concerns about such encroachment, farming in these areas exposes farmers to considerable risk in terms of probability of harvest.

- (b) *Alluvial fans* (desalting areas). These areas in the north of the region are increasingly being farmed. This agricultural activity disturbs the silt deposits, resulting in increased silt deposition to the south. As is the case for wetlands, farming in these areas exposes farmers to considerable risk in terms of probability of harvest.

126. *Urbanization and Migration* Previously it was noted that Bangladesh is probably just entering its period of fastest urbanization. The region is lagging behind much of the remainder of the country in this regard; partly for cultural reasons (Regional residents have preferred rural life) and partly because of relatively poor accessibility to urban areas (which is improving, see below). However, given the rapidly growing rural population in the northeast, increased landlessness, and population pressure on fragile ecosystems, it is likely that urban centers in the region will experience rapid urbanization and that there will be increased migration from the region to major urban areas such as Dhaka.

127. At present, cyclical migration does occur, particular from central wetland (haor) areas to urban centers such as Sylhet. Some migrants have settled in northeast urban centers on a permanent basis, but they usual retain ties (frequently through land ownership) to their rural homestead or community.

128. Given the enormous pressures on rural land, urbanization in the region can represent a positive force, particularly if well managed. Inevitably, a much higher percentage of the gross regional domestic product (grdp) will be accounted for by urban areas. An emerging urban settlement system exists upon which to build; Sylhet has a population in excess of 200,000; Narsingdi over 100,000, while seven urban centers have populations between 25,000 and 100,000; several smaller centers exist. Since all urban centers in the region are still relatively small; they can be shaped to improve future human well-being, environmental prudency, and economic effectiveness.

129. *Improvements to Transportation and Accessibility* Accessibility in the region is improving significantly. The most important factor contributing to this change is the mechanization of country boats. To a more limited extent, improvements to road networks are also a contributing factor in improving accessibility. Based on ongoing, committed and planned road programs and projects, road network improvements are more likely to reflect initiatives in

rehabilitation and maintenance rather than network extension.

130. Improved access facilitates rural-urban physical linkages which contribute to: (i) marketing of agricultural produce (to the extent that surpluses exist); (ii) migration — cyclical and permanent; (iii) better access to private and public services such as health facilities, banks, government offices, located in District and thana centers; and (iv) possible links between local resource user groups and urban-based environmental and community development groups. Improved physical linkages between rural areas and larger settlements increases access of outsiders to local rural resources while at the same time improving the economic bargaining positions of rural residents. That is, improved access can result in beneficial development or outside exploitation of rural areas depending upon other factors at work.

131. If not planned carefully, highways can alter drainage patterns, impede navigation, and create other negative environmental or economic impacts. Similarly, efforts to improve navigation such as straightening of rivers can cause unexpected hydrological impacts with negative environmental and/or agricultural consequences.

132. *Improvements to Communication and Electrical Systems* The number of telephone lines is increasing rapidly (see Interpretive Description of the Region); plans have been approved to approximately double the capacity of the regional telephone system (measured in terms of lines). This development creates potential for rural small scale industry and facilitates communication linkages between rural and urban areas.

133. Improved access to information by local farmers strengthens (through better communications) their knowledge of market prices, and techniques, and improves service response time for public and private sector services such as health and agricultural inputs. However, at the same time, local rural elites may differentially benefit from increased information available through improved communication linkages.

134. Improved communications represents an important factor contributing to monetization of the rural economy; communications systems are the basis of market information.

135. Rural electrification is occurring in the region; however, in terms of present service and immediate plans, it is highly geographically skewed to major corridors. Associated with rural electrification is a rapid spread in televisions although non-electrified villages often have televisions operated with car batteries. Radios are ubiquitous while video machines will almost certainly become important over the planning period. This information and entertainment infrastructure will contribute to modernization, monetization, and associated changes in values, attitudes, and behavior.

136. *Emergence of the Dhaka-Sylhet Corridor* The Sylhet urban centered area is relatively prosperous. Given rail, air, road, and infrastructural linkages between Dhaka and Sylhet, plus other factors such as the linkages between Sylhet and Europe (U.K.), natural gas reserves in the east of the region, commercial agriculture in the east of the region (plantation crops to the north and market gardens to the south), and existing (plus planned) industrialization, the corridor is likely to increase substantially in prosperity. Industrialization, urbanization, and prosperity in the region is likely to be driven increasingly by this dynamic corridor anchored in the north by Sylhet which will increasingly act as a regional growth center.

137. *Regional Economic Diversification* The economy of the Region is becoming more diversified, particularly in urban centers and in the Sylhet-Dhaka corridor. The region is lagging slightly behind the nation in this regard but will soon restructure more rapidly in terms of rural off-farm activity, urban manufacturing and service activity (formal and non formal). Already (1989-90), 62% of the grdp is accounted for by non-agricultural activities; manufacturing (6%), construction (6%), trade (8%), transportation (8%). This restructuring process will be driven by both push factors such as lack of access to land; and pull factors such as demand for non-agricultural products from the region, for example, natural gas.

138. *Continued Dependence on Local Resources for Biomass* For most of the Region's residents, local resources (surface and aquatic) are the only source of biomass for fuel and building material; and to a lesser extent, soil nutrients (fertilizer/ compost), medicines, and fodder. In particular, growing rural populations (including the landless who increasingly engage in wetland gathering [gleaning] as a means of livelihood when denied access to land) are placing increased demand on wetland resources. As pressure on local resources

increases, over-exploitation is likely to lead to a downward cumulative cycle in terms of production and sustainability unless (i) better management of natural resources occurs, and (ii) population pressures on the land are reduced through development of non-primary agricultural income opportunities.

139. Given the fast population growth outlined above, sustainable development will be virtually impossible without major changes in developmental trends. Pressure on local surface and aquatic environments will be relieved somewhat through increased rural electrification and increased local household use of the abundant natural gas reserves (which can be converted to LPG) in the region.

140. *International Demand for Wetland Products* Although less significant in terms of environmental degradation, wetlands in the region, as they become more accessible, may become subject to increased international demand for species specific products they yield.

141. *Adoption of New Agricultural Technologies and Approaches* The rate of adoption of high yielding variety (hyv) technology packages (seeds, irrigation, fertilizer, pesticides) varies throughout the region. The fastest rate of adoption is in the west of the region where extension of irrigated areas is driven by ground water availability and is occurring rapidly.

142. Although there can be negative impacts of hyv adoption, such as water pollution and encroachment of wetland areas, given the high population growth in the region, with associated food needs; hyv adoption, if managed well, represents a positive force.

143. Currently, rice yields in the region are increasing at only about 2% a year, slightly less than population growth. Since rice prices are unlikely to increase substantially, and most rice is consumed locally at any rate, there is a need to diversify agriculture in the region for food consumption/nutritional, and economic reasons.

144. *Adoption of Other Rural Technologies* In addition to mechanization of boats, introduction and diffusion of communications equipment and technologies, and hyv adoption as discussed above, other technologies are driving change in the life of the North East Region.

145. Examples of other technologies playing an increasingly important role in the region are: (i) diesel pumps which are being used for drainage (sometimes with negative consequences) and to power irrigation systems, (ii) improved fishing implements, and (iii) increased use of ice plants (to store fish). (Innovative uses of the technology are being developed. For example, the same diesel engine might be used part of the year to power a boat and part of the year for irrigation.) These, and other emerging rural technologies, have potential for negative impacts, but if managed correctly can contribute to improved livelihood in the region.

146. *Traditional Cultural Emphasis on Rice and Rice Cultivation* Farm management decisions, reflected in the economy of the region, are influenced by factors other than economic return. In Bangladesh society, there is an extremely strong preference for rice. Rice connotes pleasure and plenty; rice cultivators have considerably higher status than those cultivating (or gathering/gleaning or fishing) other crops.

147. Creating areas suitable for rice cultivation sometimes leads to draining of marginal areas or management practices which inadvertently create secondary impacts such as the silting up of wetlands. Although much of the North East Region is ideally suited for rice cultivation, sometimes rice is planted when other crops would probably yield higher nutritional and/or economic returns, and/or be less environmentally damaging.

148. *GOB Ownership of Wetland Areas* (Wetland areas (originally defined as permanent water bodies) were identified through various surveys prior to 1956.) Tenure over these wetlands and other government owned lands is vested in the Ministry of Land (MOL) which has a revenue collection mandate. MOL generally leases out its holdings — be they fisheries, quarries, grazing lands, or swamp forests.

149. The major beneficiaries of the current leasing system are the money lenders and lessees who derive high profits from land leases; those paid to collect the tax; and specific government agencies holding accounts to which the tax is credited. The system is not totally in conformity with the national development strategy because:

- (a) The system of rent and taxes stimulates resource depletion rather than sustainable development,
- (b) Rents and taxes on wetlands transfer wealth from rural areas to the center, and from poor resource gatherers to members of the elite, and
- (c) The land system subsidizes concentration of control over natural resources.

150. *Risk* Because of the high risk of flooding and widespread poverty in most of the region, households are, not surprisingly, risk averse. This affects behavior, particularly in the agricultural sector, to a considerable extent. To the extent that natural hazard risks (particularly those associated with flooding) can be lowered, it is likely that more innovative approaches to agricultural and other activities will emerge.

151. Certain risks exist in the Region, such as earthquakes, about which little can be done; however, these risks generally do not affect human behavior to any significant extent.

152. *Social Change* The economic role of women in the household and the community is becoming more valued in the region. In part, this trend is a product of necessity; the labour of men and women is required to earn a living in an increasingly densely populated environment.

153. Also, as noted above, modern communications technologies are contributing to social changes in the region.

154. The population of the region, as for Bangladesh as a whole, is very young. Although the dominance of the less than 14 years population cohort has recently decreased somewhat, in 1981, 46% of the population of the region was under 14 years of age. Since young people are more amenable to change, it is likely that the youth will be influential in driving change in the region. Given, the age structure, the employment needs to absorb this population over the next two decades will be enormous, labour force growth in the range of 10% or more annually will be needed as the peak of this group enters the regional labour market.

155. *Local Initiatives and Decentralization of Power* Historically, local people have requested government assistance for local projects. For example, many BWDB initiatives and plans reflect locally generated project ideas or actions started locally. Of late, with the return to democratic government, there is increased involvement of local people in the identification of local needs in terms of intervention by bodies such as the BWDB.

156. *Changes in Agricultural Subsidies and Prices* Recently, subsidies to agricultural production have been reduced. It is not yet clear whether this is a long-term change. If so, it will be a major force driving the type of agriculture practised in the region and consequently will affect the location and types of water initiatives that are most effective.

157. The price of rice is falling and this could be a long term trend. If it is a long term trend, it would constitute a significant driving force in the region and would affect what constitutes an effective water management plan for the region.

158. *Tectonic Processes* The northern part of the region is subject to subsidence as a result of collision between the northward moving Indian Plate and the stationary Eurasian Plate. However, at the same time, the northern part of the region is subject to considerable sedimentation. To some degree, these two powerful forces seem to be counterbalancing each other.

Conclusions

159. Because of strong driving forces acting in and upon the region, it appears that the region will change significantly in economic, social, demographic, and environmental terms between now and the year 2015. Thus, to develop a water sector plan based on the present characteristics of the region or the region that has existed from 1971 to the present, is unlikely to yield an effective plan. The challenge is to develop a futures view of the region and then devise a water management plan that will support and promote development over the next 22 years rather than one (through “rear view mirror” planning) that reflects the past.

160. The strongest forces, which interactively are bringing about this change are those related to: (i) relatively rapid population growth, (ii) the end of

potential for significant increased numbers of land owners in rural areas (and productive deployment of large numbers of additional labour in agriculture), (iii) urbanization (which is just entering its strongest growth period), and (iv) industrialization and economic restructuring away from land based activities. Improved and increasingly geographically diffuse communication systems are likely to strengthen the aforementioned driving forces.

161. At the regional scale, both strong traditional forces (such as emphasis on rice), and modern technological (such as communication systems), forces are at work. Change forces, as is always the case, will be stronger in some areas than others; for example, it appears communications changes and water transportation technology will lead spatial restructuring in the North East Region relative to roads and perhaps rural electrification.

162. The strongest driving force in the region is population growth relative to land availability. It is almost inevitable that this process will force restructuring in the region's economy and geographic distribution of population. Water management and planning will need to support and protect areas of high value in terms of new income generating activity (in agriculture and non-agricultural activities) if it is to be effective in supporting developmental objectives for the region.

163. Resources for water management initiatives should be distributed on the basis of future developmental objectives rather than solely on the basis of hydrological analysis or present economic activities and population distribution. In addition to protecting rural areas where most of the population of the region currently lives, urban areas and integrative systems, such as communication, electricity, and transportation, need also to be protected because these latter areas and systems represent the core physical skeleton for change in the region. In rural areas, water management needs to reflect changes in agricultural patterns and activities being brought about by driving forces. Lastly, but very important, water management related strategies need to protect the environmental quality of the rural landscape which is so essential in supporting and improving human livelihood in the region.

3. POTENTIAL INITIATIVES

164. The Northeast Regional Project is in the process of preparing pre-feasibility studies for about forty development initiatives. The initiatives, which originated largely from concerns expressed at public meetings^{1/} held within the region are described briefly below.

Non-Structural Initiatives

Examples:

- (a) *Environmental Management, Research, and Education Center.* Establishment of a regional institution to address regional needs for improved environmental management, research, and education, with an emphasis on wetland systems.
- (b) *Environmental Quality Monitoring and Water Quality Monitoring.* Project/programme to address regional needs to monitor and improve environmental quality, in particular water quality.
- (c) *Fish Sanctuaries.* Strategy to enhance survival of over-wintering fish broodstock.
- (d) *Fisheries-Related FCDI Engineering.* Strategy to reduce fisheries habitat disruption from embankments.
- (e) *Lowland Forestry.* Programme to improve management existing swamp forest stands and to afforest additional sites.

^{1/} During the past year, public forums have been held at each of Sylhet, Sunamganj, Moulvibazar, Habiganj, Netrokona, Kishoreganj, Sherpur, and Narsingdi. Participants included Members of Parliament, Thana and Union Officials, Civil Servants, and the general public. Average attendance at the meetings exceeded 100 registered participants.

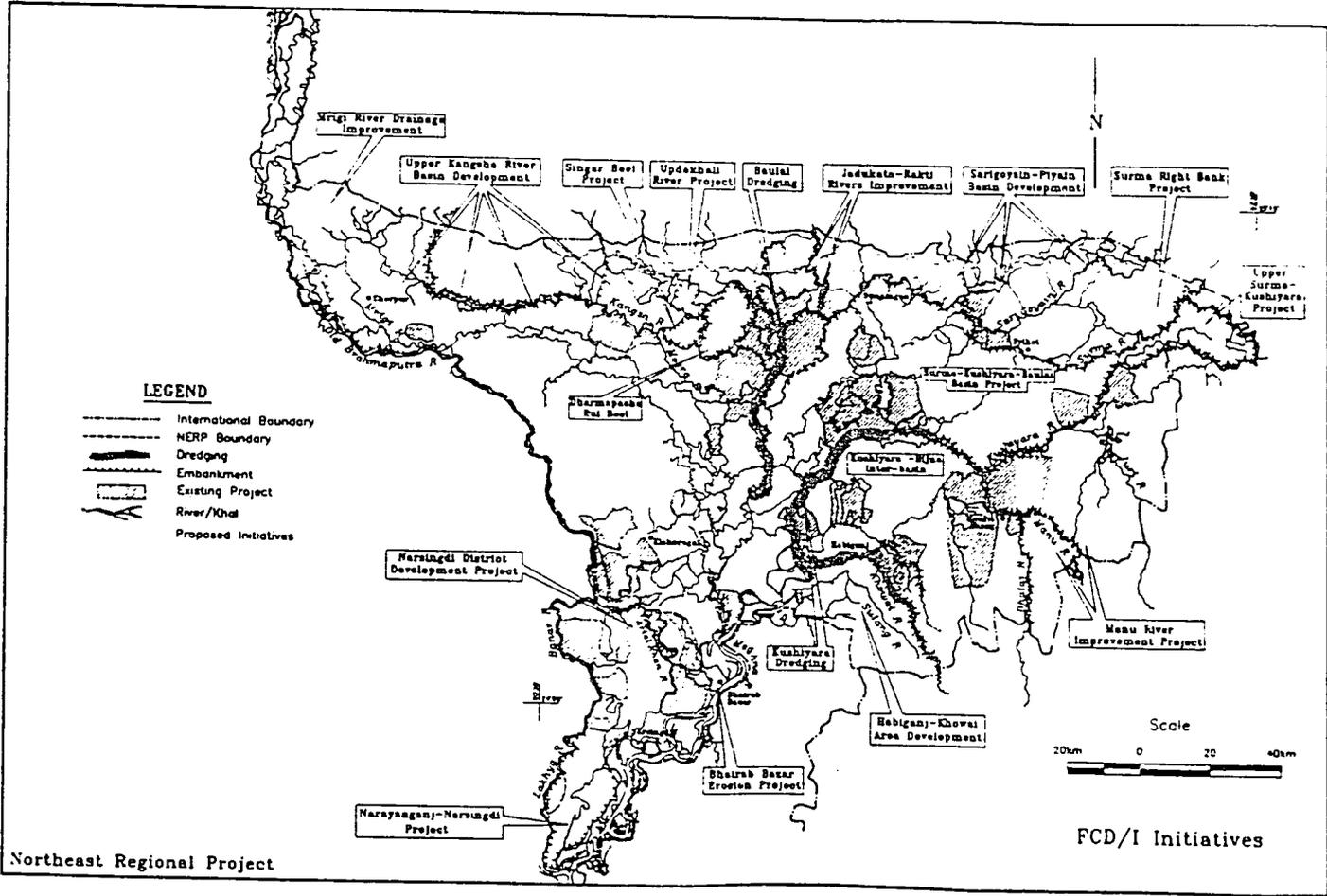
- (f) *Flood Proofing.* Programme to enhance local capabilities to cope with flooding.
- (g) *Public Participation in Water Resources Infrastructure Planning, Implementation, and O&M.* Strategy to make investments more responsive to public needs and thereby improve performance.
- (h) *Operation and Maintenance of Regional Water Resources Infrastructure.* Strategy to improve O&M, consistent with findings of public participation studies.

Structural Initiatives

165. The locations of many of the structural initiatives are shown in Figure 2. These initiatives fall in the following categories:

- (a) *Partial Flood Control.* Submersible embankment projects to protect nearly-mature *boro* rice from early flash floods.
- (b) *Full Flood Control/Controlled Flooding.* High embankments to protect monsoon crops by excluding or controlling monsoon flooding.
- (c) *Drainage Improvement.* Canal (re)excavation to allow earlier planting, lessen crop damage, and in some cases enhance fisheries, by accelerating drainage, expanding drained area, and permitting flushing.
- (d) *Area Water Resources Development.* Combinations of the above types of infrastructure as appropriate to address an area's problems.
- (e) *Other Water Resources Infrastructure.* This category includes.

Figure 2



- (f) Channel Stabilization and Sediment Management on Alluvial Fans. Manage the immediate and high risk of channel shifting on the Someswari, Jadukata, and Dhalai/Piyain River fans, by providing river training works and sediment storage areas as appropriate, and by monitoring for impending channel changes.
- (g) Lower Kushiyara River Rehabilitation. Address the possibility of aggravated pre-monsoon flooding, impeded navigation, and negative impacts on Ajmiriganj and Markuli towns, if the lower Kushiyara abandons its present course due to rapid sedimentation that has occurred over the last 20 years. Actions to stabilize the channel might include river training and dredging.
- (h) Amalshid Permanent River Training Works. Reduce Kushiyara basin flooding and facilitate Surma navigation, by diverting water from the Kushiyara to the Surma with a sheetpile wall.
- (i) Dams/Reservoirs on Selected Reservoirs for Sand Entrapment. On rivers that spill sand onto cultivated lands, investigate the possibility of building sabo dams behind which sand would accumulate.

Initiatives and the Regional Plan

166. Each proposed initiatives, once prepared to a pre-feasibility level, will be evaluated in terms of its relevance to the goals and objectives established by the Regional Plan.

**Technical Session on
Northeast Regional Water Management Project
FAP 6**

Mr. Stan Hirst, ISPAN

Question: How can Wetland Conservation and Maintenance of Biological Diversity be ensured if ownership and control are given to Private Land Owners?

Answer: Design of local natural resource management systems will be difficult. Central government control is not the answer but neither are the opposite extremes of unhampered communal access or private ownership by a few. A system involving local users cooperating to undertake wise resource management is needed. Pure sustainable development in the Region is probably an unrealistic and imprudent objective; however, progress can be made toward sustainability. We recommend increased electrification and LPG consumption to take the pressure off local biomass resources. Progress toward sustainability in rural areas will require better local natural resource management and process such as urbanization to remove some of the pressure from rural land being generated by the relatively fast pace of population growth in the Region. It is our position that local user groups need to be developed to manage critical environments, such as wetland areas, in the interests of the community as a whole and the biosystem in question. Such user groups could operate in areas where land is privately owned; however, the distribution of land would be important. A case where 90% of land is held by two or three families is much different than a case where land ownership is more equitably distributed. The latter situation is more amenable to local user group involvement in local natural resource management.

S. Waliullah, FPCO

Question: Driving Forces What, if any, are the impacts of foreign remittances and the growth of Asian wide satellite T.V services on the life and culture of the area?

Answer: This is an interesting question in that we should have stressed in our paper and presentation that driving forces are often interactive, creating synergistic effects. Your question illustrates such a point. FAP 6 social analysts expect that satellite T.V. will first become widespread in parts of the Region where foreign remittances and incidence of returned migrants are highest. Two factors are at work: (i) foreign

remittances provide the money to purchase the equipment (or it may be brought back as part of personal effects), and (ii) returning migrants from abroad are more likely to be interested in accessing global news and entertainment media. Once entrenched in urban areas, such communication media, and others such as videos, are likely to spread to rural areas, including rural areas in the North East Region.

Mr. M. A. Salam, Chief Engineer, BWDB

Question: Many projects have been completed in the region by BWDB before the NE Regional Study. Will you make definite observations about these projects in your final report?

Answer: Planning for future water resource management in the region must take account of existing projects. As an initial step, the FAP 6 team reviewed each of the 66 existing projects in the region in terms of status and impact. The results of this review were published in June of 1992 under the title "*Water Resources Thematic Study*". The understanding of the performance of past investments resulting from this review plays an important part in formulating an approach for the future.

Question: Seminars were held in Mymensingh, Netrokona, Sherpur, Kishoreganj, Sylhet, Habiganj, Narsingdi, Moulvibazar, Sunamganj, after completion of all studies are you fixing priority projects in each district, according to where meetings were held?

Answer: The general outputs of the various seminars are being incorporated into a water management strategy and specific proposals from these seminars will be considered as part of the initiatives (projects) being analyzed to a pre-feasibility level. The outputs of the pre-feasibility studies allows a multi-criteria based ranking of the various projects though the decisions as to which projects should be considered priority in each sub-region (District) is a political one and should be made by GOB.

Mr. Promode Mankin, Member of Parliament, Mymensingh-I

Question: As there are good number of hill-rivers coming from Garo Hills, Meghalaya, namely Kangsha-Bhugoi, Nitai, Somswari, causing great damage to houses and crops, every year, what specific programme is there under FAP-6, to mitigate flood, river siltation and

reservoir in dry season.

Answer: These streams will be difficult to control due to the large sediment inflows and high discharge intensities during flash floods. Some rivers such as the Someswari have developed highly unstable alluvial fans. Adequate provision must be made to account for sediment deposition on these streams. FAP 6 is investigating several options such as set-back dykes, non-structural zoning measures, and channel maintenance options.

Mr. Mohammed Mozzammel Hoque

Bangladesh University of Engineering and Technology

Question: The activities proposed in the region may cause significant river bank shifting due to erosion and deposition causing sufferings to the people. How, you are incorporating the possible measures of this river bank shifting as there is no appropriate mathematical model is available currently and may not be developed during your project time for morphological study?

Answer: The question refers to lateral changes on rivers as opposed to vertical changes (aggradation or degradation). FAP 6 has compiled information on rates of morphological adjustment induced by past developments using historic maps, cross-section data, satellite imagery, and air photographs. These data can be used to provide information on the magnitude and time scales of future changes that may be induced from other projects. There is also a considerable amount of information about the nature of morphologic change that can be inferred from the channel morphology.

Mr. T. Herman, World Bank

Question: The comprehensive and integrated analysis approach taken is exemplary. Why are the other regional studies not following a similar approach? In comparison, they look like a narrow project identification exercises which are not based on an understanding of regional potentials and constraints. Shouldn't the TOR and budgets for the other studies call for a similar comprehensive approach?

Answer: Our TOR and budget were agreed to by GOB and CIDA after an initial assessment of the issues in the Northeast Region.

Begum Matia Chowdhury, Member of Parliament, Sherpur - 2

Question: There is no reference about Sherpur District which is under FAP 6. Has any definite program on Sherpur District or any study on physical features, water resources, economy, infrastructures, power, communication, etc. What projects have been taken up particularly for Nalitabari and Nakhla thana what actions have been taken to protect the people of Nalitabari from the Hilly river Bhogai.

Answer: FAP 6 is considering the following options in Sherpur District:

- Rehabilitating 35 km of the Old Brahmaputra River left bank embankment from Nij Khamarer Char to Gograkandi on a priority basis;
- Closing Katakhal khal at the Jamalpur-Bakshiganj Road cross-point;
- Re-excavating Mrigi River from Boysha Beel to its outfall to Old Brahmaputra River;
- Retaining the opening between Chandrakona and Digrir Char in Nakhla Thana since a closure with necessary drainage regulator would not provide any improvement;
- Strengthening the existing embankments along Chillakhali and Bhogai Rivers with adequate setback;
- Straightening the Kangsha River from below Nalitabari to Jaria; and,
- Diverting Kangsha flood flow to Mogra and/or Saiduli Rivers.

In addition, FAP 6 is co-ordinating with FAP 25 to assess the impact of construction of Old Brahmaputra River right bank embankment on the left bank area. FAP 6 is also exploring possibilities for fisheries development in Nakhla and Nalitabari Thana's. There are more than ten ox-bow shape beels in these thana's which retain water to depths ranging from 2 to 3 meters in dry season. The production

level of these beels is 10% of similar beels in Jessore which have been developed for fisheries. With some development work (such as establishment of nursery and weed eradication), it is possible to develop culture based fisheries in those beels and increase production significantly.

Mr. Mesbahuddin Ahmed, Chief Engineer, BWDB

Question: Would you please given an outline of your plan for flood mitigation, drainage improvement and water management in different parts of the Northeast region and particularly in the south western part covered by the Lakhya River and Meghna River in the district of Narsingdi.

Answer: This question is in essence asking for the regional plan. The Northeast Regional Plan will be completed in September of 1993. Since it is as yet incomplete, it would be premature to attempt to answer this question.

Mr. Ahmed Ali, CPP-FAP 20

Question: The area is already devoted to Tea, Rubber, Agro-forestry/Hill forestry; and it is also assumed that these have further potentiality and driving forces to develop them to high standards. What are your possible interventions to up-grade them? and did you study the socio-economics and environmental impacts of them?

Answer: Information on the uplands (which include the tea, rubber, and agro-forestry) has been compiled and studied at a level which is considered relevant to preparing a regional water management plan. This information is summarized in the regional description. It is well outside of the mandate of FAP 6 to prepare a program of interventions which would focus exclusively on upgrading these special crops.

Mr. Saeed A. Rana, World Bank

Question: Since the Northeast region has very significant linkage with the other two regions viz the North Central and the Northeast in terms of the resources for development have there been exchanges of ideas with on-going studies in those regions.

Answer: To date, the main exchanges of information have been on the hydraulic parameters governing interactions at region boundaries. Specifically, we are examining the impact on the left bank of the Old

Brahmaputra (within the Northeast Region) of a flood embankment proposed by the North Central Regional Study on the right bank of the Old Brahmaputra in conjunction with FAP 25. Yet to be examined are economic interactions between the northeast and adjacent regions. Since the regional studies of the adjacent regions are complete, this work is being undertaken on a unilateral basis by FAP 6.

Mr. Tauhidul Anwar Khan, Joint Commission
JRC, Bangladesh

Question: How do you envisage to tackle the problem of erosion in the Bangladesh reach by the Piyain River caused by construction of a huge groyne by India at Dawki? What measures would you suggest to halt the process of continued erosion of the Bangladeshi Bank of the Kushiya River due to structural measures undertaken by India on the other Bank which in turn is also gradually pushing the international boundary line well inside the Bangladesh territory.

Answer: Controlling erosion from these types of developments requires a political decision from the Bangladesh government on the necessity of installing river training works to protect its boundary. There may be insufficient economic benefit from protecting agricultural land with major river training works. However, it should be technically feasible to control erosion on the Kushiya River by constructing stone revetments if proper allowance is made to control scour and if regular maintenance is carried out.

Question: In the context of Bangladesh realities whom would you accord priority - the poor people or the migratory birds from Siberia or elsewhere?

Answer: People have first priority though it should also be noted that (i) environmental protection and food production are not mutually exclusive and (ii) taking account of environmental parameters does not "stop" development but rather ensures the longer term sustainability of investments.

Mr. T. Herman, World Bank

Question: Is dam construction on transboundary rivers (e.g. the Barak) in India expected to reduce or exacerbate flooding? Would it reduce dry season flows?

Answer: Based on the information presently available, it is expected that the proposed dam at Tipaimukh (on the Barak River) is expected to reduce flood season discharges in the Surma and Kushiya systems. Also as a result of the Tipaimukh dam, it is expected that dry season discharges into Bangladesh would increase — how much these discharges increase will depend on how much of the additional dry season flow (released from the reservoir above Tipaimukh) is diverted from the Barak for irrigation in the Cachar Plains (upstream of the Bangladesh border with India).

Mr. Tomas Petermann, FAP 20

Question:

Ref: Community based management for wetland sites for multiple uses (fisheries, bird sanctuaries, Stands of threatened plant species etc).

- (1) What are your experiences in planning and implementation?
- (2) How you will address conflicting interests?
- (3) How you address institutional (inter-departmental) co-operation?

Answer: Locally based natural resource management systems have a long history in many parts of Asia, particularly in densely populated areas where conflicts must be avoided or addressed, for example, the Subak system in Bali, Indonesia or community-based fisheries management which is extensively practiced in Japan. Of late, modern local nature resource management systems are being designed and implemented in many Asian countries, often incorporating contemporary management tools such as personal computers, data bases, and satellite imagery. International organisations, such as IUCN are assessing such systems on a comparative basis and suggesting improvements. The FAP 6 professional staff are trying to access as much information as possible about existing systems that may be of relevance to the region. Some examples of community-based management of fisheries still exist within the region and these will be carefully studied. The structures they contain can be of use in setting up the broad architecture of a fisheries community-based management system tailored to the particular socio-economic and environmental conditions in the region. Formation of local user groups does not, of course, eliminate conflicts over natural resources. However, existence

of such groups would provide a forum for such conflicts to be negotiated. Compromises could be worked out whereby different groups (such as fishermen, gleaners, farmers) could benefit differentially at different times of year or compensation schemes (for example; so much rice to local fishermen in return for leaving the embankment intact for x amount of time) could be negotiated. A possibility would be to develop formal inter-departmental (and inter-disciplinary) natural resource planning groups at the water basin level. Within each basin, several community based local users groups would operate. Integrated natural resource planning is difficult to achieve because of the usual constraints, inter-departmental jealousies, etc.; however, there are success stories in various parts of Asia.

Mr. M. F. A. Siddiqui

Mars & Associates Consulting Engineers

Question: Your statement at page 8 last para on particular sex domination and laws of inheritance, marriage and divorce is unwarranted, uncalled for and objectionable as well. Certainly the consultants are not entitled to adversely comment on codified laws. Apparently the comments are stemmed from incomplete information. I personally am protected from family laws introduced under marital laws in this country.

Answer: The referenced text is not considered to be (nor intended to be) an adverse comment on Bangladesh society but rather a simple and neutral statement of fact.

Question: The statement that submersible embankments are not always sufficiently submerged to allow boats to pass seems to need further elaboration. Certainly at certain periods of rising and receding floods these embankments interfere with obstacle free navigation as they are not movable. You cannot expect all the benefits at one go. One has to sacrifice some in exchange of others. Reduction of navigability of the Surma above Chattak is visible from October through May. It does not need any second hand report. Causes of reduction stated are correct.

Answer: There are numerous examples of submersible embankments obstructing navigation. The one which has been best documented by FAP 6 is that of the Shanir haor in which, out of 17 public cuts, 14

were made solely for navigation purposes. While it is agreed that not all the benefits can be obtained “at one go” it is also apparent that investments require a broader evaluation of impacts than has been past practice.

Dr. A. L. Sarker, POE/FPCO

Question: Potential Initiatives On this topic, you have an initiative of Full Flood Control as well as controlled flooding. If you go for full flood control, how do you think you can mitigate the fisheries loss? Could you please throw some highlight on this?

Answer: To reduce the negative fisheries impact of controlled flooding, FAP 6 is examining engineering measures to facilitate the passage of fish through embankments or other structures. These bypass structures will, to some extent, continue to allow fish migration between flood plains and rivers. Clearly, it will not be possible to mitigate all losses incurred by interventions which obstruct the natural fish movement between the rivers and the floodplains. An appropriate approach then is to limit, as far as possible, projects of this type and on those which are being considered, ensure that the financial implications of the loss to fisheries are well reflected in the analysis.

Engineer Md. Aminur Rahman, Consulting Engineer

Question: Many projects funded by the Donors and planned, designed and implementation monitored by alien consultants have gone bitterly sour. Now, if any project implemented under the caravan of FAP goes wrong, who is going to compensate the people of the project area for the losses they have to sustain? The Donors or the consultants? Can you deny the inalienable right of the people of the project area to go to the court of law demanding proper and adequate compensation for their losses?

Answer: Experienced Bangladeshi professionals from a broad range of disciplines form the core of the FAP 6 team and are leading in the planning process. In addition, through public hearings, people within the region have also been consulted as to the kind of interventions they consider necessary. The Northeast Regional Water Management Plan will be founded on the understanding of these two groups of people (Bangladeshi professionals and public representatives). It is expected that the analysis at feasibility — carried out in accordance with FPCO

guidelines which include environmental, social and economic criteria — will ensure that projects are only implemented when there is agreement with the people who are affected by any intervention. In this context, donors and the expatriate consultants they engage, are positioned to provide assistance to national efforts in developing and implementing projects. FAP 6 examined existing water resource development projects in the region. Among the 67 projects which have been constructed, there are no projects that could be classified as having gone “bitterly sour”. There are many projects which were designed as single purpose agricultural projects in an environment where fisheries and navigation are also economically important sectors and these were modified by the public through means such as embankment cuts; some of these and other projects were designed on the basis of inaccurate or insufficient hydrometric or other information and accordingly did not achieve full expectations; some projects were dysfunctional because they exceeded their design life span. On balance, however, every project served some positive purpose for some period of time. It would be a beneficial step to introduce further accountability to the project development process with the aim of ensuring that public investments in such projects are more efficiently utilized.

Dr. Bruce Currey, Independent Scholar

Question: Although I note that Rowmari thana is incongruously in the Northeast Region, could you amplify upon your apparent suggestion that Himalayan deforestation is a “driving force” in the Northeast Region?

Answer: We were incorrect in referring to Himalayan deforestation; we meant deforestation in the Indian hills upstream of the Region, in particular, the Meghalaya hills. Deforestation in these hills contribute to extremes in river flows.

Mr. Mike Smith, FAP 17

Question: Have we any approximation of the relative production value from agricultural production compared to fisheries for the region?

Answer: Available information shows that agriculture contributes 31% of the gross regional product (at current prices) while fisheries contributes 2%.

Mr. S. R. Khan, FAP 21/22

Question: Many rivers of the area are silting up. These may lead to future drainage congestion, hydro-morphological, environmental ecological un-stability. Are you thinking of re-excavating these rivers? My question is specifically about local minor rivers.

Answer: In the planning process, consideration is being given to re-excavating rivers at strategic locations where substantial drainage benefits can be identified.

Dr. G. T. Keith Pitman, ISPAN

Question: How are you proposing to address the problem of hydrologic interaction with the NC and SE regions? — particularly as both these regional studies are completed before you finalize your recommended plan.

Answer: FAP 6 has obtained the assistance of FAP 25 in running the General hydrodynamic model to analyze the changes to the Old Brahmaputra flood regime which occur as a result of a proposal by FAP 3 (NC) to embank the right bank of the Old Brahmaputra River. These changes will affect planning on the left bank of the river. Changes to the hydraulic regime of the Meghna River resulting from FAP 6 activities should ideally be analyzed by FAP 4 (SE) in the context of interventions which they are considering. It is expected that this work will be addressed by FPCO while consolidating the regional studies in its next phase.

Mr. S. A. Hussain, Asian Wetland Bureau, Malaysia

Question: NERP (FAP 6) is to be highly commended for the due attentions given to study and project natural wetland ecosystems of the area. The idea of demarcating certain areas as fish sanctuary is good. But, how will it be ensured that actions taken by other Agencies operating in the area such as Fisheries Project; Agricultural Dept. etc. do not nullify the protection measures? Is there any effort to involve these other Agencies in implementing these measures?

Answer: As suggested in the question, ecosystems such as wetlands are not well managed by a sectoral authority, such as a water authority or wildlife authority. Rather, an integrated approach which involves inter-departmental co-operation is likely to yield more effective results. As noted in an answer to a previous question, the water basin may be

an appropriate geographic scale for such an approach. It is possible that we will be suggesting such an approach in our integrated water strategy for the North East Region.

Dr. A.M. Choudhury, SPARRSO

Question: Presentation on FAP 6 unfortunately is not as comprehensive as was the case say of FAP 2 or FAP 3. What proportion of fund are being spent on FAP 6? These was no discussion on the adequacy of existing flood control structures in this region. Could you comment on the functioning on Manu and Khowai Projects? Have they met their objectives?

Answer: The FAP 6 study has not yet been completed and as such the presentation may not have reflected the "comprehensiveness" of the other referenced FAP studies which were complete. An analysis of all existing flood control, drainage, and irrigation projects in the region was carried out and the results were published in a document entitled Regional Water Resources Development Status. The Manu River Irrigation Project appears to be having a positive impact on cereal production. Boro production has not increased as predicted but HYV aus production has increased though the capital and operation and maintenance costs of the project have been high. The project has reduced the area of permanent water bodies and interferes with the migration and thus the production of fish. As a result, fish catch has declined significantly. Reportedly, employment in fishing has declined by about 20% and the wages of fishermen have declined by about 30%. The Khowai River system has never been fully completed. Nevertheless, the embankments along the Khowai River have provided flood protection to the adjacent areas. However, a combination of river aggradation and increase flows resulting mainly from river confinement has resulted in higher than expected flood levels. This has also led to increased erosion of the embankments with the result that the flood hazard has not been eliminated. The project has had a positive impact on agricultural production and has had no impact on navigation. The project's impact on Khowai River fisheries appears to be minimal and its impact on flood plain fisheries is not discernible.

Mr. M. R. Chowdhury, BETS

Question: There is an added component in FAP Regional Studies to

provide for year round water management and irrigation. Is there any provision for that in FAP 6? Is there any thinking to utilize the vast water resources of upper Meghna for irrigation and water management in FAP 6 areas?

Answer: Efforts are being made to find alternatives which would increase irrigation in the region. One difficulty with attempting to exploit the "vast resources" of the upper Meghna is that following cessation of the monsoons, farmers are anxious to drain the land so that crops can be planted. The water is drained out of the region via the Meghna (since storage on the flood plains interferes with crop cultivation) and several months later, when the water is required for irrigation, it is no longer available. Nevertheless, some expansion of irrigated agriculture should be possible.

Mr. S. Waliullah, FPCO

Question: Driving Forces What could be the impact of development assistance in the region?

Answer: Ultimately, development in the Region will depend on local initiative. However, there are some key areas of potential leverage that development assistance could target:

- (1) Human Resource Development — health and education indicators are much worse for the North East Region than for the nation as a whole. It will be difficult for the Region to restructure and develop unless human resource development occurs at a much faster pace in the Region.
- (2) Accessibility and Communications — The topography of the Region (for example, numerous rivers, wetlands) makes access even more difficult than in most other areas of Bangladesh. This situation makes water transportation and communication systems (as a compensating mechanism) very important.
- (3) Natural Resource Management and Planning — This would include water and land resources which need to be better managed. Implementation would be based on structural and non-structural initiatives and would place heavy emphasis on institutional development.

Development assistance could position the Region to restructure to improve living conditions, create productive income earning opportunities outside primary agriculture, and improve productivity in areas such as agriculture.

Mr. Shamsur Rahman, Engineering and Planning Consultants Ltd.

Question: One of the study objectives was to identify priority projects. The report states that a total of 66 major surface water resource projects have been constructed or are nearing completion. Have you been able to identify new priority projects. If yes can you please name those projects.

Answer: Some 35 projects have been identified which include non-structural as well as structural initiatives. The structural initiatives consist of partial flood control projects, controlled flooding projects, drainage improvements, and area water resource developments. These are all being studied to a pre-feasibility level. They will be ranked in terms of priority (from a technical, social, and environmental perspective) when the studies on all are complete or near completion. The overall priority (which also takes account of political considerations) will clearly need to be fixed by GOB.

Mr. J. U. Chowdhury, BUET

Question: It has been stated by FPCO that the scope of FAP should be widened to contribute to further elaboration of the National Water Plan (NWP). The paper does not refer to the NWP. Are you not taking the NWP into consideration in the preparation of the NE regional water management plan?

Answer: FAP 6 is building on the information base established by the National Water Plan.

Mr. A. K. Aatur Rahman, Department of Fisheries

Question: Fish migration routes have been disrupted due to submersible dykes. What are the measure recommended by FAP 6 for establishing migration routes?

Answer: FAP 6 is proposing multipurpose water management to enhance fish production in the deeply flooded areas. This will mean that, at the outset, FCD/I projects will need to have a fisheries component which identify requirements to sustain (or, at the very least,

reduce damage to) fisheries and that budgets are provided explicitly for this purpose. Management and mitigation measures which can be considered include: haor zoning to ensure certain areas are reserved for fisheries; beel bunding to retain water for a longer fish production season; embanking beels in a manner which provides open access to rivers; and fish bypass technologies. Bypass technologies have historically included; relying on the existing hydraulic structures to give passage to migrating fish (the results are unsatisfactory); relying on public cuts to give passage to migrating fish (this system works better but leads to conflict between fishermen and farmers); installation of purpose-built structures designed explicitly for fish migration (these are successfully used elsewhere but have not been extensively tested in the northeast region); and, modifying the design of existing hydraulic structures so that they become more efficient in giving passage to migrating fish.

Question: If water could be retained in the beels for a longer time better growth and higher production of fish could be ensured? How this could be achieved?

Answer: The beel bunding scheme suggested above with appropriate hydraulic structures would achieve the required retention.

Mr. A. A. Ansari, BWDB

Question: To what extent is fishery affected in partially flood protected area?

Answer: The results of detailed studies by FAP 6 on projects such as Shanir haor indicate that fish production may have declined by as much as 50% as a result of the submersible embankments.

Mr. Gazi Nurul Alam, Fisheries Expert, FAP 20

Question: Sedimentation of Beels in the region is a problem for valuable fisheries resources - please could you suggest what are the possible mitigation measures to get rid of this problem in order to save this wealth.

Answer: Embankments can alter localized sediment deposition patterns and these can be used to preserve some of the beels. It should be noted, however, that an estimated 7 million tones of sediment are deposited within the region annually and that the long term effects of

this will be gradual infilling of the basins.

Question: Overfishing and fish disease is also great problem for fisheries. But what is the role of Fisheries Department to this effect your comment please. Thank you.

Answer: The fisheries department has not been accorded sufficient responsibility to allow them to take all the actions necessary for fisheries development. The ownership of various aspects of fisheries are divided between Ministry of Lands, BWDB, and Department of Roads and Highways. For example, Fish Ulcerative Disease, which has had a devastating impact on fisheries, appears to be most endemic where water is stagnant. Since DOF does not control the water bodies, they have no mechanism with which to address this problem.

Question: Cultivation of HYV or paddy in vicinity of important fish habitats is continuing. Which careful measures you propose to implement to preserve the fish habitat?

Answer: The question of environmental management of pesticides must be and is being dealt with at a the national level. These efforts have focused on an Integrated Pest Management approach, which aims to keep crop losses to pests at an acceptable level while minimizing environmental toxicity impacts. Regular exchange of information and field data between IPM, fisheries, and water quality experts would be useful in focusing IPM efforts on areas and chemicals of greatest importance to fisheries.

Mr. Darrel Deppert, FPCO/POE

Question: How would you suggest that the areas you have identified for fish sanctuaries be developed and maintained as such. What kind of programs/policies will you be suggesting to ensure that local power structures would not violate the sanctuaries integrity.

Answer: Maintenance of fish sanctuaries will require that sound management practices are established and enforced and that physical structures are put in place as obstacles to fishing in these areas. Management practices would need to be built around community based management having some external support and these would be expected, over time, to supplant existing local power structures. There are examples of this type of community based fisheries management in

the region.

Dr. S. Waliullah, FPCO

Question: The Human Resources: Could you indicate the reason for low population density in the region in the face of increasing density elsewhere in the country.

Answer: Relatively low population densities are found in the central area of the North East Region. This has historically been the case because this sub-region has presented difficulties to potential settlers in terms of (i) access and (ii) risk in terms of crop harvesting. However, with contemporary land pressures in Bangladesh, the central geographic areas of the Region are becoming more densely populated. Aside from the central portion of the North East Region, the remainder of the North East Region is characterized by rural population densities close to norms for Bangladesh as a whole.

Dr. A. L. Sarker, POE/FPCO

Question: You have stated that fish catch and fish Bio-diversity have been declining and [you] also referred [to] pollution industrial and domestic. Pollution is an international problem for Fisheries. Have you included pollution in your study and, if so, how you think you can combat pollution?

Answer: Pollution is indeed a problem for the region's fisheries. I refer you to the reply to Ahmed Ali's question for a discussion of pesticide pollution. Currently, the major industrial pollution problems for the region's fisheries are from the Sylhet Pulp and Paper Mill (SPPM) at Chhatak and the Fenchuganj fertilizer factory. These are described in the NERP Fisheries Specialist Study, and in the NERP Water Quality Study. Of urgent concern is that the pulp mill is discharging significant amounts of mercury into the river, along with other harmful pollutants. NERP is completing a pre-feasibility study of an improved water treatment system for SPPM. The Fenchuganj factory, which was constructed in 1961, has already exceeded its projected lifespan by about 10 years and is reportedly scheduled to be closed. If it is not closed, it should be modernized including provision of adequate water treatment facilities. The responsibility for pollution control rests with the Department of Environment. DOE's activities have included source inventories and monitoring. The agency has

limited trained staff and facilities, and very limited real power. Enforcement, as indicated by the examples above, is not effective. There is a need to expand and strengthen DOE internally, but in addition, opportunities to bring the private sector into partnership need to be investigated, to cover the areas of clean technology incentives and expertise, monitoring, enforcement, and clean up. The Bangladesh Chemical Society, for example, which maintains a keen interest in industrial chemistry, chemical technology, and environmental chemistry could be a focus for clean technology transfer etc. NERP will be proposing a regional environmental management, research, and education project under which a regional Environment Center would be set up as an NGO. The Center would undertake water quality baseline and monitoring studies on behalf of (possibly contracted by) DOE. Over the Plan period (to 2015), industrial pollution is likely to increase many times over, given that the industrial sector of the economy is projected to grow at quite high rates. The number of pollution sources, the type of sources, the number of pollutant substances, and the average size of sources are all likely to increase. The need for institutional strengthening within government and in the private sector can only intensify.

Mr. Nazrul Islam, Department of Fisheries

Question: In the Northeast Region the floodplain fisheries--Haors, Beels and wet lands are being converted into paddy fields, which is one of the major factors for declining capture fisheries in the area. Haors, Beels and Wetlands should be developed for fisheries but not for crop/paddy.

Answer: The haors, beels, and wetlands can serve multiple purposes in the interests of increasing food availability in the region. One of the outputs of the Northeast Regional Plan will be to define ways in which these areas can be developed for multipurpose use.

Mr. Khalilur Rahman Chowdhury, Member of Parliament

Question: Is there any program to visit all the thanas? If so, when?

Answer: Throughout the course of the study, considerable effort has been invested in obtaining primary field information. Members of the FAP 6 team will have visited all Thanas by the time the Regional Plan is complete.

Mr. Khalilur Rahman Chowdhury, Member of Parliament

Question: Within greater Sylhet, you did not show the Habiganj District isolatedly. Nothing was mentioned in the report about Habiganj. I want to know from you, is there any concrete plan was made for Habiganj? Khowai River and the FCDI embankment from Sherpur to Markuli is the main sad implementation by the government. Is there any plan initiated by the Government to dredge out the Madna River or embankment of the bank of Khowai River.

Answer: Investigations are being carried out to assess measures for increasing the security of the existing Khowai embankment to reduce the risk from breaching and overtopping. Two approaches are being considered. The first approach involves upgrading the Khowai embankments, by providing setbacks, eliminating constrictions, and raising low areas. A second approach being considered is splitting flood flows near Ballah and diverting water to either the Sutang or Karangi Rivers. Investigations are also being made to assess the feasibility of extending embankments further downstream from Habiganj. However, impacts of further sedimentation need to be assessed.

Mr. Khalilur Rahman, Joint River Commission, Bangladesh

Question: Whether you have considered the likely impacts that would be caused after the implementation of the Barak Dam project at Tipaimukh and Barrage at Fulerthal in India. There is apprehension that very little water would be available during the dry season in the Kushiara and Surma rivers in Bangladesh which would not be adequate to meet the Agriculture needs alone.

Answer: Based on the information presently available, it is expected that the proposed dam at Tipaimukh (on the Barak River) is expected to reduce flood season discharges in the Surma and Kushiara systems. Also as a result of the Tipaimukh dam, it is expected that dry season discharges into Bangladesh would increase — the extent to which discharges increase will depend on how much of the water released from the reservoir above Tipaimukh is diverted from the Barak for irrigation in the Cachar Plains (upstream of the Bangladesh border with India).

Mr. Ahmed Ali, CPP-FAP 20

Question: Do you have any programme of “Institutionalizing Approach” to the project for long term sustainability; if so, how you are sub-dividing the project area to “Priority Areas” and what kind of approach you are thinking for institution setting in each priority areas’ preferably with peoples’ participation.

Answer: Institutional development recommendations will be an important component of the NERP integrated water strategy. Institutional development recommendations will cover the gamut from village level participation in local natural resource management to functions of national level agencies such as BWDB. A priority in institutional development work will be to suggest institutional models (structure and process) for local natural resource management (with water as a key natural resource). This will be particularly important in certain eco systems, such as wetland areas. It is likely that we will designate priority areas (generic and specific) for such consideration. NERP may recommend pilot projects to develop local natural resource management systems. Priority geographic areas are likely to be designated on the basis of criteria such as, criticality, threats (often irreversible), or potential. Design of local natural resource management systems will be difficult. Central government control is not the answer but neither are the opposite extremes of unhampered communal access or private ownership by a few. A system involving local users cooperating to undertake wise resource management is needed. Pure sustainable development in the Region is probably an unrealistic and imprudent objective; however, progress can be made toward sustainability. We recommend increased electrification and LPG consumption to take the pressure off local biomass resources. Progress toward sustainability in rural areas will require better local natural resource management and process such as urbanization to remove some of the pressure from rural land being generated by the relatively fast pace of population growth in the Region. It should also be noted that the mandate of FAP 20 includes a study of the institutional aspects of water management out of which recommendations would be expected by other FAP studies.

Engr. Md. Aminur Rahman, Consulting Engineer

Question: The utopian “Controlled Flooding” does not exist anywhere

on this planet - Is Bangladesh going to be the ground for experimentation and charlatanism?

Answer: BWDE has constructed numerous water regulating structures throughout Bangladesh over the past three decades. These are being used to control and regulate entry of flood water to the advantage of crop production — they do not eliminate flooding. The term “controlled flooding” is being used within the Flood Action Plan to indicate that instead of eliminating floods, flood water would be allowed to pass in a controlled manner.

Mr. Ahmed Ali, CPP-FAP 20

Question: You are in a sense recommending for intensifying the cropping in the area, and recommending for HYV cultivation, which would invite for use of more pesticides. You are also proposing for development of fisheries. Did you study the effect of pesticides on fisheries, and what is your plan to handle this problem?

Answer: As you mention in your question, many of the infrastructure projects under study would create conditions favorable to increasing the area under HYVs, and to higher input levels, including pest management, and, all other things being equal, this would drive increases in total regional pesticide use. Currently, pesticide use in the region is less than the national average: 1989-90 statistics show of 11% of national pesticides total were distributed to the region, while the region's rice area is 19% of the national total. Nonetheless, damage to openwater fisheries from pesticide pollution seems already to be occurring. Simple physical reasoning suggests that the most contaminated fisheries habitat, and thus the one where fisheries impacts of pesticides are likely to be observed first, is smaller beels that receive runoff from pesticide-treated areas and have restricted flushing due to embankments, closures, or other factors. One symptom of higher contamination levels is higher prevalence of fish diseases. The NERFP fisheries team found definite correlations between the habitat characteristics describe above and the prevalence of fish ulcerative disease, with productivity losses estimated as high as 80%. This is highly suggestive that pesticide pollution is already at levels inimical to fisheries in some water bodies. To follow up on these findings, the Regional Plan will likely recommend undertaking ongoing baseline studies and monitoring of both water quality and fish flesh

contamination. Fundamentally, however, the question of environmental management of pesticides must be and is being deal with at the national level. These efforts have focused on an Integrated Pest Management approach, which aims to keep crop losses to pests to an acceptable level while minimizing environmental toxicity impacts. Regular exchange of information and field data between IPM, fisheries, and water quality experts would be useful in focusing IPM efforts on areas and chemicals of greatest importance to fisheries.

Mr. Azizul Haque, Chief Agronomist, WARPO (Former MPO)

Question: You have stated that the western side of the region has maximum ground water potential (38-68% for Irrigation) but even there are reports of over exploitation of ground water. It is also true that major surface water sources (rivers) passes nearby the region. Why surface water is not used? What is the recommendation of FAP 6 Team to use extensive surface water since exploitation of ground water has many adverse affects.

Answer: Utilization of surface water will be planned for and used wherever possible.

Question: Mr. Mujib, as a professional, you have disappointed us by concentrating your deliberations mostly on infrastructure, transmission line etc. etc. We wanted to hear about agriculture

Answer: The session was intended to describe regional planning requirements — not simply agriculture development.

Mr. Stan Hirst, ISPAN

Question: What is the trend in soil fertility in the region, and how is this affected by the extensive levels of sediment inflow and deposition?

Answer: In much of the region, with current land use, soil fertility is being maintained. The areas of concern are the alluvial fans where coarse material is conveyed into Bangladesh and deposited on good agricultural land rendering it unfit for any purpose.

SPECIAL SESSION ON FISHERIES

May 18, 1993

(19:00 - 21:00 Hrs.)

Chair: Mr. A. K. Aatur Rahman
Director, Fisheries Directorate

Topic: Study Results on FAP 17
by Dr. Mike Smith

FAP 5 by Dr. Patricia C. Almada-Villela
and Mr. Alan Bird

FAP 6 by S. Nandi and Nirmal Ch. Paul

FAP 16 by Mr. Steven Minkin

Moderator: Dr. Darrel Deppert, POE, Fisheries

Deliberation: Mr. A. K. Aatur Rahman

* Formal papers for FAP 5 and FAP 16 have
not been provided by the Authors

216A

FISHERIES DESIGN STUDY & PILOT PROJECT (FAP 17)

FISHERIES ISSUES : NATIONAL STATISTICS

FRSS and the FAP

1. The FRSS consists of a series of surveys conducted each year for the Department of Fisheries (DOF). The surveys are designed to estimate the total annual catch of the various sectors which make up the total fishery of Bangladesh. Separate surveys are conducted for:

- (a) Inland Fisheries
 - i. Rivers and Estuaries
 - ii. Sundarban
 - iii. Beels
 - iv. Kaptai Lake
 - v. Floodland commercial fishing
 - vi. Floodland subsistence fishing

- (b) Culture Fisheries
 - i. Ponds
 - ii. Baors
 - iii. Shrimp farms

- (c) Marine
 - i. Industrial fisheries
 - ii. Artisanal fisheries

2. These data are the primary source of fish catch statistics in Bangladesh and have been used extensively by FAP as a means of measuring the potential impact of Flood Control Drainage/Irrigation (FCD/I) schemes on fisheries production. Some of the reports which refer to FRSS include:

FAP 2	North West Regional Study Interim Report
FAP 3	North Central Regional Study Interim Report
FAP 3.1	Jamalpur Priority Project Interim Feasibility Report
FAP 4	Southwest Regional Study Interim Report
FAP 5	South East Region Water Resources Development Programme, Interim Report
FAP 6	Draft Thematic Study Fisheries in the North East Region of Bangladesh
FAP 12	FCD/I Agricultural Study RRAs
FAP 16	Environmental Study, Nutritional consequences of biodiversity of fisheries, pilot study
FAP 17	Inception Report
FAP 20	Inception Report plus Annexes.

3. The investigation of the FRSS data and related methodologies has been carried out by FAP 17 with the full support of DOF and has been able to utilise their considerable knowledge and experience of the inland fisheries. Only the floodland commercial, floodland subsistence and riverine data sets were studied in detail although some reference has been made to both pond and beel data. These data sets were chosen because together they contributed approximately 80% of total published inland capture fishery.

4. Both survey data and survey methodologies have shortcomings. These include lack of data control, small sample sizes and old sampling frames. **FAP 17 can take no responsibility for these shortfalls.** However, recommendations

have been made for future improvements. What must be accepted is that, even after the completion of the FAP 17 programme, the principal source of catch statistics will continue to be the FRSS despite those limitations.

5. The original field documents were used to provide raw data for the exercise. The documents were coded to replace descriptive information about species, gears and fishing sites. Data entry programs were written using Dbase IV for each questionnaire to store the basic types of data. Approximately 95,000 records were entered into the computer during this exercise. Unfortunately some data sets were incomplete which has limited the accuracy of the final results. The data was then screened and validated using popular statistical programs (Lotus 123, Minitab, Genstat and SPSS) to identify flawed data. Programs were written to extrapolate the corrected sample data to estimate national production.

6. Low sample sizes prevented reliable estimates of regional and district totals from being calculated. Supplementary data was collected from the Bureau of Statistics, the Directorate of Marketing, Institute of Nutrition, Bangladesh Institute of Development Studies.

Results

7. Commercial Floodplain Catch.

- (a) Although this data set has been collected since the start of the FRSS in 1983/4 it has never been included as part of the published figures. Indeed the 1983/4 Fish Catch Statistics of Bangladesh states on page 20 that the
- (b) The commercial floodplain sector represents almost 45% of total production according to 1990/91 figures.
- (c) Up to the time that the FRSS system was introduced, estimates of production were based on consumption survey data extrapolated by a count of the population. In 1972 the Inland Fishery was estimated to produce 729,00 tones per annum based mainly on the Nutritional Surveys of Bangladesh for 1962/4 which estimated approximately 30 gm intake per capita per day. This was revised sharply downwards in 1975 against

estimates of around 20 gm, with a resulting apparent dip in production to 545,000 tones. In 1983/4, with the introduction of FRSS, the reported catch statistics were apparently in line with that calculated from the per capita consumption rate of the 1975 Nutritional Survey despite the exclusion of Commercial Floodplain catch. It is likely that the nutritional intake of 1975 was a significant underestimate since more recent values from Bangladesh Bureau of Statistics and Bangladesh Institute of Development Studies put the value between 29gm and 35 gm per capita per day which is in line with the 1962-64 values.

- (d) With this hindsight it is clear that production prior to 1983/4 was significantly higher than the published values and that inclusion of Commercial Floodplain catch was actually necessary to account for this shortfall. However, at the time it was felt sensible to check the validity of this data set further before publication. Unfortunately lack of resources in DOF prevented this follow up action from taking place.
- (e) The revised total catch has been compared with recent consumption data. If some allowance is made for spoilage then, for the first time, data sets from totally different sources provide a consistent picture.
- (f) There may be some overlap between the beel survey and both commercial and subsistence floodplain surveys. However, the total recorded beel catch is significant in comparison with the size of the commercial catch and any overlap makes little difference to the total. The riverine survey only covers the larger rivers in the country and it is likely that a shortfall in production attributable to small rivers is in fact being identified as part of floodplain catch.

8. **Subsistence Floodplain Catch.** Revised estimates by FAP 17 show some differences with those calculated by DOF. These differences were partly caused by improved methods of estimation using computers and partly by several minor errors related to the extrapolation procedure. Bearing in mind that the

floodplain subsistence data sets have previously been evaluated by hand an increase of approximately 25% for most years shows reasonable agreement.

9. **Riverine Data.** The Riverine data showed excellent correlation with FAP 17 calculations and the published figures have not been revised in any way. The data for 1989/90 and 1990/91 had not previously been processed and will be made available by DOF for publication in due course.

10. **Totals.**

- (a) When the revised figures are aggregated a picture emerges which is much different from the published statistics. The total tonnage has doubled from 750,000 tones to 1,500,000 tones. If this revised estimate is taken and production attributed solely to the floodplain ecosystem (estimated by MPO; Technical Report 17 to be 6,700,000 Ha.), then the average floodplain production is approximately 150 kg per Ha.
- (b) The published data shows a slight increase with time, caused by increased culture fisheries which more than compensate for the decline of the open water fisheries. In contrast the revised figures show little real change in the total production level although riverine catch is definitely declining. An analysis of the last 2 years riverine data indicates a rapid decline of catch in the principal and major rivers.
- (c) Public perception of the state of the Fishery is one of rapid decline and falling production levels. If this were the case then the price of fish would be escalating rapidly in response to diminishing supply. however, when wholesale price data from the Directorate of Marketing is examined this perception does not hold true. While the nominal price of fish is increasing in line with inflation, the real price of fish appears to be relatively steady, further evidence that production levels are holding up. In order to derive the real price the nominal price was adjusted downwards to 1975 values using the wholesale

price index published by Bangladesh Bureau of Statistics.¹

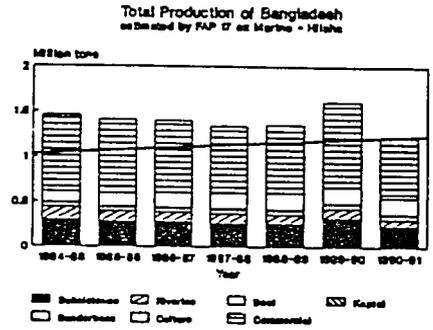
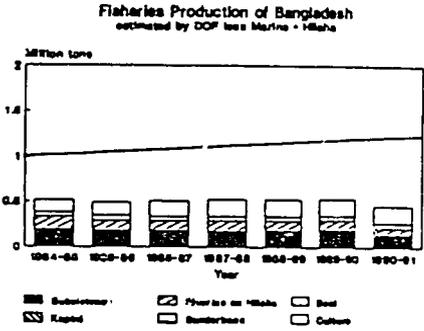
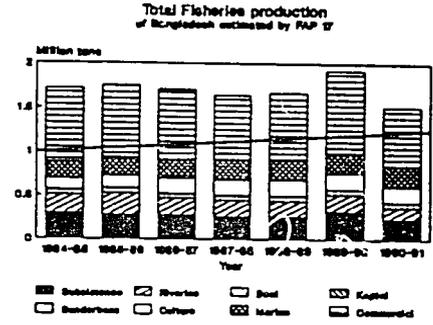
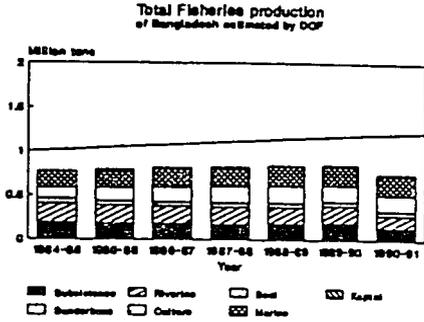
- (d) Of the six species for which long term wholesale market prices were available, two species of fish show a significant real price increase. These are Ruhi and Puti, both of which are migratory species that can be thought of as model species. Ruhi representing the major carps which are thought to undergo relatively extensive migrations in Bangladesh, and Puti representing the more residential species that take refuge in the secondary rivers and anabranches during the dry season and then migrate laterally with the floods onto the floodplain during the rainy season. From field observations it is apparent that both of these species are relatively intolerant of the low oxygen concentrations that are found in the more stagnant waters, typically found within flood control schemes.
- (e) The other four species: Soal, Koi, Boal, and Shingi does not show significant long-term trends in real price. Three of these species: Soal, Koi and Shingi are well adapted to living in conditions of low water quality.
- (f) Thus it is clear that FRSS statistics and wholesale prices collected by an independent organisation both describe a picture of a immensely rich fishery which appears to be holding up to the present level of production.
- (g) There is however some evidence that the system is under pressure. The riverine fishery production has shown a precipitous decline since FRSS statistics have been collected. Subjective interviews in the field report that the fishermen report the size of fish are getting smaller and the individual catch is decreasing. Decrease in fish size is not necessarily an index of overfishing and the decrease in individual catch could

¹ A incremental jump which occurs in all data sets for May 1985 was not included in the analysis of long-term real price trends as it was considered that this did not reflect any long-term change in supply or demand.

result in more people entering the fishery. However, further information concerning the population dynamics of the fishery will be available when FAP 17 project is completed in 1994.

11. Conclusions

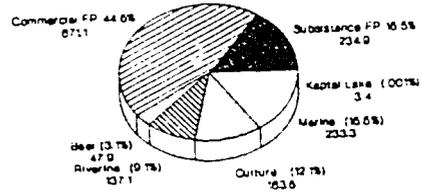
- (a) In the long term it is clear that the strengthening of the FRSS system should be a priority in order to obtain more accurate information concerning this major resource.
- (b) In the shorter term, and of direct relevance to FAP, it is recommended that the figures to be used for loss of floodplain resulting from FCD/I interventions be based on a figure of 152 Kg/Ha instead of 55 Kg/Ha.
- (c) The figures produced by FRSS are primarily for use as a planning tool at the National level. When project evaluation is undertaken the complexity of the Bangladesh fisheries system means that project analysis **MUST** also take account of data sets collected in the project area.



Line indicates level of fish consumption

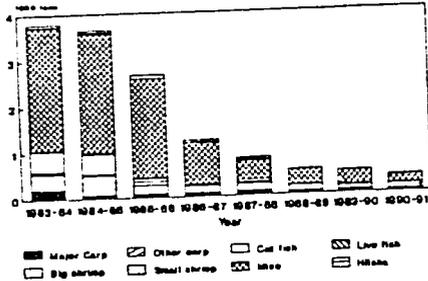
Figure 1

Total Fisheries Production in Bangladesh (FAP 17 Estimates) 1990/91

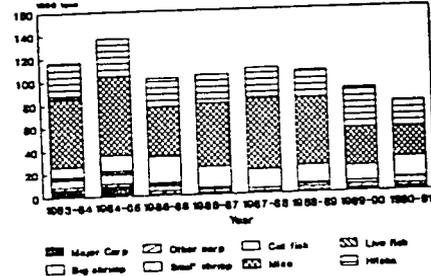


Estimates in 1000's of tonnes

Riverine fish production by species River: Brahmaputra



Riverine fish production by species River: Others



Riverine fish production by species River: Jamuna

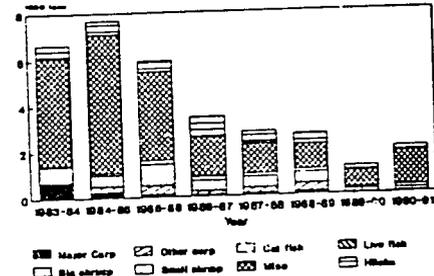
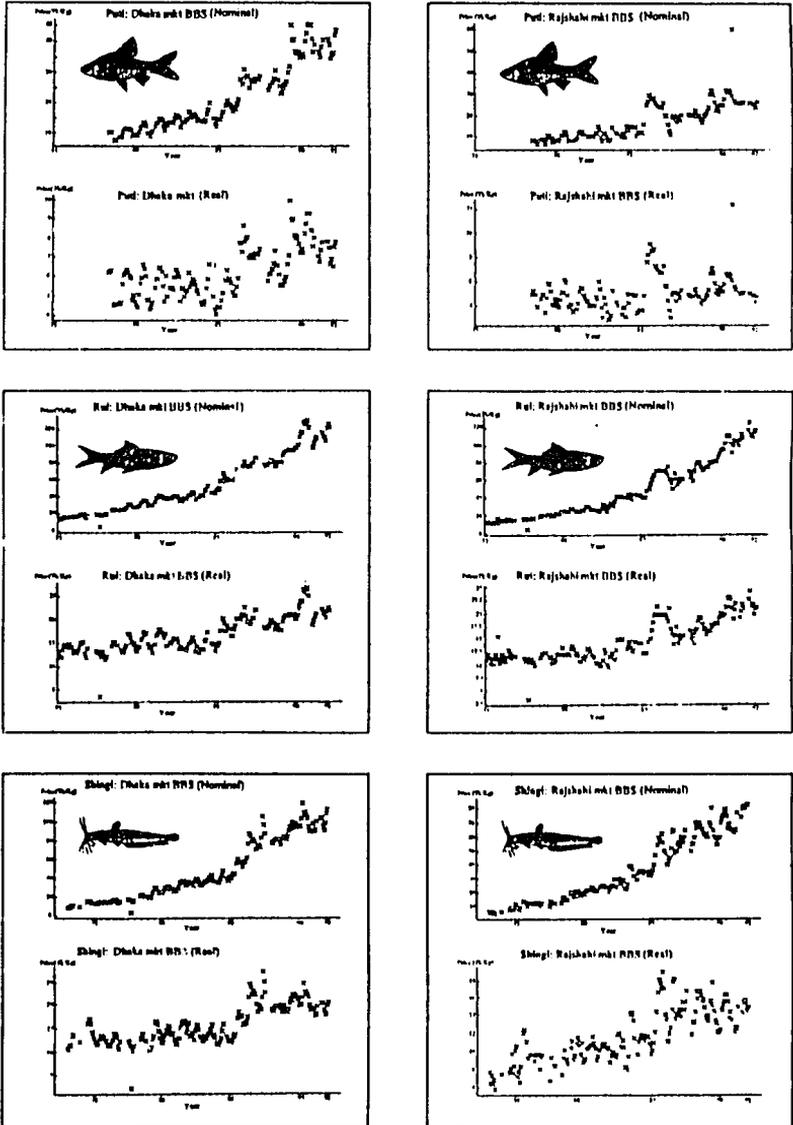


Figure 2

Figure 3



FISHERIES DESIGN STUDY & PILOT PROJECT (FAP 17)

Economic Implications of Revision to FRSS Estimates of Fish Production

An Illustrative Example

1. Implications of Revised Estimates of Fish Production

The revision of the FRSS estimates of floodplain fish production from 55 kg/ha to 120-150 Kg/ha has significant implications for the FAP. Should it be corroborated by the findings of FAP 17 field studies, the fisheries disbenefits of flood control are considerably greater than previously appreciated. This paper is intended to illustrate this impact.

2. Caveat

(a) The FRSS estimates, as revised by FAP 17, have the advantages of logic and consistency: they no longer exclude the most important single component of the inland catch as estimated by FRSS, the Commercial floodland catch; and they are broadly consistent with national level data on fish consumption¹, and that coming from micro level studies such as those of Third Fisheries.

(b) Nevertheless, uncertainties that remain - over both the quality of the raw FRSS data and the degree to which the villages used for both the Subsistence and Commercial floodland catch assessment surveys are representative of their districts - ensure that these estimates must be used with caution.

3. Impact of Flood Control on Fish Production from Capture Fisheries

(a) The value of fish production from capture fisheries is affected by flood control in three main ways: first, by a reduction in the area flooded;

¹ The Household Expenditure Survey (1988/89) gave total national fish consumption as being 40% higher than fish supply as estimated from FRSS.

second, by changes in the catch per unit area of the area that remains flooded; and third by changes in catch composition.

(b) The impacts of flood control are taken to be negative in all three dimensions: flood control usually takes reduction of the area flooded as one of its major objectives, catch per unit area in the residual flooded area often declines and catch composition tends to shift away from the more valuable migratory fish (including the major carps) towards the less valuable miscellaneous floodplain resident species.

(c) A full assessment of impacts must quantify all three of these effects. To do this, FAP 17, which finishes in June 1994, is monitoring fish catch through the year at around 104 sites.

(d) Due to a lack of reliable published data on the effects on fisheries of Flood Control and the difficulties of making reliable estimates, the regional FAPs have generally estimated losses by simply calculating the loss of floodplain and multiplying this by the catch per hectare, often as derived from FRSS estimates.

(e) It was always recognised that this provides a minimum estimate, ignoring as it did the second two dimensions. The upward revisions to the FRSS catch figures now make it clear that it was probably a significant underestimate of this minimum. The purpose of this paper is to provide a simple illustration of what these revisions in estimates might mean in economic terms.

4. Recalculation of Fisheries Impacts Using Revised FRSS Estimates

(a) The accompanying Table illustrates, with use of data from the North Central Region (NCR), the effect the changes in catch estimates would have on the imputed value of fisheries costs due to the loss of floodplain. As noted above, this represents a minimum impact, since it assumes no costs due to changes in production or catch composition on the floodplains that remain. The methodological approach followed is broadly based on that proposed in MPO Technical Report 17.

5. Derivation

(a) The analysis calculates the fisheries costs using three different estimates of floodplain fish production: 40 Kg/ha, the old FRSS estimate for NCR; 87.6 Kg/ha, the revised national FRSS estimate (low) of 120 Kg/ha adjusted down by a factor of 27% to reflect the lower than average catch rates for NCR; and 109 Kg/ha, the revised national FRSS estimate (high) of 150 Kg/ha similarly adjusted.

(b) The data on changes in flooding is for different planning units (PUs) in the NCR and is taken from the Fisheries Report of FAP 3. It is important to note that the changes in flooding shown (and fisheries costs) are those that were projected for a situation in which all the various flood control schemes were implemented. As many of these schemes have already been discarded by FAP 3 on economic grounds (using the old FRSS estimates of fisheries impacts), it does not represent an estimation of the fisheries losses that are likely to occur. Its purpose is illustrative; though for the planning units where development does go ahead as originally envisaged this Table will give an indication of the additional fisheries costs that should be included.

(c) Costs of fishing are derived from secondary sources for commercial fishermen², from FRSS data on catch rates for subsistence fishermen and from FAP 17 census data on fishing costs. Prices are derived as a species weighted average from FRSS data on catch and prices received by fishermen.

(d) The shadow wage rate used is that recommended in the FAP Guidelines, Tk.25/manday. Since so much fishing takes place in seasons that are agriculturally slack this probably overstates the true economic costs of fishing and places a downward bias on the estimates of fishery losses.

²

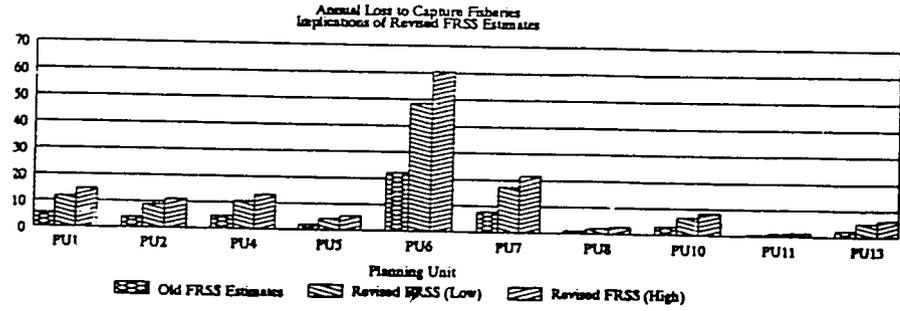
Principally from FAP 12 reports.

Implications of Revision of FRSS Figures

Catch/Ha.		Costs of Fishing: Commercial vs. Subsistence						Average Costs			
FRSS - Original Estimate for NC	Kg/ha	40	Commercial catch	%	70%	Subsistence catch	%	30%	Economic Cost/Kg	Tl.	18.0
FRSS - Revised National Est. (Low)	Kg/ha	120	Financial cost	Tl./Kg	5.8	Financial cost	Tl./Kg	2.0	Average Catch rate	Kg/ha/yearly	2.0
FRSS - Revised National Est. (High)	Kg/ha	150	Catch rate	Kg/day	2.2	Catch rate	Kg/day	1.4	Price of fish	Tl./Kg	30
North Coastal Adjustment factor	%	73%	Shadow wage rate	Tl.	25	Shadow wage rate	Tl.	25	Conversion Factor		
			Total Cost/Kg	Tl.	17.2	Total Cost/Kg	Tl.	19.9			

PU	F1-F3 Area Ha.	Change F1-F3 %	Change F1-F3 Ha.	Old FRSS Estimates				Revised FRSS Estimates (Low)				Revised FRSS Estimates (High)				Difference Net Loss vs. Old FRSS Tl. 000	Difference Revised high vs. Old FRSS Tl. 000
				Loss of Fish Mt.	Loss of Fish Tl. 000	Fishing Costs Tl. 000	Net Loss Tl. 000	Loss of Fish Mt.	Loss of Fish Tl. 000	Fishing Costs Tl. 000	Net Loss Tl. 000	Loss of Fish Mt.	Loss of Fish Tl. 000	Fishing Costs Tl. 000	Net Loss Tl. 000		
PU1	33,207	21	11,173	447	13,408	8,032	5,376	979	29,364	17,991	11,773	1,223	34,705	21,928	14,717	6,397	9,341
PU2	41,895	20	8,379	335	10,035	6,023	4,011	754	22,020	13,191	8,829	918	27,575	16,489	11,036	4,797	7,005
PU4	43,815	23	10,077	403	12,093	7,244	4,849	843	24,484	15,265	10,618	1,103	33,104	19,831	13,273	5,770	8,424
PU5	52,167	8	4,173	167	5,008	3,000	2,008	366	10,968	6,570	4,397	437	13,709	8,213	5,497	2,389	3,489
PU6	81,498	54	43,911	1,834	55,093	33,004	22,089	4,022	120,653	72,278	48,375	5,027	150,816	90,347	60,469	26,226	38,380
PU7	59,189	28	16,419	637	19,703	11,803	7,900	1,438	43,150	25,849	17,301	1,798	53,938	32,312	21,626	9,401	13,728
PU8	12,508	18	2,001	80	2,402	1,439	963	175	5,259	3,151	2,109	219	6,574	3,938	2,636	1,146	1,673
PU10	43,912	14	6,294	252	7,573	4,523	3,050	551	16,541	9,909	6,632	689	20,676	12,388	8,290	3,604	5,262
PU11	16,336	6	980	39	1,176	701	472	86	2,576	1,543	1,033	107	3,220	1,929	1,291	361	819
PU13	68,188	7	4,773	191	5,728	3,431	2,297	418	12,544	7,314	5,029	523	15,680	9,393	6,287	2,733	3,980
Total	472,693	23	110,182	4,407	132,218	79,208	53,012	9,672	289,358	173,422	116,096	12,045	341,947	216,827	145,121	63,084	92,108

Source: FAP 17



(small) Tl.

Figure 4 - Implications of Revision of FRSS Figures

6. Implications

(a) Some of the schemes proposed in the NCR have substantial Economic Rates of Return, which could comfortably absorb an increase in the fisheries costs of the order of magnitude shown here. However, a number of schemes are marginal in economic terms and would probably not survive a reanalysis. A similar picture is likely to emerge in other regions. Considering the forgoing analysis ignores the effects of flood control both on the catch per unit area of the floodplain that remains and the catch composition, its implications are profound.

NORTHEAST REGION

FISHERIES TECHNICAL PAPER (FAP 6)

Existing Situation

I. Fisheries remains a major economic sector in the region contributing about Tk.2400 million annually to the gross regional product. It provides significant employment, income and food to the population. The trends in environmental change and fishing effort noted above have led to the present situation concerning fisheries environment and fish production in the Northeast region:

- (a) Easy and timely fish migration access is blocked to about 25% of the floodplain by the existence of some 65 FCDI projects. A hypothesis is being developed that this has led to broodstock spawning migrations being "channelized" into four major areas in the Northeast Region: Tangua Haor, Khaliajuri Area, Companiganj Area, and Hakaluki Haor. These areas, known locally as "mother fisheries", consist of groups of duars and nearby beels and wetland spawning grounds. They have two important features in common: (i) they are not enclosed by FCDI projects, and (ii) they appear to 'control' fish abundance over much larger areas. [NERP field studies indicate that a fifth major mother fishery, Kawadighi Haor, was annihilated after the construction of the Manu River FCDI project].
- (b) Serious industrial pollution of some deepwater overwintering stretches of the Surma and Kushiara Rivers takes place during the dry season because of low dilution and absence of tertiary effluent treatment systems.
- (c) There are few stands of floodplain trees and reeds remaining in the region.
- (d) Stagnation of water in some FCDI projects results in acidification of the water and other undesirable water quality phenomenon.

(e) Reduction of biodiversity due to declines or local extinctions of some fish species. No effort is being made to address the problem of declining biodiversity by rehabilitating seriously depleted stocks of native *Nandina*, *Angrot*, *Sarpunti* and *Mohaseer*.

(f) Ineffective implementation of the New Fisheries Management Policy. Only about 100 out of 5,000 jalmohals in the region have been transferred from the leasing system to the New Fisheries Management Policy. The focus on generating tax revenue from fish production continues to prevent genuine fishermen from having easy access and secure tenure over fishery resources.

(g) The only notable intervention into the fisheries sector of the region at present is an ADB-financed floodplain stocking programme. Large amounts of development capital are being spent on stocking of selected native and exotic carp. However, such efforts may be less successful than expected for three reasons: (i) it would be financially prohibitive to replace the entire natural broodstock and spawn with hatchery outputs, (ii) unless effective management of fishing effort is achieved simultaneously, all stocked fish are likely to be fished out within three years, and (iii) the existing negative trends affecting aquatic environment quantity and quality are unlikely to be conducive to increasing the carrying capacity of the environment for carp stocks.

Trends

2. **Fish production:** Many fishermen and fisheries personnel mentioned that a trend of decline in overall fish catch has taken place in the region over the last half century. Certainly for carp this appears to be the case. For example, carp used to constitute 30-40% of catches from *beels* three to four decades ago, but have since declined to about 5%. Big shrimp landings have also decreased. There have been some increases in catches of miscellaneous species (mostly small stagnant water species used for subsistence consumption) and in *hilsa* (whose life-cycle is not floodplain dependent). But the overall trend appears to have been towards a decline in fish production.

3. **Fish biodiversity.** There has been a trend of declining fish biodiversity over the last few decades. Two previously widespread carp species (*Nandina*

and *Angror*) are now practically extinct in the region. Other species such as *Sarputi*, *Mohaseer* and *Pangas* have become rare in areas where they were formerly abundant.

4. **Fisheries management.** Biological management of fish stocks appears to have suffered a declining trend since about the 1950s. Previously there was more control over fishing effort during critical periods in the life-cycle of fish, and therefore levels of production were high. Since then the trend has been one of increasing fishing effort. *Beels* that in the past were harvested only once in every three years are in more recent years being harvested annually. There has been a trend to reduce lease periods from six to ten years, down to three, two, or one year, giving little incentive for carrying out biological management practices which produce returns only in the medium and long term. Since 1986 the DOF has attempted to begin replacing the leasing system under the Ministry of Land (MOL) with a fishermen licensing system called the New Fisheries Management Policy but the rate of transfer of individual fisheries has been extremely slow. More recently GOB has designated several areas as fish sanctuaries, but enforcement has been lax due to insufficient allocation of finance.

5. **Fisheries environments.** Modification and containment of the aquatic environment through FCD/I projects designed solely to increase agricultural production and river training to enhance navigation has proceeded steadily during the present century. The trend of increasing hectareage under FCD/I protection was especially rapid during the last three decades. The increased number of regulators built across *khal*s has become a major impediment to fish migration during the early monsoon breeding season. The result has been a trend of reduction in spawn and recruitment, and decreasing abundance of some fish stocks. Full flood embankments have increasingly reduced the area of water available for fish for spawning, nurseries and grazing. Submersible embankments have allowed flooding, but delayed it (thus reducing the hectare-months of inundation). The combined effect has produced a trend of shrinking of fish habitat in time and space which in turn has resulted in a reduction in fish abundance.

6. **Water quality.** The main trends in water quality relevant to fish production have been negative. Construction of two major industrial plants in the region in the 1960s (the Fenchuganj fertilizer plant on the Kushiyara River

which discharges toxic ammonia, sulfuric acid and caustic soda, and the bleach kraft pulp mill at Chhatak which discharges chlorinated phenolics, mercury and other toxins) has seriously affected water quality in the deepwater upper stretches of the Surma and Kushiyara Rivers. This is especially apparent during the dry season when effluent dilution in receiving water is minimal. This has caused fish kills and contamination of fish flesh rendering it unfit for human consumption, apart from lowering its market value. Water quality has also suffered inside some FCDI projects due to stagnation and excessive aquatic macrophyte growth, leading to acidification of the water and associated water chemistry changes such as heavy metals release from sediments. This has probably reinforced the trend of changes in the composition of *haor* fish stocks to small stagnant water species.

7. **Deforestation.** Conversion of *haors* to paddy cultivation has led to a trend of extensive and rapid deforestation in the region over the last 50 years, a process facilitated by the construction of FCD/I projects. Because dense stands of trees and brush harbour large fish populations during the flood season, there is generally a good relationship between forest/brush cover and fish production. The long term trend of large scale clearing of wetland forests of *hijal*, *korach* and other inundation-tolerant tree species, as well as brush and reeds, has undoubtedly reduced the quality of the floodplain environment and its capacity to produce fish.

8. **Sedimentation.** In-filling of many *beels* with sediment has reduced their mean depth and volume and converted some from permanent to seasonal status. Fishermen are well aware that this is reducing fish production. This trend of *beel* sedimentation has been especially apparent over the last few decades, and might be correlated to the increase in number of FCD/I projects. Sedimentation is also affecting large and small rivers because of river training works. This has led to sedimentation downstream and in-filling of *duars* (which are deep scour holes of great importance as relatively secure overwintering habitat for broodstock).

9. **Fish disease:** Fisheries monitoring field studies indicate that fish disease has played an important role in reducing fish production. The situation in *beels* and *haors* (where disease outbreaks are sometimes very severe and result in mass mortality) contrast sharply with most of the riverain fishes (which are more or less free from disease free). NERP fisheries team observation suggest

that certain environmental factors may be responsible for the annual late outbreaks of infections, and furthermore may control the severity of infection. The following sequential scenario with an FCD/I project is proposed as a hypothesis:

- o Rapid growth of macrophyte during late monsoon.
- o Spoilage of aquatic weed during late monsoon.
- o Polluted water body loses its primary food producing capacity.
- o Residual insecticides and fertilizers increase the degree of pollution.
- o In the course of time both the degree of pollution and the fish density increase.
- o The metabolic activity of fish decreases due to low temperature.
- o As a result, herbivorous fishes (having low resistance power) are attacked immediately.
- o Reduced water volume and velocity on the floodplain during the monsoon due to siltation and different types of infrastructure causes water stagnation, and more spoilage due to anaerobic oxidation of benthos organisms in the bottom of the water body.

It was observed that heavy rain and flood flash greatly reduced the incidence of disease through out the region.

Impacts of FCDI/I Projects on Fisheries:

10. Case studies carried out by FAP 6 had difficulty separating the effects of FCD/I projects on fish production from non-FCD/I factors. However, the following appear to be the principal impacts of different FCD/I project types on fish production:

- (a) Partial flood protection projects tend to have positive and no impacts more frequently than negative impacts. Benefits are associated with higher water levels which improve pile fisheries and with prevention of siltation. Submersible embankments increase the surface area of beels during the dry season. Reduced production is associated with obstruction of fish migrations. Submersible embankments impede fish migration in either direction for about 10-20 days during the early monsoon until the embankment is overtopped. As fish stocks may include early spawners and late spawners, submersible embankments will select for late spawners. Early spawners overwintering in rivers will probably swim further upstream to headwaters and tributaries.
- (b) Full flood protection projects (both with and without pumped drainage) have only negative - caused by reduction in flooded area and obstruction of fish migration - or no impacts (frequently because the area was not fish producing prior to project construction).
- (c) River channelization projects can have very mixed impacts. River loop-cuts have a severe negative impact on carp reproduction as ox-bow bends are a favoured spawning habitat. Sedimentation of duars is another negative impact.
- (d) River and khal re-excavation projects have positive or no impacts. Benefits are probably due to greater habitat depth, better flow regime and improved connection with other channels and their fish stocks. Greater use is probably also made of the re-excavated khals by migrating fish stocks.
- (e) Water retention schemes have no impacts. However, such projects in the region are not performing well.

11. The conventional wisdom on FCD/I impacts on floodplain fisheries has been determined (sometimes, but not always) from actual case studies in Bangladesh, such as the Chandpur Project, Cauline Beel Project. (MPO, 1985; Ali, 1991). The following impacts are attributed to FCD/I:

- o open water fish production declines due to general reduction in the area (hectare-months) of floodlands and beels (such as reducing the area of nurseries and feeding grounds);
- o regulators prevent migration and recruitment of migratory species, especially major carp;
- o small sized fish and prawn species replace large sized species;
- o cross dams on rivers prevent migration upstream, and consequently the upstream fishery disappears;
- o embankments cut off channels (khals) which connect beels to rivers thus preventing both water and fish stock replenishment of beels.
- o submersible embankments delay spawning migrations, resulting in resorption of ova and milt in frustrated brood stock. (This may be a non-issue. Tsai et al (1981), for example, witnessed 11 spawning episodes of major carp in one river bend locality between 21 April and 25 June. Submersible embankments designed to overtop \pm 16 May will still allow late spawning to take place. Carp which have overwintered in rivers are not inconvenienced as they can swim to spawning localities further upstream).

12. To summarize, negative impacts center on interference with fish migration/reproduction and general reduction/disruption of aquatic habitat quality and area. Many of these conventional impacts have been observed or reported from the region. However, given the high number of partial flood protection projects as a percentage of total projects in the region, FCD/I impacts on fisheries would not appear to be as catastrophic as may be the case in other regions of Bangladesh. In evaluating the impacts of the FCD/I projects in the region, it is of importance to bear in mind that many FCD/I projects do not behave according to design plan. Problems frequently seen are:

- o too early overtopping of submersible embankments;

- o too much breaching of submersible and full embankments either by floods or by public cuts (i.e. farmers and/or fishermen trying to drain out fields or to flood them for various and frequently conflicting purposes);
- o too many drainage and irrigation structures inoperable due to mechanical damage and siltation;
- o river channel siltation contributing to the above and limiting navigation.

13. The relevance to fisheries of these failures is profound because it implies partial reversions to pre-FCD/I conditions (in effect, natural or local community initiated "mitigation"). Clearly, the impact of any particular FCD/I project has the potential to vary from one year to the next. Furthermore, as there is an overall decline in the maintenance of structures in the region, the general regional direction of drift is towards pre-FCD/I conditions. In conceptualizing and assessing the impacts of FCD/I projects one must clearly distinguish between what might happen over the long term if the structures performed perfectly, and what has actually transpired given the highly imperfect behaviour (from an FCD/I engineering perspective but not necessarily from a fisheries perspective) of many projects.

Proposed Fisheries Strategy

14. Fisheries Engineering Measures

(a) ***Multipurpose FCD/I project design.*** It is a fact that virtually all FCD/I projects lack a fisheries component. In practice this means that no area(s) within the project is set aside and designated for fish production, and no finance is budgeted for construction of fisheries related structures. The proposed solution to this deficiency is for all water management and development projects to be multipurpose in concept, objectives, design and operation. Thus the concept of Multipurpose Water Resource Management is proposed as an enhancement of the traditional FCD/I approach which is narrowly focused on agriculture. Every Multipurpose Water Resource Management project must have a fisheries purpose and component. finance for its construction and execution, and be a joint agency effort (BWDB/DOF) with full collaboration during

planning, design, construction and operation. Multipurpose water resource management would also include clearly defined components for navigation, cattle grazing, wildlife as well as agriculture within a project area, perhaps through a zoning or compartmentalization approach. Opportunities exist for mitigating losses from full flood protection projects and these must be pursued. Many of the 'FCD/I versus fisheries' issues in the region might be resolvable without resource to blanket replacement aquaculture scenarios (which may in any case be impractical).

(b) *Beel bypass and embankment setback.* The most basic of all design criteria for FCD/I projects is the routing of the embankment. Normally the route follows river banks, and takes advantage of existing natural elevated river levees in order to reduce costs of earthworks (by minimizing earth volumes moved) and minimize encroachment and expropriation of agricultural plots. Two alternative routing patterns which should be evaluated for possible application under MWRM criteria are beel bypass and embankment setback.

(c) *Beel Bypass* Under this routing pattern, the embankment bypasses any major beels within the project area. In many haors, beels tend to be clustered in the lowest (i.e. "downstream") end of the haor. The land adjacent to the beel cluster is usually difficult to drain and therefore is high risk. Higher elevation land is more easily drained, and thus of lower risk. Instead of locating the embankment along the periphery of the haor as is the usual practice, in a beel bypass scheme the embankment is built only around the low risk agricultural land, and completely bypasses the beel cluster (or clusters) and adjacent high risk land. Thus the beels remain freely connected to the river system, resulting in unimpeded fish migrations for spawning. If the embankments are submersible, fish would get on to the low risk land in the normal manner of partial flood protection projects once the embankment is overtopped by the flood. Drainage regulators for the low risk embanked part of the haor should be located so they discharge directly into the haor cluster (rather than directly into the river). Because of land slope this would be their "natural" location in any case, and furthermore this prevents the scheme from creating new pockets of poor drainage on the low risk land.

(d) *Embankment Setback.* Another approach is to set the embankment back from the river by circa 100 m or more. The rationale for this approach is based on the following factors:

- o Due to increase siltation many river beds are rising. This reduces their flood water storage volume,
- o Dredging is not being widely carried out to re-excavate river beds because of high cost,
- o The reduced river channel volume results in greater area flooded and longer flood duration,
- o High water levels and velocities causes breaching and overtopping of embankments, further increasing area flooded and flood duration.

Setting back the embankment from the riverside is possible solution to these problems because it would increase the effective storage volume of the river. It would then be necessary to dredge only selected river stretches identified as causing drainage congestion, rather than the entire river channel (thus minimizing cost).

(e) **Beel Bunding** This approach consists of constructing a low bund around beels, and applies mainly to shallow seasonal beels which dry out completely during the winter months. The rationale for beel bunding is based on the fact that as a haor drains during the post-monsoon period, the residual water level (in beels) will eventually reach a contour which farmers will regard as a kind of dry-season benchmark. This water level is known as the lowest level of plantation (LLOP). When the monsoon flood water drains from haors, farmers start planting the *boro* crop in late December or early January. As the shoreline recedes towards the beel area, rice planting follows closely behind. Near the end of January farmers stop planting *boro* because if rice is planted any later it will not have enough time to mature before the next monsoon flood. Wherever the beel shoreline is located at the end of January is regarded as the LLOP. Once LLOP is reached, the regulator gate is shut because farmers want to conserve the water stored in the beel for irrigation of *boro* in February or March, as without this mid-season irrigation yields will be lower. The shutting of the gate, therefore, physically sets the LLOP beel water level, as well as the volume of water stored in the beel for subsequent use for mid-season irrigation.

(f) **Beel Embanking** A more imposing variant of beel bunding is to construct an embankment around the beel. The embankment could also extend along both sides of the feeder khal. Regulators would have to be provided with at least two locations:

- o One regulator at the beel, which would be closed during the monsoon before flood recession begins, so as to maximize the volume of water stored in the beel during the dry season,
- o One regulator at the river and main peripheral embankment, which would act prevent permonsoon flood water from entering the haor from the river.

15. **Haor Zoning.** A more complicated Multipurpose Water Resource Management approach to creating high producing fishery environments inside FCD/I projects is haor zoning. The concept is basically about subdividing haors into wetland and dryland zones which would be physically separated by an internal embankment. Regulators and drainage vents would be set into the peripheral and internal embankments so that the hydraulic operation of each zone could be managed separately so as to suit the differing needs of fisheries (in the wetland zone) and agriculture (in the dryland zone). From the fisheries perspective the objective would be to realize the potential benefits of been bypass (easy access between beel's and rivers for migrating fish stocks), as well as beel embankment (to maximize dry season water storage volumes in the beels, so as to increase the size of the dry season broodfish population). Haor zoning could also be extended to provide sub-zones allocated to livestock grazing and forestry/tree culture. Seasonal flooding of the wetland zone could also contribute to controlling flooding in the main rivers by means of peaklopping. This concept could effect the transformation of the region by restoring its ecological balance and stimulating its economy with particular reference to the poor.

16. **Haor Compartmentalization.** The construction of compartmental bunds inside haors is gradually becoming a regular component of FCD/I projects. These structures are of low elevation (circa 1-1.5 m) and are intended to contain flood or rain water within the compartment for irrigation and prevent wider crop damage inside the haor. An unintended result is poor drainage of the compartment during the post-monsoon and dry season, since farmers whose plots

are located outside of a flooded compartment and whose crops are not affected will oppose cutting of the bund. Poor drainage during the dry season promotes growth of dense aquatic macrophyte stands and wetland grasses (*Paura bon*), which can cause land clearing problems for farmers at a later date. Although the *paura bon* results in more fish production, low water quality also promotes outbreaks of ulcerative fish disease.

17. *Fish Passes.* Fish need to be able to bypass embankments. Submersible embankments can be freely bypassed once they are overtopped, but at other times they can only be bypassed via the project's hydraulic structure(s) and/or by public cuts. The latter applies to full flood control embankments at all times. There are six types of hydraulic structures which, when open, allow the flow of water past an embankment or into a project area (and thus provide some opportunities for fish to do the same). These are:

- o hydraulic regulator with fall-broads
- o hydraulic regulator with vertical lift takes
- o hydraulic regulator with flap gates
- o river barrage
- o drainage pipe sluice
- o irrigation inlet

All of these structures are purpose built to serve agricultural needs, and none have special features to increase their fisheries efficiency, or serve the needs of navigation. If existing structures address any valid fishery needs at all, it is by default only, and generally very poorly at that. In fact, flushing in river water through regulators is being practices in some projects not to assist spawning migrations, but rather to catch large quantities of broodstock. Some public cuts are done to catch fish.

There are several options for providing fish pass facilities in FCD/I projects:

- o relying on existing hydraulic structures to give passage to migrating fish (with perhaps some modification of structure operation to increase into fisheries efficiency),
- o relying on public cuts to give passage to migrating fish,

- o installation of appropriate purpose-built structures designed only for fish migration,
- o modifying the design of hydraulic structures so that they are also highly efficient in giving passage to migrating fish (i.e. make them multipurpose),
- o installation of navigation gates, and relying on them to give additional passage to migrating fish.

Fisheries Management Measures

18. ***Fish Sanctuaries in River Duars.*** There is a widespread awareness among fishermen of the importance of *duars* for conserving fish stocks in order to sustain production at a high level. Fishermen in many areas advocate exempting important deeper duars from the present revenue collection system and creating *duar* fish sanctuaries under biological management. For example, fishermen state that if the Ranichapur and Dhalimati fisheries of the kaliajuri area are turned into fish sanctuaries by GOB, then the whole area will be overpopulated by fish. Fishermen in Hakaluki and Tangua haor also advocate setting up duar sanctuaries.

19. ***Fish Sanctuaries in Beels.*** Fish sanctuaries also need to be established in beels. There are three important reasons:

- o Many species of *chotomaach* are limited to the beel/floodplain habitat and will derive no direct benefit from river duar sanctuaries. These species are especially important for maintaining the subsistence catch.
- o A substantial proportion of juveniles *boromaach* (major carp, *Chital, Boal Air*) do not return to rivers during their first and second years but overwinter in the deeper beels.
- o The use of katha in beels causes some *boromaach* broodstock to remain in the beels during the winter. A large proportion of this overwintering broodstock is fished out from the beels every year (between January and April) by leaseholders before

they have an opportunity to breed.

Fishermen are aware of these facts and advocate establishment of sanctuaries in beels.

20. **Community Based Fisheries Management** The community-based management approach in fisheries is now gaining wide acceptance in many parts of the worlds, in both developing and developed countries. Fishing communities must themselves determine and enforce management measures limiting fishing effort and protecting broodstock. They are the only agency capable of carrying out cost effective management. It is the fishing communities who will suffer the economic consequences of bad management and stock depletion, and therefore only they will have sufficient incentive to carry out effective management. Closed fishing communities can be expected to limit entry, determine and enforce closed seasons, delimit prohibited fishing grounds, allocate resource exploitation spaces among its members and test and share new technologies. As a political unit, services. Fishing groups must be given long term responsibility for management and conservation of the fishery resources of their jalmohals, including monitoring, surveillance and control. Licensed fishermen villagers (spontaneous CBM). There is need to establish a new set of customary fishing rules (building on the existing) which everyone will generally accept and adhere to.

Other Measures

21. **Floodplain Afforestation** Afforestation of the upper Meghna floodplain is a high priority need which is not yet being addressed. Its importance is highlighted by the fact that local people themselves consider it important and plant *hijal* and *koroch* on a limited scale without any GOB promotion or support. The potential benefits of a floodplain afforestation programme are multifaceted. A support programme should not be limited to particular near-pristine wetland sites (important though these may be) but to all haors in the region. Forests are an important component of fish environments in the haor area. Those haors containing more forests are able to produce more fish. Trees not only produce more fish food in the aquatic habitat (through decomposition of epithelial tissue of branches and fallen leaves), they also serves as a good substrate for periphyton. Moreover birds take shelter on trees, and their droppings help to generate fish food organisms in the aquatic habitat. Due to several reasons,

wetland trees in the haor area have been cut down and few new plantation programs have been taken up.

22. *Effluent treatment* Industrial water pollution requires immediate attention. A turn-key tertiary treatment system should be installed at the Chhatak pulp mill. The plan to shut down the Fenchuganj fertilizer plant should proceed. Consideration could be given to building a new plant using modern environmentally friendly process technology to minimize polluting generation at source.

23. Sewage treatment in the region is at its infancy. The health risk to the rural public is high during the premonsoon. For small rural point sources sewage should be treated and disposed of diffusely underground. For larger municipal loads, there should be centralized collection and high grade treatment systems to stabilize the effluent and reduce the BOD prior to controlled disposal into major rivers. The river plankton and fish will benefit from the controlled eutrophication and so will the estuarine fisheries once the rivers reach the sea.

Technical Session on FISHERIES

Answers given by FAP 17 team members and the staff of the FAP 5 and FAP 6 Regional Studies and FAP 16

Dr. Yousuf Ali, Bangladesh Center for Advanced
Studies (BCAS)

Question/Statement: Can I add some information on floodplain annual yield? You have pointed out only the air breathing fishes. How about the other species such as Ompak, Pabda, Ompak bimaculatus, small cyprinids and fresh water prawns ?

Answer: All the mentioned species and other related species were discussed in Fish Biodiversity Section (2.2) of the Fisheries Specialist Study by the Northeast Regional Water Management Study (FAP 6). The document can be viewed at FCPO or the World Bank Mission's library.

Mr. Monowar Hossain, MARC

Question: You got a shock from the Hydraulic model in terms of its failure to predict flooding pattern? Is there any feedback of this shock on the model ? Will it, in other words, be improved upon to be better to predict floods ?

Answer: There seems to be some confusion, the shock we got from the mapped outputs of the hydraulic modelling of the Gumti area was that the timing and direction of flooding was very different that that we had been led to believe from previous anecdotal knowledge. The output of the model would seem to be sensible and certainly explained a lot of things that had puzzled us. These results have important implications for the timing and direction of fish recruitment as well as the possibilities for flood management. The model could perhaps be refined, however, a more pressing priority would be to automate the production of output maps using a digital elevation model interfaced to the model output. This would save considerable time and money and remove a source of oversimplification and error.

Mr. Steve Jones, POE/FPCO

Question: The trends in real prices which you presented may be more apparent than real since there seems to be a jump in prices around 1985 in all series. The price trends before and after 1985 appear almost flat. Could you please comment ?

Answer: What you say is correct. With the exception of the single price jump there was only a slight change in price of most species. Exceptions to this were puti and rui, for which the real price increased by over 1% per annum.

Mr. S. M. Kamal, POE/FPCO

Question: What was your approach in the assessment of total fishery? What was different from Department of Fishery assessment.

Answer: Our methods were based on the DOF manual. However, in comparison with the DOF we were fortunate to have more up to date computer hardware and software and a well-trained team of local and expatriate staff. This gave us the opportunity to re-input and evaluate DOF data. In most cases our estimates were close to those of DOF.

Mr. Tom Franks, FAP 2

Question: Can you please give some additional details of the basis of your recomputation of the DOF statistics ?

Answer: (The previous answer also applies to this question)

Dr. Monowar Hossain, MARC

Question: Bio-diversity is a complex issue, particularly when it is pitted against survival of another species. The poor amongst homo sapiens. Could the organisers provide a small niche to discuss this issue ?

Answer: Bio-diversity has not been scheduled as a specific topic at this conference but notice has been taken of the question and the subject will be considered when the agenda for the next conference is discussed.

Mr. Ahmed Ali, Agronomist, CPP FAP 20

Question: Why you call North East Region as fish-mine ? What about southern zone and coastal belts ? Think of shrimp culture and Ox-bow lakes down south.

Answer: We believe that generally the NE is the richest inland fishery region. The areas of water are larger, and periods of flooding longer than in any other region, providing more fish habitat. Our work shows fishermen take on average larger catches per unit of fishing effort and average fish size is also larger for most species.

Question: Did you study the prospect of shrimp culture development and production; and how far this can go; and what impact the FAP projects will inflict on shrimp-culture expansion and development ?

Answer: No, we have not worked on shrimp culture, though we do recognize the great importance of this industry to Bangladesh. It might be expected that increased construction of polders and increasing salinization will provide more suitable sites and opportunities for shrimp farming.

Question: With the expansion of HYV rice cropping pesticide use is increasing and people are saying that the diseases/syndromes now being found in the fishes are due to pesticides. Do you agree with that or studied that. If so, what are the intensities of organo-phosphorus and other pesticides those affecting the fishes?

Answer: The ODA-supported regional fish study has not been able to demonstrate a causative link between any environmental factor, including the presence of pesticides, and alternative fish diseases. FAP 17 studies found very low levels of organophosphatic pesticides in fish, generally less than 10% of the concentration considered harmful. Nevertheless, the extensive use of organophosphate is considered a potential risk to fish populations and consumers. This subject requires further study.

Dr. Monowar Hossain, MD, MARC

Question/Comment: Opportunities for intensive culture fishery is a benefit of flood control, just as loss of flood plain fishery is a

disbenefit. In my analysis of the impact of flood control on fisheries, both types of fisheries (i.e. culture and capture) should be taken into account. It appears that FAP-17 has not covered culture fishery so far. Will it be done in future? If not, why not?

Answer: We fully agree with you about the importance of fish culture. During the present Phase 1 activities of FAP 17 we have studies pond aquaculture in Bangladesh with particular reference to the "target group approach" of NGOs. During Phase 2 of our work, which is scheduled to begin in mid-1994, there is no doubt that we will be active in practical fish culture.

Mr. Ross Hughes, International Institute for Environment and Development

Question: If your revised estimate for flood plain fisheries production proves to be correct, what do you consider to be the implications for the economic justifications for proposed flood control infrastructure, particularly those of the north west and north central regions.

Answer: Clearly, if the production from floodplain fisheries proves to be substantially greater than previously thought, the economic loss from reduction in floodplain size will also be correspondingly greater. When FAP 17's own, more definitive results become available, we will be in the position to compare our measurements with those of DoF and offer a revised estimate of the magnitude of the loss.

Mr. Mokammel Hossain, DOF

Question: I came to know that FAP-17 provided information based on collected data of FRSS. It was wise if they could collect their own data and then could compare the data with FRSS. Would you kindly inform me what is the reason behind of this?

Answer: As pointed out in the answer to a previous question on this subject, FAP 17 is collecting its own data which will be compared with the results of FRSS analyses.

Mr. Syed M. Latif, SRP/EEC

Question: Did you consider the impact of boat engines specially "noise factor" which contribute to habitat change and decline in fish production?

Answer: No, we did not consider this issue, but we agree that this is an important point for habitat change of open water fishery.

Mr. Imtiazuddin Ahmad, World Bank

Question: One suggestion made was "community based new fisheries management policy". The elaboration was made (time constraint). But how does this differ from the new fisheries management policy?

Answer: The New Fisheries Management Policy (NFMP) is an experimental policy executed by the government through a multi-sectoral committee. We evaluated the policy in various ways and based on our findings we are suggesting improvements and actions to overcome existing constraints. One suggestion is a community based fisheries management approach through which the total community, including fishermen, around the fishery would receive benefits.

Dr. Stan Hirst, ISPAN

Question: Have you estimated costs and benefits for the various mitigation approaches in FAP 6 ?

Answer: No, at this stage we only identified the possible mitigation approaches. During our pre-feasibility and feasibility stages we would identify the suitable approaches and assess their costs and benefits.

Mr. Murshed Ahmed, Chief Economist, WARPO

Question: Existing and conventional structures should be replaced by congenial and appropriate structures for easy movement/ migration of economically important fishes in the study areas. The author could high light domestic and appropriate technology which highly useful technology easily transferred to needs of project beneficiaries.

Answer: At this stage no technology has been proved to be appropriate but we intend to explore all the options during FAP 6's next study phase.

Mr. S. M. Kamal, POE/FPCO

Question: In the decline of fishery, have you got any idea how much (say in %) may be attributed to FCD/I Projects? Why have FCD/I projects been singled out for critical assessment when it is generally accepted there are many reasons for the decline in the fishery.

Answer: Our report stated clearly all the possible factors responsible for environmental degradation and considered that FCD/I projects are a major factor in changing the aquatic environment. We also stated that a full flood control project could cause a 90% decrease in the fishery, a partial flood protection project a 50% decrease, river channelization a 25% decrease, river and khal re-excavation nil decrease and water retention structures nil decrease.

Mr. Gazi Nurul Alam, FAP-20

Question: It is said that beel fish reproduction maximizes if the water level increases in beel by around 1.5m within June, but if the increase of water level is delayed, reproduction will be delayed even up to August. Please comment.

Answer: Your statements are correct.

Mr. T. Herman, World Bank

Question: Floodplain fisheries imply fish more over the plain and not only in rivers. If this is so, surely "fish-friendly" structures do not help much for embanked polders covering the flood plain. Please comment on this and if submersible embankments overcome the problem.

Answer: Neither fish-friendly structures nor fish bypasses can replicate natural fish movement in an embanked haor. However, FAP experts are reviewing a range of technical options, including submersible embankments, to improve fish production in areas that also are intensively used for agriculture.

Mr. Gazi Nurul Alam, FAP 20

Question: Ref: "**Present trend of fisheries in North-East Region**" In your speech you mentioned that some of the fish species has undergone extinction and some are rare species. Could you please comment what

are the reasons causing such catastrophe? Also in your speech you told that stagnant water causes fish disease like "Epizootic Ulcerative syndrome disease". How can you confirm to that. Your comment please? Please go through handout & details in special study.

Answer: Excess siltation, pollution, river/beel bed raising, and deforestation of wetlands appear to be the main causes for the loss of species. Please refer to the FAP 6 Fisheries Report for detailed technical comments.

Mr. Mukleshur Rahman, FAP 16

Question: You mentioned about protecting carp spawning grounds - what about nursing grounds ?

Answer: Yes, we believe fish nursing grounds should also be protected.

Question: Floodplain afforestation and Beel binding - there will be little scope for fish to disperse/migrate to floodplain. Your comment.

Answer: Construction of embankments around beels would prevent lateral dispersion of resident species on to the floodplain for feeding and breeding in the early monsoon season. Raising silt levels in drainage canals may serve the same purpose of increasing dry season flood areas of beels, without preventing fish dispersal.

Question: Boal floodplain resident species - we found Boal (adult) - migrate from river to flood plain for spawning. Your comment.

Answer: FAP 17 is also studying fish migrations, and we will be able to describe the annual movements of important species when our work is finished. However, Boal is not a resident floodplain species but it does come on to the floodplain to spawn.

Dr. Monowar Hossain, MARC

Question: A quick comment was made about the floodplain fishery is not being compensated by aquaculture. Is this based on analysis carried out under your study ? If so, is the analysis available to concerned analysts ?

Answer: This point was not subject to technical analysis. It was a point from the social and economic perspectives (i.e. most of the floodplain is a free fishery whereas aquaculture usually is practiced in privately owned water bodies).

Mr. Mark Aeron Thomas, FAP 17

Question: Is your estimate of floodplain catch as 3 times the previous (FAP 6) regional statistic a corroboration of the FAP 17 findings, or dependent upon them.

Answer: The estimate of a floodplain catch as three times the previous regional statistic was a corroboration of the FAP 17 based on our surveys.

**Deliberation of Mr. A. K. Ataur Rahman
Chairperson of Special Session on Fisheries Study
Held in May 18, 1993 in Sheraton Hotel**

1. Mr. A. K. Ataur Rahman, Director, Department of Fisheries, Chaired the Fisheries Session on FAP Third Conference held in Hotel Sheraton. Dr. Mike Smith of FAP-17, Dr. (Ms.) Patricia A. Lane and Mr. Allen Bird of FAP-5, Messrs. Nirmal Chandra Paul and Subrata Nandi of FAP-6 and Mr. Stephen Minkin of FAP-16 made four presentations. Mr. Rahman, as Chairman of the session summed up and made some concluding statements. He appreciated the authors for their valuable presentations and stated that all the papers provided useful information based on fishery related studies of the Flood Action Plan.

2. The Team Leader of FAP-17 presented a surprisingly high estimate of fish production from floodplains based on commercial catch data of floodplains earlier collected by BFRSS of DOF. He mentioned that during compilation of catch statistics of floodplains by FRSS, the commercial catch of the floodplains were not considered by the FRSS consultant since there had been substantial mixing of catch data of riverine and bed fisheries which were within the floodplains. He pointed out that the production estimate of floodplains reported by FAP-17 Team Leader cannot be accepted without verification. The catch assessment study now being undertaken by FAP-17 in the four regions of the country is expected to come out with realistic estimates of floodplain catch in the country. It would be reasonable to consider the results of those studies to make a realistic estimate of floodplain production. He maintained that it would have been appropriate if the Team Leader of FAP-17 presented a report based on the data generated by them in the four regions of their study instead of bringing the controversial issue of fish production statistics.

3. The presentation socio-economic study by Steve Minkin has been very interesting and deserves appreciation. The presentations included a number of recommendations which need consideration. He appreciated the work of FAP-6 under which several 'river duars' have been identified in the North-East Region

which will help the Department of Fisheries in taking some management measures by way of declaring some of the important ones as sanctuaries for conservation of stocks and preservation of bio-diversity.

4. There has been controversies and differences of opinions in respect of capture and culture fisheries. Some mentioned that culture fisheries could greatly compensate fishery production losses, others mentioned that culture fishery could not conserve bio-diversity and could not significantly contribute to fishery losses. He maintained that through appropriate extension and technology transfer it is possible to increase production from culture fisheries many times. But the areas for aquaculture production is limited in the country (of the 4.3 million hectares of inland waters pond area is only 115 thousand). Even though we achieve 500% higher production in aquaculture, the output from pond culture will not be as significant as that of modest increment from vast capture fishery resources.

TECHNICAL SESSION III

May 19, 1993

(11:15 - 12:45 Hrs.)

- Chair: Dr. K. B. Sajjadur Rashid
Professor, Dhaka University
- Rapporteur: Mr. M. H. Siddiqi
Chief Engineer
Flood Plan Coordination Organization (FPCO)
- Topic: People's Participation in Compartmentalization
Pilot Project (FAP 20)
by Mr. Obaidur Rahman
Project Director, CPP Project, Tangail
- Discussants: Mr. Umed Ali Mia
Chairman, Union Parishad, Dhania

Prof. Quamruzzaman, BSS, Tangail

**PEOPLES PARTICIPATION IN THE
COMPARTMENTALIZATION PILOT PROJECT
FAP - 20**

**Presented by the Project Director
Md. Obaidur Rahman**

Introduction

1. Honorable Chairman and all present in the Seminar as partners in the activities of the Flood Action Plan and participants. "Assalam-o-Alaikum". This morning we heard how people's participation is being applied to FAP in general terms. I will only deal with how the application of people's participation is actually being carried out in the field in the FAP 20 pilot project. Before going into the details let me say a few words about the concept and objective of compartmentalization. This will help in understanding the aims, objectives and extent of people's participation in the project.

Concept and Objective

2. The compartmentalization concept with controlled flooding and containing the flood and rainwaters for in-field water management within a designated area has been a cherished issue for Bangladesh floodplain development. For the sustainability of such a concept public participation is of vital importance. The overall objective is to establish an appropriate water management system for the development of protected areas so that criteria and principles for design, implementation and operation can be made available for the action plan. This will entail the testing of the compartmentalization concept in the field under real operating conditions addressing all the relevant socio-economic, institutional and environmental issues, and trying out water control works and water management systems. The compartment is basically a management unit in which the involvement of beneficiaries is considered essential for its success. The objective is to provide, through water management, a more secure environment for intensive agriculture, fisheries and integrated rural/urban development and thereby improve the economic security and quality of life of the floodplain population.

3. The Pilot Project in Tangail and Sirajganj will demonstrate the practicability, viability and justification of compartmentalization. Through a systematic assignment of the advantages and disadvantages, the concept is to be verified. Economic, financial and social cost benefit assessments will be carried out under this project and taken into account in recommending the system for adoption in the Action Plan. In order to establish systems for water management and criteria for full-scale development, the following aspects, among others, will be examined:

- i. the physical works and their management
- ii. social issues and programs
- iii. the environment - its preservation and enhancement
- iv. institutional arrangements
- v. economic justification
- vi. impact on agriculture, fisheries, navigation and urban development

In the compartments, the required area development works can be broken down to manageable packages. The responsibilities for detailed planning, design, implementation, operation and maintenance can be decentralized and delegated to an institution, which should be organized in such a way that the peoples participation is ensured to a maximum extent.

The People's participation anticipated in the TOR of FAP 20

4. The specific objectives of the Pilot Project are to establish water management systems which are feasible, achievable and sustainable by among other things:

- i. involving the local population in planning, design, operation and maintenance.

- ii. providing disadvantaged groups with employment opportunities, whereby special attention will be paid to the involvement of women.
- iii. establishing consultation systems and procedures.
- iv. to ensure a close consultation between officials of BWDB and thanas, and between them and beneficiaries, to ensure that compartments are planned, designed, implemented, operated and maintained in ways that meet the needs of the population and minimize the kind of conflicts between groups in the area than can adversely affect project performance.
- v. to educate project beneficiaries as to their responsibilities in respect of operation and maintenance.
- vi. to establish legislation regarding the payment of water rates by the beneficiaries.

Planning and Operation of Compartments

5. Approaches to the planning and operation of compartments will be tested and developed, including the most effective ways of involving beneficiaries and of ensuring cooperation between BWDB and thanas. This will include:

- (a) Ways of consulting the local population and other interest groups during project planning and design. Potential conflict and complementarities between different interest groups will be identified at the planning stage and socio-economic, agricultural, hydrological and engineering surveys undertaken to ensure that compartments are designed so that they can be operated effectively and conflicts minimized. Early in the pilot project, recommendations would be made on approaches to be used in the consultation of the population in planning other

projects under the Action Plan.

- (b) Effective ways of involving beneficiaries in the operation of compartments. Various approaches to involving beneficiaries could be tried. One way might be for BWDB to organize and chair a committee of beneficiaries to operate the compartment (comprising, for example, the Thana Nirbahi Officer, Union council chairmen, representatives of farmers' cooperatives and of fishermen from different parts of the project area). Another way might be for the thana council(s) to do so, with BWDB acting in an advisory role. In both cases, District and/or thana officials from relevant departments (e.g. Department of Agricultural Extension, BRDB) and from non-governmental organizations would be ex-officio members of the committee. Initially the pilot project operational systems would be developed by the project, in consultation with local government officials and the beneficiaries. But when the committees are established, probably after at least one year of operations, the committees should be given the responsibility for further development of operational plans in consultation with Project staff. The effectiveness of the committees would be assessed periodically and when needed, changes would be made. The committees would also be responsible for assessing and collecting water charges and for educating beneficiaries about their responsibilities. At the end of the project, recommendations would be made on the best institutional arrangements needed for the operation of compartments.

Construction and Maintenance of Compartments

6. Ways of constructing and maintaining the compartments would be planned and designed so as to target the benefits as fully as possible to the rural and urban poor. These will be undertaken in cooperation with NGOs working in the area and will involve:

- (a) Reserving a part of all earthwork undertaken in constructing the compartments (initially probably 30%, later a higher percentage) to labor contracting societies (LCS) that are registered as 'D' class contractors with BWDB. LCS have

proved able to carry out earthwork to a good standard. By awarding contracts directly to the LCS, middlemen are excluded and the laborers receive higher wages.

- (b) Developing and testing ways for landless groups (especially women groups) to carry out routine maintenance (e.g. of embankments) in exchange for the right to cultivate embankment sides, to cultivate khas land or for a wage.

Application of People's participation in FAP 20

7. As stated earlier, one of the aims of FAP 20 is to involve the people in all stages of the compartmentalization process. Basically, participation requires that target beneficiaries are convinced of the rationale and objectives of the project. The approach is, where the people concerned define their own problems, the potential solutions, then discuss and agree to the suggested plan and take part in implementation, operation and maintenance to the fullest extent according to the resources available.

Participation in planning and design

8. Initially the Tangail compartment was divided into 16 sub-compartments. The multi-disciplinary survey (MDSC, later on renamed as needs assessment) was designed to assess the way the people of the area see the present water related situation, its problems and possible solutions. This information was used in the planning, development and design of the compartment and sub-compartments. The different FAP 20 specialists evaluated the problems thus identified and the solutions proposed by the people. They added their own suggestions as to what might be done, giving particular attention to the objective of the compartmentalization concept and matters that people are not aware of in respect of regional and national development that might affect the area.

Procedure applied for the survey

9. The survey team included a Drainage Engineer, Agronomist, Sociologist (male), Sociologist (female) and Fisheries Specialist. The Agronomist of the

MDSC survey team interviewed farmers while the Sociologist interfaced with the landless, artisans and laborers. Fishing communities, as well as subsistence fishermen will clearly be effected one way or another by water management. Therefore, the MDSC survey team included a fishery specialist to collect information on this sector. Water is also important to women. They bear most of the responsibility for crop and food processing, raising children, up-keeping the health of household members and participating indecision making. Apart from this, women are most vulnerable during floods. Therefore, the MDSC survey team included a female Sociologist to determine these issues. The team was given a two day training for this survey. Each Specialist then prepared their check list. Based on the general principles of the Rapid Rural Appraisal methodology, the team was specifically trained in gathering the perceptions of the local people about water related issues. The MDSC survey field work started mid January/1992 and completed in 4 months.

10. The following definition of RRA has been used for the survey: " A systematic, but semi-structured, activity carried out in the field by a multi-disciplinary team and design to quickly acquire new information on, and new hypotheses for, rural development". The survey schedule was made to allow two days field work and every third day was used for report writing for each sub-compartment. Group interviews of randomly selected individuals from the same interest groups were carried out. Interviews were normally held in location where people felt it convenient. Interviews started with an introduction, explaining them that as part of FAP the BWDB was about to start a program in the area and that the BWDB wanted to know the opinion of the people about the existing water related situation, the main problems and potential solutions. In terms of report writing each specialist drafted his/her own section and these were then compiled in a draft sub-compartmental report. On completion of the survey in a particular part, a meeting was held with the MDSC survey team and other relevant CPP staff to analyze and conceptualize the findings for anticipating in the planning process. A total of 25 sub-compartments were surveyed by the multi disciplinary team. Of these 17 are inside the CPP boundaries and 8 outside (i.e., influence area).

11. The three main conclusions of the MDSC survey were that;

- (a) Normal monsoon flooding is acceptable to rural and urban people as long as crops are not damaged and settlements and roads are not flooded. It is acknowledged that it brings fish fry

into the floodplain and allows cheap navigation. However, it also causes soil flooding and this can be problematic. People suggested certain structural interventions against floods. Local people in general valued embankments, including those living in the urban area, and at some places they suggested building regulators.

- (b) Early drainage in the post monsoon as well as pre-monsoon, to facilitate dry season crop production, is an almost unanimously expressed need of the farmers and detailed suggestions were made as to which channels should be excavated and what type of structures are needed to augment quick drainage of the congested waters.
- (c) The inhabitants of the area appreciated embankments/roads and suggested further improvements including bridges, culverts and pipe-outlets/inlets.

The CPP Team has taken the detailed and localized suggestions from the needs assessment, and has combined these into an overall and coherent development planning and design of the compartment.

The Consultation Process

12. As a continuing part of the process of people's participation the strategy and ultimate aim of the consultation process is to enhance the sustainability of the compartment. More specifically the consultation process aims at:

- (a) Sharing with all concerned information on the planning and technical interventions, including;
 - i. the needs as identified by the people and why their suggestions have or have not been taken up,
 - ii. the needs as identified by the different specialists and the interventions based on their observations,
 - iii. flood protection works planned and designed at the periphery of the compartment (embankment,

structures),

- iv. proposed additional internal water management works,
 - v. positive and negative impacts of all interventions, including proposed mitigation measures.
- (b) Sharing with all concerned information on the possible institutional interventions, and pre-work of the institutional setting.
 - (c) Feed-back from all concerned about the suggested technical and institutional interventions.
 - (d) Feed-back on additional and/or alternative interventions.
 - (e) Stimulate the involvement of all affected and concerned people in the compartmentalization process.
 - (f) Planning and involving interest groups in income generating works especially for the landless and the women (this step was considered essential because ultimately the people of the area would have to live with the additional benefits and negative effects that would be generated from compartmentalization testing).

13. The result of the consultation process is based on the assumption that the sustainability of compartmentalization requires:

- i. that the potential of flood protection and monsoon water regulation is carefully explained to the people affected by compartmentalization.
- ii. that the different interest groups (farmers, fishermen, landless, women, urban dwellers, etc.) be allowed to express their opinion without interference from other interest groups.

- iii. all public representatives of the area (union, thana, parliament) be consulted and their support/suggestions solicited.
- iv. relevant GOB, NGO and other officials be consulted.

14. The consultation with the elected representatives is seen as crucial to the institutionalization of people's participation. Such consultation is expected to stimulate the on-going process of democratization in the long run enhancing the sustainability of development procedures in general and compartmentalization in particular. In the consultation meetings, technically and socio-economically viable interventions and different water management systems were discussed with the different interest groups and their suggestions were sought as how to improve the interventions through minimizing social conflicts. During the first phase of the meetings the interest groups were approached separately. In the second phase, representatives (usually 2-3) of each interest group were brought together for a joint discussion. Mostly, these joint discussions led to proposals for change/shifts etc. which were again discussed in separate meetings followed by the members of joint meetings.

15. Apart from the meetings with interest group members, Union Parishad chairmen, ward members, local knowledgeable persons, elites, school teachers, etc. have also been consulted. These consultations have confirmed the findings in the villages and have led to an active participation of the local representatives in the project.

16. In a number of Sub-compartments the phased approach of consultation meetings has now been completed and the construction work is going on. In other areas this process will continue until the beginning of the monsoon. The remaining areas will be covered during the next dry season leading to construction in 1994-95. We may point out here that people very much appreciated the fact that the BWDB felt it important to ask their opinion and to explain the plans drawn up. This procedure was also applied to the outside influence areas, (upstream) of the compartment where the people could be negatively affected and mitigation measures have been planned in consultation with them.

Peoples participation in Implementation

17. Flood protection and compartmentalization in general are likely to bring much benefit to farm households and urban people. On the other hand provision for providing disadvantaged groups with employment opportunities giving special attention to the involvement of women in the construction, maintenance and other activities is also part of peoples participation in FAP 20. The landless/poor/assetless people expressed much interest in the fact that 30-50% of the earthworks would be reserved for the Landless Contracting Societies (LCS). A total number of 11 (eleven) LCS have already been provided with work contracts during the 1992-93 construction season. The reserved quota of earthworks for the LCS will increase gradually. The LCS this year are limited in number as no detailed procedure has yet been established. We are now in the process of strengthening the procedures for LCS and believe the qualitative and quantitative targets in terms of awarding earthworks to the landless directly, will be fulfilled.

18. Participation in implementation and development procedures of the project has also been planned and is being established through an institutionalizing process involving the interest groups (farmers, fishermen, etc.), public representatives, NGOs and the related governmental agencies.

Institutionalization

19. Instead of adopting the usual method of administering or operating the project by single agency/agencies in particular, the CPP has developed a plan to operate the project through a mode of local institutional arrangements involving the local people (interest groups), the related agencies and the public representatives. This would enable consensus-operation and a sense of ownership by all the people having water related activities within the project area, and this is expected to ensure sustainability of the project itself. The involvement of the local people and agencies in the surveys, planning, design and implementation process stimulates the need and dimension of the institution building.

20. Institutionalizing the process of peoples participation in the form of water user groups, sub-compartmental water committees and a compartmental water committee has been seen as a vital setting for the project and these are being developed from the related departments and the local people.

21. The main aim of institutionalization is to develop mechanisms for operating and maintaining the compartmental water management system. It will allow for changing requirements inside the compartment to be taken into account as time goes by. The whole system must therefore be seen as a dynamic process which will allow the inhabitants of the area to manage their water systems themselves to the maximum extent possible with the co-operation and expertise from the related government agencies and the NGOs.

22. A three-tier institutional setting for water management is being developed:

- i. at the level of beneficiaries:
Water User Groups (WUG)
- ii. at the Sub-compartment level:
Sub-compartmental Water
Management Committee (SCWMC)
- iii. at the Compartment level:
Compartmental Water
Management Committee (CWMC)

23. The field level water management in CPP will predominantly be decided at the chawk (landblock) levels of each sub-compartment depending on the water requirement and control status (water retention or drainage) of each field to be determined by the WUGs. The formation of WUGs would include the active representation of the farmers while the landless and womens groups would be represented in earthworks and the maintenance and production process.

24. The indented water management requirements of each WUG together would form the basis for sub-compartment water management planning and the operation of each sub-compartment would be decided by the Sub-compartment Water Management Committee (SCWMC). The SCWMC will be formed with the representation from the WUGs of farmers, fishermen, landless and women (also from the urban area if needed) and publically elected representatives (chairmen/ward members of the UPs), NGO representatives and field level personnel of DAE, BRDB, and BWDB as ex-officio members.

25. The overall management of the compartment in respect of water control and management would depend on the total requirements of the Sub-compartments and this would direct the operation and management of the peripheral elements and overall development planning of the project. The CWMC, which would be the ultimate authority to operate, manage and maintain the project, would be formed with the representatives of the SCWMC, NGO, public representatives and the district and thana level officials of DAE, BRDB, LGED, DoF, BADDC, DOL, R&H, Pourashava, Establishment Division (DCs representative) and the BWDB. The Project Director will be chairman of the Committee.

26. The CWMC will have the responsibility of liaising and if necessary, negotiating with the committees from the adjoining compartments for inter-compartment transfers of flood/drainage water.

Peoples participation in operation and maintenance

27. In the TOR a compartment is described as a 'Management Unit' and 'the involvement of the beneficiaries is considered essential for its success'. In the long-term this means that all concerned must be involved in the project establishment and operation. To provide the necessary sustainability their involvement in maintenance is also essential. The overall development procedures and the project operation and maintenance would stabilize with the involvement and active participation of the local people. With effective working of the institutional setting the operation and maintenance of the project would be sustained and the objectives of the water management would be achieved. The same process of peoples participation is being adopted in the Sirajganj Compartment with the updated expertise on the basis of experiences gained in Tangail.

28. In conclusion, I would repeat, the peoples participation in all phases of such (Compartmentalization) projects would appear effective and have an excellent potential provided that the process be taken up in a systematic and planned manner without hurrying for effect. If the approach and methodology of the process is well designed, honestly executed and religiously addressed it must bring good results, especially in augmenting the sustainability of the project besides perpetuating to a reasonable extent the socio-economic and democratic behavior of the people.

29. I would fervently hope this brief deliberation would benefit many of us in planning, designing and implementing of such projects under the Flood Action Plan.

Thanking you, Khoda Hafez.

**Technical Session on
Compartmentalisation Pilot Project (FAP 20)**

Answer given FAP 20 Team Members and FPCO Staff

Mr. Dirk R. Frans, FAP-20
Consultants Team Sociologist

Question: The three main conclusions of the most survey, as mentioned on page 5 of the paper are not those drawn by the team that did the survey. In the three main conclusions mentioned in the Tangail Interim Report there was a clear indication that people wanted drainage to improve dry season agriculture, but no regulators. In this paper that conclusions is turned up-side down; People are said to have asked for structures against floods. I realize that it is difficult for the FPCO and the PD to explain in a paper on people's participation what was happened in the FAP-20. It would have been perfectly justifiable to defend the turn of events (see Tangail Interim Report and annex, 1992) by pointing to (at least part of the) TOR as the FPCO/POE did in June, 1992.

Answer: It appears that Mr. Dirks Frans (Sociologist, FAP-20 Consultants Team) has forgotten the peoples suggestions and MOSC Survey teams conclusions documented in the Annex 1.3: MULTI-DISCIPLINARY SUB-COMPARTMENTAL SURVEY; MAIN VOLUME of the Tangail CPP Interim Report (September, 1992) wherein there are many references that the people wanted regulators and asked for structural interventions. But those were suppressed in the main volume of the INTERIM REPORT (September 1992) and the three main conclusions were written in a different way to conceal them, and not the team but possibly by one individual. We can cite some reference from the Annex 1.3 as below:

Page 21: "People in general value embankment, particularly those living in town; and at some places they have suggested building regulators.

"people have given detailed suggestion as to which channels should be re-excavated and where possible structures might be situated".

- Page 28: "2. Investigate the need for a regulator to control the inflow via Gala khal."
- Page 29: "2. The need for a regulator at Sadullapur or near Pauli should be further investigated."
- Page 30: "Alternatively a **regulator** beside pauli ensuring drainage to pungly to north will also solve this problem."
- Page 37: "2 Investigate the need of a regulator on the north of the kalibari khal."
- Page 38: "There is a demand for construction of larger **regulator** with low sill level."
- Page 39: "A **regulator** should be constructed at Baruha on this khal at the outfall to the Elangani river."

Question: However, I think it is totally unacceptable to change the findings of the needs assessment (MOSC Survey) to bring them in line with the objectives of compartmentalization as defined in the TOR as per interpretation thereof by the people.

Answer: It is quite clear from the report that people have suggested for mitigation of drainage congestion problems caused by outside and inside water; And this can only be done by constructing/re-constructing and building CDOs/regulators/ sluices. But it is a matter of great regret that these findings of the MOSC survey (needs Assessment) were not included in the three main conclusion documented in the Tangail CPP Interim Report, Main volume (September, 1992).

Now again, during the consultation process meetings peoples are quite agreeing with the plans and designs of the CDOs, regulators and other structures presented to them as envisaged in our intervention programmes (project plans and construction programmes) which they are finding to be beneficial to them

The FPCO and the PD didn't witch-hunt anything from the air, but it is from the inner stories of the MOSC Survey Teams findings and the real feelings of the local people that the truths of the soils have been pulled out and reflected in the presentation for information and realization of all concerned. It was not fair to draw the support of Mr. Adnan since we don't know whether he visited the project area and talked to the real peoples and the MOSC Survey Team Members or the Project Planners/authorities. He might have been misguided by his wishful hypotheses.

We did not change anything of the MOSC survey findings, rather tried to dugout the real truths (which were suppressed in the Interim report) from the original reports to highlight the real peoples perceptions and suggestions in the peoples participatory process towards compartmentalization concept of the project.

Mr. Abu M. Sufian, Research Advisory Service

Question: "Construction will start irrespective of public consultation;" this decision was taken last year by FAP Management. Interestingly enough the "Father of Compartmentalization" says "The compartment is a management unit in which the involvement of beneficiaries is essential for its success.

Answer: The FAP management believes as mentioned in the TOR that the involvement of beneficiaries is essential for its success. Because of this reason, Project Planning was started from needs assessment survey. The decision of FAP management was that general planning should be completed in consultation with the people, then construction should be started; and detailed / minor water management plan will be adjusted as per fields and peoples requirement during the construction period.

Mr. Chard, O.D.A.

Question: Do you think it would be appropriate to await results from the Tangail Pilot Project before starting further compartmentalization project ?

Answer: The testing in two different situation was envisaged in TOR. In these two locations, testing should be carried out simultaneously and the results then he analyzed.

Dr. Bruce Currey, Independent Scholar

Question: Could you explain in Bangla and English the meaning of the Word "Cherismo" in the context of the first para of the concept and objectives of Mr. Shafi's paper.

Answer: To charm 'somebody'.

Mr. Iqbal Karim, UNDP

Question: Organizing the groups and committees and delegating some responsibilities to them, would possibly end-up with the same fate which the Framers' cooperatives had in the G.K. Project.

Answer: Institutional settings are being examined. Thanks for the suggestions.

Question: The consultants should review and examine the causes and factors, in order to develop a mechanism that could address the issue, more from realistic perspective.

Answer: The issue will be considered during the study.

Mr. Murshed Ahmed, WARPO

Question: The concept design and strategy as envisaged for CPP (FAP-20) will not bring much benefit to farm households without provision for irrigation infrastructure. Again cost recovery for such FCD works will be difficult issue since it is considered as a social service and pre-conceived as public welfare project whose benefits cannot be readily quantified.

Answer: Not fully correct. These factors are being considered and strategies being developed to address these issues.

Mr. T. Herman, World Bank

Question: Is a objective of compartments also improved flood control by limiting flooding to the compartment area in the event of embankment failure ? If so, is the likelihood of deep flooding within the compartment mentioned at public meetings as a disadvantage accompanying improved water management ?

Answer: The one of the objectives of Compartmentalization is to contain the effect of embankment breach in the Compartment/ Sub-Compartment. The breach mitigation is discussed in the consultation meeting.

Dr. Tofail Ahmed, BARD, Comilla

Question: What provision has been made for the resettlement squatters on the FAP-20 Embankment following land acquisition by BWDB ?

Answer: Surveys are being undertaken to identify and quantify the squatters to be affected by land acquisition; and resettlement plans are being formulated for them. Presently the prevailing Govt. rules are followed.

Mr. S. B. Nandi, FAP-6

Question: There will be no open-water fishery after the implementation of such types of pilot project. Comment please.

Answer: Since CPP concept allows controlled flooding there will still be open water fishery, though at a little reduced rate.

Question: Compartmentalization will restrict fish migration, reduce water hectare month & reduce fish production. Is it possible to replace that production by culture based pond fishery ?

Answer: Yes, a fishery mitigation plan has been developed, not only polyculture in ponds but also culture-based fishery in the beels and flood plain with stocking (by fingerlings produced from hatcheries) in monsoon. It is estimated that by such culture-based fishery mitigation programme not only the reduced fish production due to structural intervention will be replaced rather enhanced production will be possible.

Mr. J. Bird, ADB

Question: In view of your experience in FAP-20, how important is the legal framework to successful operations & maintenance by water user associations, in particular the public participation act.

Answer: It is of real importance no doubt. we have not yet started O&M of the project which will be done in 1996-97 after the construction/implementation of physical and non-structural works in 1985. We are anticipating these issues in our O&M procedures and institutionalization process. Some regulations will be required for successful O&M of the project.

Question: What provisions have been made for conflict resolution between sub-compartment groups in the O&M of the system.

Answer: Sun-Compartmental Water Management Committees (WCWMC) and the Compartmental Water Management Committee (CWMC) proposed to be established, with representations from lower groups (interest groups, WUGs) and from related departments/agencies and the local public representatives; These committees will resolve the conflicts of each respective tiers and will be responsible for sound O&M.

Mr. Akhtar Hamid Siddiqui, MP, Naogaon-3

Question: Whether MP's can be taken to Tangail Pilot Project area for a short visit to acquire practical knowledge about the project during monsoon period.

Answer: Every body including the Honourable MP's will be welcomed in the project, But there is no such separate programmes.

Dr. Kazi Sadrul Hoque, ISPAN

Question: Now that the guidelines for People's Participation (GPP) is prepared by FPCO, to what extent these guidelines being tested by FAP-20 for effective People's Participation? What is your experience in the field testing of the GPP? How far the objectives been achieved so far by FAP-20? What problems you faced?

Answer: For effective peoples' participation FAP-20 has its own programme from the very beginning. This programme is more elaborate than the GPP. So it can be said that the GPP. is being tested in FAP-20.

Ms. Monira A. Khatoon, RAJUK

Question: Percentage of women's representative at different level of water management groups ? Methodology of selecting or electing the women's representative ?

Answer: There will be women Water User Groups (WUGs) in each area of all the sub-compartments wherever women Groups exist or new groups to be formed through BRDB and NGOs. Representatives from Women WUGs will be taken to sub-compartmental water Management Committees (SCWMC) through election or selection whatever they decide. One women representative from the SCWMCs will be taken to the compartmental Water Management Committee (CWMC) through election/selection. Usually the methodology used by the BRDB/NGOs will be undertaken.

Question: Whether all the NGO working within the project area will have their representatives ?

Answer: No. the NGOs (usually 2/3) who have maximum coverage in the project area would be encouraged to set their representatives.

Mr. M. Anisur Rahman, Bangladesh Sangbad Sangstha (BSS)

Question: It seems that people are appreciating the CPP Projects for their immediate benefits. Would this be enough to justify the project ignoring the long-term ecological consequences ?

Answer: Not only that. We are also studying the long term ecological/environmental impacts, and chalking out enhancement and mitigation plans to implement and monitor for long term effects.

Mr. Md. Rahamat Ali, MP

Question: Do you consider the public interest in the People's Participation and advise.

Answer: Yes, we considered and will continue to consider the public interest in the people's participation and advise.

বেগম মতিয়া চৌধুরী, এমপি

প্রশ্ন :- পানি উন্নয়ন বোর্ড এবং ফ্যাপ এর কার্যক্রম সম্পর্কে গণপ্রচার মাধ্যমে রেডিও, টেলিভিশনে আলোচনা অনুষ্ঠানের কোন পরিকল্পনা আছে কি ?

উত্তর :- ফ্যাপ সম্পর্কীয় কার্যাবলী বিভিন্ন সময়ে দৈনিক সংবাদপত্রে এবং রেডিও ও টেলিভিশনের মাধ্যমে আলোচনার ব্যবস্থা ভবিষ্যতে করা যাইতে পারে।

প্রশ্ন :- গত দু'দিনের আলোচনায় আমরা জ্ঞানতে পারলাম কয়েকটি প্রকল্পকে অগ্রাধিকার দেওয়া হয়েছে। এই অগ্রাধিকার কি জনগণের অংশীদারিত্বের ভিত্তিতে করা হয়েছে ?

উত্তর :- ইহা জনগণের মতামতের ভিত্তিতে ও অর্থনৈতিক ও সামাজিক উপযোগিতার ভিত্তিতে প্রকল্পসমূহের অগ্রাধিকার নির্দিষ্ট করা হয়েছে।

প্রশ্ন :- টাঙ্গাইল পাইলট প্রকল্পের আওতাধীন একটি ইউনিয়ন ধানিয়ার নিবাচিত চেয়ারম্যান আশংকা প্রকাশ করিয়া বলেছেন ৮৮'র বন্যার মত আরেকটি বন্যা ঠেকাবার শক্তি বা সামর্থ্য এই প্রকল্পের নাই। তাহলে ৮৮'র বন্যার অভিজ্ঞতার আলোকে ফ্যাপ কর্মসূচী হাতে নেয়া হয়েছে, এই বক্তব্যের সার্থকতা কোথায় ?

উত্তর :- ১৯৮৮ সনের বন্যার ব্যাপকতা এবং ভবিষ্যতে এই ধরনের বন্যায় ক্ষয়ক্ষতি লাঘবের উদ্দেশ্যে ফ্যাপ কর্মসূচী হাতে নেয়া হয়েছে। ফ্যাপ-২০ বন্যা নিয়ন্ত্রিত এলাকায় একটি পানি ব্যবস্থাপনা প্রকল্প।

Begum Matia Chowdhury, MP, Sherpur-2 [English Translation]

Question: The elected Chairman of Dhania, a union under Tangail Pilot Project, was expressed concern that this project does not have the capacity to resist the effects of a flood like 1988. If that be so what is the justification of the claim that this project has been undertaken in the light of the experience of the flood of 1988?

Answer: Bangladesh Flood Action Plan (FAP) has been undertaken towards achieving the objective to reduce the future flood damages similar to that of the catastrophic flood of 1988 and also to mitigate the extent of flooding. FAP 20 is a water management project within an existing flood control area.

Question: During the discussions in the last two days, we learnt that some projects have been selected on priority basis. Has this priority been given on the basis of people's participation?

Answer: Yes, the projects have been given priority on the basis of people's opinion and on their social and financial viability.

Question: Is there any plan to project the functions of the Bangladesh Water Development Board and FAP through, mass media like Radio and Television?

Answer: All FAP activities are being widely covered in national media including Radio and Television

Mr. Masud Hasan Khan, Reporter, The Daily Star

Question: What are the major challenges you faced while involving people in the project implementation?

Answer: In Socio-Economic system in Bangladesh it is difficult to organize the people for involving the people in project planning and implementation. The consultation is started from grass root level and it is expected that proper involvement can be possible.

Mr. Gazi Nazrul Islam, MP

Question: Is it equal meaning that the People's Participation and "Local People's Representatives' participation? If not, how the representatives of the people can participate in compartmentalization pilot project? Please Answer, Thank you.

Answer: Peoples participation as a whole includes local peoples representatives obviously. In all aspects and tiers of Project planning, designing, implementation and O&M the local peoples representatives (say UP Member, Chairman, Pourashava Ward Members and Chairman) are involved and they are expected to be in all the committees of the Project. However, in addition to peoples representatives, different interest groups are also consulted and represented.

Mr. J. U. Chowdhury, BUET

Question: It is good that target beneficiaries would be convinced of the rationale and objectives of the project. But how the views of the people who would be adversely affected by the project would be taken into consideration ?

Answer: The Need Assessment Surveys and Consultation process have also been undertaken for the disadvantaged/adversely affected people in and around the project area. Mitigation measures have been planned and will be implemented to redress the adverse affects.

Mr. Khaja Ahmed, CFD, Dhaka

Question: The UP Chairman of Dhania proposed to shift the embankment alignment towards the river. Is he informed about the justification of the alignment ? I would like to know more about the consultation process, information exchanged, etc. regarding the alignment.

Answer: In the consultation process meetings alignments of the embankments are duly discussed with all interest groups and local public representatives. Sometimes new suggestions come to shift the alignment but if those are not technically feasible the matters are again discussed with them and convinced. We are not constructing new embankment rather the old existing embankment/road would be resectioned and improved to form flood defence. Moreover, surveys are being conducted to identify and quantify the displacements due to increase in alignments at different places, for planning compensation and resettlement issue

Mr. Mujibul Huq, POE, FPCO

Question: In our meeting with NGOs at ADAB, a case study was presented in which it was found that most people in CPP area have no idea of what was going on. Your comments please in view of the consultation process going on for the last two years.

Answer: The case study may be biased. We have covered 76 villages out of 152 in our Needs Assessment Survey during 1991-92. In the consultation process meetings were held about 108 times covering most of the villages. The process is continuing. Moreover, in several Workshops/Seminars we have discussed our project with about 500/600

peoples including local MPs., UP Members and Chairmen, Pourashava Ward Members and Chairman, local elites, Journalists, NGO representatives, Officers and staff of (local)GOB departments/agencies etc. In addition, by now, we have had meetings with about 30-40% of the farmers in each chawk of Sub-Compartment # 9,10 and 11 in the process of organizing the Water User Groups (WUGs). So the observation of ADAB is not and can not be correct.

Mr. Mian Akbar Hussein, Service Civil International (SCI)

Question: Can you provide any analysis on economic Benefit:

Answer: Since this is a testing project final economic evaluation has not been done at this stage. This will be done in 1997. However, preliminary economic analyses have been exercised which reveals that the project will largely benefit from present status. For example, it has been estimated that about 9000-10000 tons of additional quantity of rice will be produced and crop diversification will bring further benefits out of intensive productions in the field.

Question: What is the present status ?

Answer: Studies going-on.

Question: What would be the estimated benefit after FAP-20 if implemented ?

Answer: The estimate will be completed after completion of the study.

Question: How the environmental degradation caused due to implementation of FAP-20 ?

Answer: Environmental aspects have been addressed to. But the question of any degradation have not been finalized yet except the capture fishery will be slightly decreased for which mitigation plan has been evolved.

Question: How about water logging? How it could be solved?

Answer: To release water logging (congestion) is a prime criteria in our project concept, and this has been given the topmost priority in survey, Planning, design implementation and O&M of the project. Controlled entry of flood water through regulators, re-excavation of

khals, establishment of CDOs (Controlled Drainage Outlets) etc. have been planned to release the water logging.

Mr. Jerome Sarkar, RDRS/LWF

Question: While you intend to involve women' participation, may I know, if you have female expertise to consult the women group in identifying their need.

Answer: Yes, we have one Female Sociologist and one Women-in-Development (WID) in addition to short-term expertise by an Expatriate WID.

Prof. Van Ellen, POE/FPCO

Question: For the benefit of the audience, it is appropriate to mention that, according to FAP, a compartment is a protected area, with its own system for water management. If the definition has been changed subsequently, this could be entirely acceptable, but should be explained.

Answer: Yes, the Compartment is to be a protected area where internal water management systems would be developed with controlled flooding and drainage, and maintaining desired water levels to enhance crop production and enable production of culture-based fishery in addition to other development effort and for damage prevention. The definition of Compartment is not changed.

Mr. M. F. A. Siddiqui, MARS & Associates

Question: Have you assessed the opinion of the beneficiaries under the provisions of existing laws in force e.g. EBACT-1 ?

Answer: Under the Act, the Government by notification in the official Gazette declared the limits of any tract within which the provisions shall take effect. But in BWDB this is not practiced since long. Moreover, the opinion of beneficiaries under the Act is sought when the plan is complete. But in FAP-20 the people are consulted from the very beginning starting from needs assessment.

Question: How does the Thana Nirbahi Officer whose existence in the present form has been questioned by a section of the people appear in the committee ?

Answer: This is not the case in FAP-20. The institutional set up is being studied and will be tried.

Question: How do you propose the Thana Councils who are no longer in existence, organize the committee ?

Answer: This is not the case in FAP-20.

Question: Does your institutionalizing process need any legislative sanction ? If so, is there any law in existence ? If, yes, what is that law? If not, do you suggest enactment of any ?

Answer: This is being looked by FPCO and the WDB. Legislative sanction/regulations are being worked out. If required that will be practiced in FAP-20.

Mr. A. H. Chowdhury, MP

Question: Now that implementation process has started, what are the satisfactions and frustrations emanating from people's participation ?

Answer: The places in the project area where we started implementation have been found encouraging through people's participation except that the compensation to land acquisition is taking time.

Question: I would also like to know what, if any, is the perceived specific role expected from people's representatives at all levels.

Answer: We are involving the local people's representative (UP members and Chairman, Pourashava Ward members and Chairman) in specific tiers of the institutionalization and they are expected to play their due roles. In addition, we are seeking the supports of the MPs; and other people's representatives.

Mr. Anton Schutte, The Royal Netherlands Embassy, Dhaka

Question: On page 5, first conclusion, if Mr. Rahman's paper, it is stated "Local people in general valued embankments, including those in urban area". Could Mr. Rahman indicate more precisely the needs as expressed on the one hand by rural people and on the other hand those expressed by urban people.

Answer: This would need a long elaboration because needs varied from area to area and place to place depending on site and situation specific problems and criteria. Precisely, the rural people asked for release of drainage congestion, protection of crops and property from flood damages, improvement of communication facilities, balanced water conditions for crops as well as fisheries, enhancement of conditions for health and sanitation, and many more things; the urban people strongly demanded protection from floods, improvement of conditions for health and sanitation, better communication facilities, protection of the town from river erosion etc. etc.

Mr. Lutfur Rahman, BWDB

Question: You have stated "participation requires target beneficiaries to be convinced of the rationale and objective of the project", Then Who are the nontarget beneficiaries ?

Answer: Non-target beneficiaries may include the people in transportation sector, servicemen, traders and business people, teacher-student, general laborer etc.

Question: If they (non-target beneficiaries) are not convinced of the rationale and objective will the project go through?

Answer: It is very difficult to evaluate the non-quantifiable and social benefits to be obtained by these non-target beneficiaries. However, if benefits come through them, at least, may not be needed to be convinced which will automatically generate their consensus to support the project.

Engineer Md. Aminur Rahman, Consulting Engineer

Question: What is the exact difference between a polder and a compartment ? Polders also have flushing sluices and water management manual involving peoples' participation. If the polders have failed why the compartments will not ?

Answer: The difference between a polder and a compartment is basically that the polder is only peripherally controlled and have little regulatory devices but the compartment allows controlled flooding and drainage systems and have internal sub-compartmentalization and mini-compartmentalization with network of flushing the drainage control devices for micro-level water management right upto field (chawk) level with relevance to damage prevention, development of secure agro-environment for crop production and culture-based fishery, release drainage congestion for intensive and diversified cropping, and importantly the O&M and management of the project by people's institutionalization. We don't have any information that polders have failed, rather we know that polders (mostly in the southern and coastal belt) have protected millions of people from tidal floods/surges and saline intrusion. May be in some polders, some problems may come during operation (which is natural).

Question: The designation "pilot project" means the aim is to experiment, is it not? How long the people of the project area will be subjected to the experimentation?

Answer: Pilot project of FAP-20 means testing the concept of compartmentalization. This is done in consultation with people. The project operation (partly) will start from 1994 and complete in 1997.

Mr. Chard, ODA

Question: Were local people consulted on the desirability of a "No - Flood control/improved drainage" option? if not, why not?

Answer: Consensus were developed from Needs Assessment Survey where no leading questions were asked to the people, and the options have been developed from their perceptions and suggestions with refinement by technical feasibility exercises. So, automatically the options of both flood control (rather controlled flooding) and drainage improvement came up together; and the people have accepted those respecting the technical feasibility and desirability.

Question: Do you think it weakens the value of the process if people must choose from limited options?

Answer: As explained above there is no "limited options"; the options

have been developed on the basis of the people's perceptions and suggestions and followed by technical feasibility exercises etc. However, the people are told about the concept during the consultation.

Mr. M. A. Quassem, BWDB

Question: Will you agree if I put the objectives of "peoples participation" more bluntly as follows:

- (a) The population of a project area has the right to participate in its (project's) planning, implementation, operation and maintenance i.e. the moral value of peoples participation.
- (b) Peoples participation facilitates need-based effective planning i.e. its technical value
- (c) It facilitates construction, operation & maintenance i.e. its management value
- (d) It generates awareness about the project i.e. its social value.

Answer: Agreed; and it paves the way for production and commercial activities also i.e. the economic value.

Mr. A. F. M. Shahidul Alam, FAP-2

Question: In compartmentalization project, the compartment followed the existing village road connecting the Market and Growth Center. In assessing the project benefit whether CPP (FAP-20) considered benefit of transportation as an improvement of Feeder Roads.

Answer: Since this is a water related project mostly based to water management, and the road developments are secondary features, the economic benefits of facilitating transportation have not been quantified at this stage. During economic analysis, this aspect will be looked upon.

Md. A. T. Khandakar, BWDB

Question: There are certain specified rules to award works to the contractors. How do you award contracts directly to the LCS?

Answer: For awarding works directly to the LCS a separate procedure have been developed.

Question: What legal and technical means have you got to give right to people to cultivate embankment sides and to cultivate khas lands in exchange for routine maintenance of project embankment ?

Answer: The procedure is being evolved.

Question: You mentioned about educating beneficiaries about their responsibilities. Can you take help of the ongoing Gono-shikkha programme in this particular matter ?

Answer: We would not confer formal education. Educating the beneficiaries about their responsibilities would be done through training and meetings.

Mr. M. Mohammed, ADAB, Member

Question: Are you free to give interview about FAP-20 in your office asked by any Bangladeshi citizen, without permission from your relevant authority.

Answer: It is better to differentiate between discussion and interview. This is no bar to discuss about the project with any Bangladeshi citizen. But for interview ;it depends on what type of interview and who seeks the interview.

Question: As you told it is a study project (pilot FAP-20), it will be replicated in other places, if the project is successful. But if not, then what will you do with these structures of FAP-20 later on; and is their any commitment to compensate the people for their losses in the study?

Answer: It is not yet decided, but we are hopeful of success since those are developed ;with people's participation. If there would be any defect or disbenefit those will be amended with due further studies and verifications; there is no such commitments, and we don't apprehend any loss. Land acquisition compensations are already being given. But

this aspect is being looked upon and provision for compensating the loss is kept under mitigation plan.

Question: Whether the people of FAP-20 were told to give their consent to volunteer themselves in the study?

(This is a critical issue for starting any study involving people).

Answer: Yes, they are already evolved, and they are participating.

Mr. Abu M. Sufian, Research and Advisory Services

Question: Concept and objectives as defined in the CPP (FAP-20) paper pre-supposes structural measures. It also terms it as "a cherished issue for Bangladesh Flood plain development".

Answer: It is not fully true that the concept is hypothetical and utopian "never-heard-of". The concept is a modified approach, with detail and micro-level water management, to traditional FCD/I and polder concept entailing controlled flooding and drainage valuing the local peoples perceptions and suggestions.

Question: The same paper argues the justification of this hypothetical and utopian "never heard-of" concept-which is to be verified".

Answer: The concept has been explained to the people and there is open flexibilities in the planning where people have the right to suggest and choose the alternatives; so there is little chance to go wrong.

Question: If the project goes wrong, will you say that "local people wanted this measure (compartmentalization)" and you have followed local peoples' recommendations.

Answer: Chance of failure is negligible, because works are being done by consultation with local people.

Dr. S. M. Elias, FAP-17

Question: In your project, peoples participation has been mentioned for planning, design and implementation stage. But not in monitoring and evaluation stage, which is very important for modification of project ? Why ?

Answer: Monitoring and evaluation is usually done by the Specialists,

but obviously and naturally involving the people since our plan of 3-tier institutionalization would be represented by the interest groups of the people.

Question: In your survey team, no agricultural economist is included. This is a big gap because, economic situation of the people can best be identified by them.

Answer: Our Agronomists and Economists are jointly doing the jobs.

Question: In your Survey Team, sociologist (male) and sociologist (female) have been included. This is not necessary to separate male and female sociologist. In the University, there is no separate course curriculum for male and female. Rather to identify womens participation, gender related specialist can be included. What is your comment?

Answer: Sociologist (Female) has been included in the team to facilitate contact and interviewing with the women of the project area easily as required in our social circumstances, and to organize the women to involve in our project activities. We have also in our team a WID (Women-in-Development) Specialist.

Mr. S. N. Anwar, FAP-2

Question: Any criteria for socio-economic, agricultural, hydrological (atleast broad based) been established ? How peoples participation have influenced the modification, if any, of the criteria.

Answer: Criteria has been established. On the basis of out-come of people's participation, even the design criteria for regulators are modified.

খাঁজা আহমেদ, সিএফডি, ঢাকা

প্রশ্ন :- আপনি বাধের এলাইনমেন্ট মত কাজ করতে প্রস্তাব করেছেন। আপনি কি জ্ঞানের বাধের এলাইনমেন্ট সম্পর্কে কি তথ্য সংগ্রহ করা হয়েছে এবং কিসের ভিত্তিতে আপনি এই প্রস্তাব করেছেন?

উত্তর :- পুরাতন বাধ যাহা গ্রাম্য রাস্তা উন্নয়ন করিয়া করা হইয়াছিল। এই বাধের বাহিরে অনেক বাড়ী ঘর পড়িয়াছে। জনসাধারণের অনুরোধে এবং লিখিত আবেদন মোতাবেক সরঞ্জামিনে আলোচনা করিয়া বাড়ী ঘর ভিতরে আনার জন্য এলাইনমেন্ট পরিবর্তনের প্রস্তাব করা হয়।

Mr. Khawza Ahmed, CFD, Dhaka

Question: [English Translation] You have proposed change of alignments in embankments. Have you any idea about the facts , information or data based on which such a proposal has been made.

Answer: The rural roads were developed through the old embankments. A lot of homesteads have fallen outside the embankment area. On the request of the people and on the basis of on the spot discussions, in response to their written representations to bring in the homesteads inside the project area, the change of alignment has been proposed.

মোহাম্মদ আতাউর রহমান, জিইউপি

প্রশ্ন :- জনাব, আপনি কি মনে করেন যে আপনাদের এলাকাবাসীর গুরুত্বপূর্ণ সলা-পরামর্শ সিপিপি'র কর্তা ব্যক্তিরা শুনছেন এবং সে মত ব্যবস্থা গ্রহণ করেছেন? না করে থাকলে কেন করেন নি? জানেন কি?

উত্তর :- সিপিপি আমাদের এলাকাবাসীর সলা-পরামর্শ নিয়ে এবং জেনেশুনে সেই মোতাবেক কাজ করছেন। কৃষক, ছেলে, বিস্তহীন ও মহিলা সম্প্রদায়ের সংগে পৃথক পৃথক আলোচনা সভা ও পরিশেষে জনপ্রতিনিধিদের সহ যৌথ আলোচনার মাধ্যমে পরিকল্পনা প্রণয়ন করা হয়।

প্রশ্ন :- আপনি কি মনে করেন নদীতে বাধ দিলেই আপনাদের সব সমস্যার সমাধান হবে? যদি না হয় তবে সিপিপিতে আর কি কি করা উচিত বলে মনে করেন?

উত্তর :- নদীতে কোন নতুন বাধ দেওয়া হবেনা, পুরানো বাধ/রাস্তা মেরামত ও সংস্কার করে বাধ-উপযোগী করা হবে। তাছাড়া খাল পুনঃ খনন করে জলাবদ্ধতা দূর করা হবে, কপাটখালী দিয়ে নিয়ন্ত্রিত বন্যা ব্যবস্থাপনা করা হবে, প্রকল্প এলাকার প্রত্যেক অঞ্চলে/অংশে অবস্থা ও সমস্যা ভিত্তিক প্রয়োজনে পানি ব্যবস্থাপনা কাঠামো ও সংশ্লিষ্ট উন্নয়ন পরিকল্পনা বাস্তবায়িত করা হবে।

Mr. Mohammad Aatur Rahman, Gono Unnayan Procheta (GUP)

Question: [English Translation] Do you think that the CPP authorities pay heed to the important advises of the people of your area and take steps accordingly.

If they don't pay any heed to the advises - why don't they do so? Do you have any idea? Thanks.

Answer: CPP authorities listen to the advises of the people of the area and work accordingly. They have held separate meetings with the presents/farmers, fishermen, destitute people and the women of the area. They have held joint sessions with the peoples' representative. And on the basis of these discussions project plannings are being carried out.

Question: Do you think that building embankments on the river would solve all your problems? If you don't think so, what other steps CPP can take?

Answer: There will be no new embankments. The old embankments/roads will be repaired so as to make them effective. Besides through reexcavation works the problems of water logging will be solved; steps will be taken for controlled flooding at Kapatkhali. In every part of the project area, according to the local needs and problems, the water management infrastructure and necessary development planning shall be implemented.

Mr. Mian Akbar Hussein, SCI

Question: Are you aware about the consequences of environmental degradation cause due to compartmentalization ?

Did you discuss this issue with local people ? If so, what are their responses?

উত্তর :- আমরা এই প্রকল্পে পরিবেশ দূষণ জাতীয় কোন সমস্যা দেখতে পাচ্ছি না। এই বিষয়টি নিয়ে খাম্বাকাই বাড়বাড়ি করা হচ্ছে। আমরা শুধু মনে করছি যে প্রকল্পের ফলে এলাকায় মাছের উৎপাদন কিছুটা কমে যেতে পারে এবং এ ব্যাপারে আমরা এলাকার জেলে ও কৃষকদের সংগে আলাপ-আলোচনা করেছি এবং সিপিপি কর্মকর্তাদের সংগেও আলাপ-আলোচনা করছি। তারা জানিয়েছেন যে, মাছের উৎপাদন যাতে বজায় থাকে সেজন্য একটি মৎস্য চাষ পরিকল্পনার মাধ্যমে ব্যবস্থা নেয়া হবে।

Answer: [English Translation] In this project we find nothing that would really pollute the environment. But we feel that as a result of this project the fish production in the area may decrease. We discussed the issue with the fisherman and the farmers of the area. We also discussed the matter with CPP officials. They ensured us that to keep up the fish production, steps would be taken to implement a fish culture development project.

[Editor's Note: Some of the questions and answers were in Bangla. They have been freely rendered into English]

ডঃ তোফায়েল আহমেদ, বিএআরডি, কুমিল্লা

প্রশ্ন :- (১) ইউনিয়ন পরিষদ সভাপতি হিসাবে শুধু বন্যা নিয়ন্ত্রণ নয়, স্থানীয় উন্নয়নের বিভিন্ন কার্যক্রম স্থানীয় অফিসারগণ আপনাদের মতামতের উপর কতটুকু গুরুত্ব আরোপ করেন ?

(২) ইউনিয়ন পরিষদের বর্তমান কাঠামো, অর্থায়ন ব্যবস্থা, ক্ষমতা ইত্যাদি বিবেচনা করে আপনি কি মনে করেন যে ইউনিয়ন পরিষদগুলো খুব ভালভাবে চলতে পারবে ? না পারলে কি করা ভাল। মন্তব্য করুন।

উত্তর :- (১) অনেক গুরুত্ব আরোপ করেন।

(২) ইউনিয়ন পরিষদের বর্তমান কাঠামোতে স্বাবলম্বী হওয়ার জন্য ব্যবস্থা ও ক্ষমতা যথেষ্ট নয়। ইঞ্জিন চালিত নৌকা, ডিপটিউবওয়েল, স্যালোটডিউবওয়েল, রিক্সা, ভ্যান, গরুর গাড়ী, ঘোড়ার গাড়ী, ঠালা গাড়ী, ট্যাক্সীর আওতায় রাখা। ফেরিঘাট, নদীর উপর খেয়াঘাট ইজারা দেওয়া ও ২০,০০০.০০ (বিশ হাজার) টাকা পর্যন্ত ফৌজদারী ও দেওয়ানী মোকাদ্দমা এবং জরিমানা ক্ষতিপূরণ ডিক্রী দেওয়া ও আদায়ের ক্ষমতা দেওয়া।

Dr. Tofail Ahmed, BARD, Comilla

Question: [English Translation] To what do you think, as Union Council Chairman, not only in the case of flood control, but in all local development efforts, the local government officials pay importance to your opinion?

Answer: They pay a lot of importance.

Question: Considering the existing financial condition, power etc. do you think that the Union Councils could work very well? If not, what do you think should be done? Please comment.

Answer: The financial arrangements and authorities are not enough for the Union Councils to be self reliant. power driven boats, deep-tubewells, shallow-tubewells, rickshaws, vans, horse or bullock - driven carts, push carts could be brought under the taxation authorities of the union councils. Union Council could also be given authorities to lease out ferries etc. and to deal with criminal and civil cases and realise compensations/fines to the maximum tune of Tk.20,000/=

মিঃ মোস্তফা কামাল মজুমদার, দৈনিক টেলিগ্রাফ, ঢাকা

প্রশ্ন :- কোন বিষয়ে জনগণের মতামত গ্রহণ করার সময় দেখা যায় চেয়ারম্যান, মেম্বারদের বিরুদ্ধে কেউ কিছু বলতে পারে না। চেয়ারম্যান, মেম্বারদের আবার এলাকা এবং পেশাভিত্তিক স্বার্থ থাকে। তাহলে সাধারণের মতামত সঠিক মতামত কিভাবে নেয়া যেতে পারে।

উত্তর :- এটা সঠিক নয়। বর্তমানে জনগণ অকপটে সব কথাই বলে এবং এ ব্যাপারে তাহারা বর্তমানে সাহসী এবং এটা তাদের গণতান্ত্রিক অধিকার বলে মনে করে। তাছাড়া, সিপিপিতে উপদেষ্টাগণ পৃথকভাবে বিভিন্ন গোষ্ঠীর (যেমন চাষী, জেলে, বিস্তহীন ও মহিলা) আলাদা মতামত গ্রহণ করেছেন।

Mr. Mostafa Kamal Majumder, The Telegraph, Dhaka

Question: [English Translation] While taking the opinion of the people, it is often observed, that the common men can not say anything against the Chairman/Members of the Union Councils. Chairman/Members also have their own professional interests. Under these circumstances how can one come to know the actual feeling/opinion of the common men?

Answer: This is not correct. These days the people freely express their opinion. In such matters they are now very courageous, and they consider it their democratic right. Besides, the CPP consultants separately and independently interviewed different groups of people (like the peasants/farmers fishermen, destitute people and women) and collected their views.

Mr. Ron Schatz, CIDA

Question: Ultimately the issue of who pays for maintenance (and beneficiary involvement) will have to be considered. Is FAP-20 carrying out any work and can you report results of beneficiary capability to pay for maintenance to embankments and structures ?

Answer: So far I think, it will not be possible to bear all expenses of the maintenance of the embankments and structures by the beneficiary alone, yet I hope that they will have to participate in the programme because these are being done with a moto for their wellbeing.

Dr. Tofail Ahmed, BARD, Comilla

Question: To facilitate effective people's participation we need to address the following:

(1) Big question : The nature the central and the local state which Prof. Emajuddin said rather loosely "political will" or "social will".

Small question: Bureaucratic self interest, professional ego and confinement, compartmentalization, departmentalization, projectization of every aspect of it developmental issues.

Answer: No comments. These are statements.

Mr. Azizul Haq, WARPO

Question: Why you are trying to bring women out of doors and involve in project works although there are enough non-employed male labour force.

Answer: The statement is right, in Bangladesh there are still number of male people unemployed but simultaneously there are also increasing number of women who are looking for job by themselves. It is obvious from the socio-economic survey that there are many women who have no main earning members in their family, in particular those who are widow, divorced etc. In addition, it appears that in number of family the earning of the male does not suffice to make the living for all the members, this fact develops a trend in which women are looking themselves for additional earnings. Also it is important to notice that it has been reported that in some cases the husbands are reluctant to share their income in an harmonious way for the whole family. This overall situation is also confirmed by the activities of most of the NGOs which are getting better responses from the women.

Question: Do you not face any resistance from conservative society for this ?

Answer: During consultation process no incidence of such type came to the knowledge of the team. Specially in Sirajganj, known as a conservative area, the meeting with women gathered the much higher number of them compared to Tangail. We can therefore conclude that no particular resistance was experienced.

TECHNICAL SESSION III

May 19, 1993

(09:00 - 10:45 Hrs.)

- Chair: Prof. Emazuddin Ahmed
Vice Chancellor, Dhaka University
- Rapporteur: Mr. M. A. Wadud Bhuiyan
Executive Engineer, Joint River Commission
- Topic: A Key Note Paper on
People's Participation and FAP
by Mr. A. M. Shafi
Supdt. Engineer, FPCO
- Discussants: Mr. Sadeq Khan, Journalist
Mr. Zafrullah Chowdhury,
Gano Sasthya Kendra
Dr. Asaduzzaman
Senior Research Fellow, BIDS

354A

PEOPLE'S PARTICIPATION AND THE FLOOD ACTION PLAN

Hon'able Chairman and Distinguished Participants in the Third Conference on the Bangladesh Flood Action Plan

Assalamu-Alaikum.

Over the last few days many speakers have, time and time again, stressed the need for effective people's participation in assessing the needs of the FAP, to ensure appropriate planning and successful implementation of projects. I have been asked to present a paper on this theme which has not only drawn the attention of many, but has also crept into the standard baggage of development rhetoric. This paper, I hope, will stimulate discussion leading to a better understanding of how we can ensure that the interventions we make are those which people at the grass roots wish to have and which they will support.

My aim in this presentation is two-fold. Firstly, I want to focus on some of the key points/issues in people's participation to see whether effective forms of participation may emerge in relation to FAP and other similar projects. Secondly, I would like to present an update on what has already taken place in relation to people's participation with special reference to the FAP.

Who are the "people" whose participation needs to be ensured and what is meant by "participation". and what are the various processes, steps and stages involved in people's participation? These are some of the key issues that need to be resolved before one goes into the policy debate on how to ensure people's participation or "how to implement such a participation process" in the context of FAP. While people's participation is considered a necessary condition for the success of a development project, it must be understood that it is a dynamic process having many forms and contexts in which it may take place, and as such it clearly means different things to different people. Beyond a rhetorical advocacy for involving people in development planning and projects, people's participation has not progressed very far since the days of the First Five Year

Plan (1973-78). My own feeling is that it is easier to talk about, and perhaps write a few pages on people's participation, than to fully comprehend its implications for those who are socially disadvantaged and who are likely to be affected by project interventions.

In the past, people's participation in development projects was advocated while decision making authority remained with the expert agencies. The emphasis on a "bottom-up" approach working interactively with a "top-down" approach is evident in our government literature, but in practice this has been consistent with the institutional set-up for planning and managing development projects and the allocation of resources. Most development projects are planned, designed, managed and owned by expert agencies while people's participation, which is seen as instrumental to the success of the project, is not apparent. The government seems to be aware of this fact as it admits in the Fourth Five Year Plan document as follows:

"In most cases, rural institutions were developed as extension of government bureaucracy rather than people's organization with lack of awareness and information on the part of the poor"

"In most of the institutions, people's participation and control were lacking resulting in a failure to provide forum for collective decision making"

"The major objectives of such institutions were seen as distributing/utilizing resources injected from outside rather than mobilizing local resources"

People's participation cannot be superimposed from outside. It implies a process whereby local communities mobilize and organize voluntary action around commonly felt needs. They identify their problems and seek solutions using available resources of their environment. At best, outsiders can stimulate this process with knowledge and resources, but local people must internalize these interventions.

What then is the role that the Flood Action Plan has played in this environment. No matter how one looks at it, people's participation has become one of the focal points in the Bangladesh Flood Action Plan. The issue was discussed and debated in the last FAP conference and is also being discussed

here today. Her Excellency, the Honorable Prime Minister, in her inaugural address to the Second FAP Conference, emphasized the importance of people's participation by saying "active participation of people should be insured at the initial stage of all FAP projects for longer duration of the project". The context is important since people's participation depends on democratic traditions and on the institutions which are involved. In water resource management, people's participation also depends on geographical configurations which determines zones of common interest and conflict. This is why there can be no national, or universal pattern of people's participation.

Keeping this in mind, the present democratic government and the experts have increasingly come to share the belief that people should be more fully involved in all stages of project development; from need assessment through operation and maintenance. For FAP, this means several things.

- to obtain local knowledge and ideas relating to the development of the project plan (consultation);
- to provide local people the opportunity to have a voice in the exploration, planning, implementation, monitoring and evaluation of the project (participation in planning);
- to involve local people in assessing likely project impacts and in anticipating unexpected outcomes or side-effects (participation in planning);
- to uncover potential social conflicts arising from project interventions at an early stage, so that they can be minimized through negotiation and understanding (participation in planning);
- to initiate and establish appropriate institutions and procedures to enable local people to participate in the construction, operation and maintenance phases of the project.

In the regional FAP studies, a methodology for public consultations was developed which involved several steps. For example, in one of the regions, a series of one-day seminars were organized at sub-regional and district levels which included all the Honorable Members of Parliament, District and Thana

level officials, Union Parishad Chairman, representatives from village level organizations, and NGOs. Issues related to water management were discussed in an open forum to hear felt needs, and possible solutions. While such an exercise does not dispense from the essential participation which must occur at a more grass roots level, it provided a most useful dialogue leading to a more responsive regional planning process.

At a pre-feasibility level, studies have involved personnel from a wide range of disciplines including fisheries, environment, agriculture, sociology, water resources and hydrology to ensure adequate consideration of various aspects of peoples lives. These multi-disciplinary teams solicited suggestions from local residents which were then incorporated into proposed solutions.

The feasibility studies, which have a longer time frame, provide an opportunity to involve people more completely in the local consultation process to ensure better project design. In this process, it is intended to continue the involvement of NGOs and to base research personnel within the projects for the entire duration of the feasibility studies to open an on-going dialogue with the beneficiary groups. This is expected to help identify common needs, to discuss intervention concepts, and to explore ways in which local people could become partners in the proposed projects. Concerns raised at District seminars will also be investigated as part of this process. The general objectives of this process are to ensure that projects which are conceived are in conformity with local requirements and that people develop a sense of ownership of the infrastructure which has been constructed for their use. There has been some precedent for such a community approach in an on-going project which BWDB is implementing - the CIDA/IDA co-financed Small Scale Water Control Structures Project.

The types of people's participation described above provides a starting point for further change aimed at progressively involving people in the development process. Indeed, it is now accepted by many that people's participation is not only the key to achieving the long-term sustainability of FCD and FCD/I projects but also the overall economic growth and development of the country. In the FAP, there is much scope for cross-fertilization of local and outside knowledge to achieve sustainable development. This cross-fertilization will strengthen the process of decision-making at the local level regarding local needs assessment, project formulation, implementation, long-term operation and maintenance. The process will help identify the "felt needs" of diverse social

groups living both within and outside project areas, and minimize the potential negative impacts stemming from conflict of interests. Precisely, it is this kind of effective people's participation that is envisaged in the FAP.

Realistically speaking, one cannot expect that things will change immediately or that the FAP, or any other development project for that matter, can display the capacity to incorporate over night the most effective forms of participation. Opportunities must be explored and "the little doors opened" within the existing social and political framework of the country.

Against this background, the Guidelines for People's Participation (GPP) were prepared by FPCO and published in march 1993. The GPP sets out several stages or steps in people's participation some of which are based on FAP's on-going approaches and some of which are yet to be field-tested. The guidelines require that there be close collaboration among various government departments, autonomous bodies, NGOs and beneficiary groups. Those involved in the various FAP agencies will be responsible for field-testing and/or applying these guidelines in specific projects and in the FAP program as a whole.

Thus, the GPP aims to provide certain opportunities for people's participation and whatever may be the final outcome, at least, "people's right to be consulted has been given formal recognition" (cf, Adnan et al 1992). again, as stated in its preface, the Gpp is flexible enough to integrate local knowledge, experience and insights, to adjust to variations in project conditions and incorporate local knowledge, experience and insights, to adjust to variations in project conditions and incorporate improvements based on practical field experience.

Participatory planning should be one of the focal points in the Bangladesh Flood Action Plan. The development of participatory approaches to the planning, design, implementation, operation, maintenance, and evaluation of projects is critical if FAP projects are to be made successful. This is being recognized in many studies. Needless to say, the prospects of effective people's participation would critically depend upon the "political will" of the government and the willingness of the implementing agencies in adhering to these principles which are being formally promoted.

TECHNICAL SESSION ON PEOPLE'S PARTICIPATION

Answers given by FAP 20 Team Members and FPCO Staff

Mr. Ahmed Ali, CPP-FAP 20

Question: Do you think "Women" is a separate interest group ! Four interest groups are usually identified in FAP projects - Farmers, Fisherman, Landless, Women

- A women may be a farmer, a fisherwomen, a landless women or a housewife, excepting a destitute women. And they can be classified accordingly. Still then, do you think women should be created, in a separate interest group ? And keeping in mind our social and religious customs !

Answer: Yes, 'Women' is a separate group who plays important role in the society. Their views about the project should be considered separately.

Mr. Steve Jones, POE

Question: Could you elaborate on the changes in management of organizations such as BWDB which you consider are necessary to make them more able to plan and implement projects in a participatory way ?

Answer: At this moment it is not possible to suggest the changes in the management as this is now being reviewed under Institutional Study.

Mr. A. H. Chowdhury, M.P.

Question: The scope for people to participate in the Development process has been well articulated. There seems to be a consensus that development must revolve around people - not the other way around. I appreciate the efforts, however painstaking by FAP to include views and suggestions of people's representatives.

How does the panel react to the view that the abolition of the Upazila System has to a great extent hindered the process of gathering and collecting useful data and heartfelt cooperation.

Answer: The useful agricultural, fisheries social and other statistical data are being maintained by different Government offices located at the Thana (previously Upazila) level. FAP consultants have collected

informations from the fields as well as from these offices. Further necessary consultation has been made with the elected people's representatives e.g. Union Council Chairman, Member and Members of Parliament.

Mr. Richard Holloway, PACT

Question: FAP is asking us to believe that they are serious about peoples participation. Only one small book in Bangla about FAP has been produced in three years. Do they intend to improve on this record ?

Answer: Under the Flood Action Plan, not only a small book in Bangla about FAP activities have been produced but a series of project reports have been prepared. In addition to this, a Guidelines for people's participation has been prepared, by following which people's participation in all phases of the project from planning to Implementation and O&M will be ensured. The EIA Guidelines have also emphasized and given directive for the people's participation. Under each regional study the consultants have taken the people's view and hold meetings where people from all cross-sections have attended and expressed their opinion about the project. The views of the people are being considered in project preparation.

Mr. Syed M. Latif, SRP-EEC

Question: To ensure on effective participation stress should be equally placed on mass education programme through NGO's, otherwise people will not realise appropriately to identify needs and problems and assume responsibility themselves to manage, control, plan and assess the collective actions that are conceived necessary. Comments please !

Answer: Yes, mass education programme is an important subject and the Government of Bangladesh has identified mass literacy programme as one of the national priority programme and taking necessary steps in this regard. Under the 'Education for all', programme, the Government has made Primary education compulsory for all school going students.

Mr. Ahmed Neaz, BWDB-SRP-EEC

Question: Who will play catalytic role in ensuring people's participation. What is the nature of that organization ? How effectively the organization can play the role ?

Answer: There is no separate organization for ensuring people's participation. All the consultants of FAP must follow the Guidelines for People's Participation (GPP), which has been prepared under FAP. The FPCO Co-ordinating officials, the BWDB officials, the Ministry of Irrigation, Water Development and Flood Control and Planning Commission who review and approve projects must see that people's participation has been taken care of. In addition, if there would be any elected people's representative body at the Thana level, they could also check and see whether people's opinion have been taken into account while preparing a project.

Dr. M. A. S. Mondal, BAU, Mymensingh

Question: In one region, "public" who participated in the seminar were, MP's, District and than level officers, UP Chairman, village representatives, and NGO's. Is it not an example of traditional way of defining "people" ? How did you get the views and suggestions of the large majority of the members of the "public" e.g., landless labourers, fishermen, boatmen and women, in such a top-down managed seminars ?

Answer: In these field level meetings (which were held during prefeasibility stage) the fishermen societies, boatmen societies, agricultural societies and landless societies were also invited, who attended and participated in many cases. It is not possible to bring in a meeting all the people of different classes of the society. However, the detailed group-wise discussions at the field level will be undertaken by the consultants during the Feasibility Stage.

This approach cannot be considered as top down. The elected MPs and Chairmen, Local Elites, fishermen, farmers, boatmen, journalists, women group, NGO's etc. freely talked and furnished their views which were taken into consideration during project preparation and finalization. So far my knowledge in no other projects of Bangladesh such detailed public participation works have been conducted, as has been done in FAP projects.

Mr. Murshed Ahmed, Chief Economist, WARPO

Question: Peoples involvement and beneficiary participation in various FAP projects would depend not only on political will of GOB under the assumption of existing project implementation modalities and bureaucracy but depend critically on achieving a sound political process and a fundamental land reform programme.

Answer: The Government may take necessary steps in this regard if they think it is necessary. Under the FAP-15 (Land Acquisition and Resettlement Study) recommendations have been furnished for making new Land Acquisition Act and for modernization of Land Records and Deeds etc.

Mr. Ahmed Ali, CPP-FAP-20

Question: What kind of project you recommend suitable for Bangladesh - BOO or BOT-BOO-means Build Operate-Own; BOT-means Build-Operate-Transfer (to peoples' Institution) ? Please indicate your argument to your choice ?

Answer: In my personal opinion BOT (Build, Operate and Transfer) projects are more suitable than BOO (Build Operate and Own) projects. The Lands of the Water Resources Projects are owned by the people of the locality. If the project is well planned and executed after proper public consultation, then the people of the locality might be willing to look after the projects if it is transferred to them after building and operation. In this system there will be more equitable distribution of benefit. But if the project is handed over to a private owner, he will run and operate the project and realise charges (i.e. Taxes) as per his own sweet will and from commercial consideration, without taking into view the opinion of the people and benefit for all. BOO system may also be tried for one small canal system but not for the whole project.

Question: Previously most of the regulators and sluices have been built with hundreds of requests (applications) from the local peoples as they needed them. This is a kind of peoples' participation, is not it ?

But why, you think, most of these have failed to realise their objectives, and in some cases these have adversely affected many people; and a wide range of people are now against such regulators and sluices ?

Answer: May be the application for the construction of the regulator or sluice was given by one class of people, say farmers without taking into opinion of the other conflicting interest groups say fishermen or boatmen, so this structure was not accepted by all. Besides, may be during the O&M phase, due to fund constraint, the regulators could not be repaired and as such they could not deliver the desired benefit. Under the Flood Action Plan in the people's participation process, the opinion of all classes of people are collected and attempt is made to reconcile them and furnish necessary mitigatory measures, as per requirement. In this way the project becomes more sustainable and the people feel a sense of belonging to the project.

Mr. Richard Halloway, PACT/PRIP

Question: Informal discussions organized by the government, poor people will not speak for fear of retaliation. Why does the Govt. not organize consultations via peasant organizations of which there are 17, I believe ?

Answer: This is correct to some extent. In consideration of this, discussions with the peasants organization, landless organizations, fishermen and boatmen organizations will be held separately and in details during the Feasibility Stage of the FAP Projects.

Mr. Md. Ghulam Kibria, CPP, FAP-20

Question: These are nice words (ref: Mr. Shafi's a key FAP) I heard in this conference but my question is why these words are not coming to an action practically. Why the contradictions between implementing authority and the consultants if guidelines are agreed by both ?

Answer: I have not heard about any contradiction between the implementing authority and consultants of FAP projects, in connection with People's Participation process.

Dr. Reidar Kvam, NORAD

Question: What plans exist to strengthen staff capacity within the concerned Government agencies, such as WDB, to enable them to incorporate views of other groups, into their own planning process ?

Answer: The staff capacity within the WDB and other concerned agencies with respect to incorporating views of other groups is being gradually developed through interaction at the field level, as well as at the policy level, with the help of seminars, workshops and other formal and informal meetings. Generally, the copies of the project reports are sent to different offices and also to the elected peoples representatives for obtaining their opinions. The process is getting formalized within the framework of FAP as well as BWDB.

Mr. G.H.A.I. Jaigirdar

Question: Why the people participation should not be limited to democratically elected representatives at various levels in respect of decision making.

I believe people of different interest groups may be discussed for collection of correct information.

People's participation in the implementation process and O&M is definitely necessary. There may be case studies to formalise the details of process.

Answer: Yes, agreed to the proposal. Among the people, there are different sections with varying and even conflicting interests. The point is to take cognisance of views from all quarters to gain proper understanding of the situation. In recognition of this the consultants of FAP projects during project preparation collect views of not only of the elected representatives but also of different social group such as farmers societies, landless societies, fishermen societies, boatmen, women group and NGOs etc. As for example in the recent field level seminar as of FAP-6, we have invited all these groups and collected their opinion.

Mr. John Brown, Canadian Technical,
Unit Small-Scale Water Control Structure

Question: People's participation takes time. It cannot be fast-tracked. Can the FAP schedule accommodate this? How?

Answer: The concept of people's participation as understood today is seemingly a new concept which is gaining prominence not only in

Bangladesh, but also globally. This is obviously a long-term process. There is perhaps no ready-made model of the concept. This is expected to evolve slowly and gradually in accordance with the need of specific projects and situations.

Dr. Monowar Hossain, MARC

Question: Participation to be comprehensive require to be practiced at four stages:

- * planning (including decision as to whether or not to have a project)
- * implementation
- * benefit sharing
- * cost sharing

Why has cost sharing been left out of the guidelines ?

Answer: Cost-sharing is obviously important and may incorporated in the future. But in the present socio-economic context of Bangladesh full cost sharing can not be enforced.

Mr. Azizul Haq, WARPO

Question: Congratulations to FPCO for realizing the need of peoples participation for success of projects although many studies completed.

While discussing illiterate & little educated local people, definitely they suggested some solutions of their problems. How much feasible were their suggestions from technical point of view ?

Answer: Illiteracy has nothing to do with experience and knowledge. Accumulated wisdom of the people (largely illiterate) coupled with technical expertise of the intervening agencies will enable better planning. The interaction between the two is a necessary condition.

Mr. J. U. Chowdhury, POE/FPCO

Question: After completion of the feasibility stage, a project should go into the design stage only when consent is obtained from an appropriate level of elected local government depending upon the size of the project area. Please give your comments.

Answer: Presently the local elected bodies and the people of the area (inside and outside) are consulted for recommendation of a scheme. However, this process is in the preliminary stage and the process of consultant and obtaining consent will be further tested in the future projects in order to find out a practicable methodology in this issues.

Mr. Md. A. T. Khandakar, BWDB

Question: It is an admitted fact that success of any or all FAP projects to be implemented in phases will be dependent on people's active and positive participation. People affected adversely by intervention of a project will be the most important group to oppose even an economically viable and technically feasible scheme. Motivation and speedy disposal of compensation claims of these people will be crucial for their participation. Hence FAP should focus on this vital issue well-ahead when participation of people is talked about.

Answer: This is a very important observation/comment. It would be ideal to see that the "victims" accept a project and are provided with adequate compensation. Acceptance of a project by a section of the people, though it may have negative impact on them, will largely depend on proper understanding of the pros and cons of the intervention. Extra motivation is required if proper economic and social rehabilitation is not ensured through the compensation package. The conventional approach of compensation in the form of lump sum cash has to change.

Mr. Paul Christensen, Danish Embassy (Danida)

Question: Laws regarding land acquisition and resettlement exist. However, we all know that they, to a great extent, are neglected. When is guidelines for people's participation for land acquisition and Resettlement expected to be issued ?

Answer: It is learnt that the Ministry of Land is taking steps for Amendment of the Land Acquisition Act for helping the effected land owners, so that they can receive the proper land compensation and the resettlement issue can also be looked into the Final Report of FAP-15 has also suggested changing the Land Acquisition Act and make

Acquisition Act will be issued can not mentioned from this end. The Land Ministry is the proper authority for this purpose.

Mr. M. A. Quassem, BWDB

Question: The presentation by Mr. Shafi Ahmed sounds like a feeble defence put forward by a defendant (Project Authority), rightly accused of by a plaintiff (may be the donors) that BWDB or FPCO does not ensure peoples participation in project planning and in operation and maintenance.

The paper could have made it pronounced that,

- (a) Peoples participation has a moral value.
- (b) It facilitates need-based effective planning i.e. the technical value
- (c) It facilitates implementation, operation and maintenance of a project; i.e. the project management value.

On the whole it is encouraging that the issue is discussed.

Answer: True. Also it helps to generate maximum benefit by facilitating conscious and active participation of the target groups through the judicious use of the infrastructure, and hence it has an economic value too.

Mr. B. M. Chowdhury, FAP-17

Question:: Does the concept 'People's participation' envisage resolution of conflicts of different interest groups, such as conflict over waterbody use between different, groups or a mere approval of an already designed project ?

Answer: The issue of the resolution of conflict at the micro project level can be dealt with having appropriate procedural and operating mechanism at the project level. This needs to be addressed at the feasibility study level.

Dr. Tofail Ahmed, BARD, Comilla

Question: Local government especially the rural local government is now at the cross-roads. The participatory framework should be consistent with the coming local government structure. For grass root level mobilization, cooperatives, NGO activists may be involved but they are also not free their own vested interests comments please. As far as the participation of NGOs in the project areas, grass root level (Local NGO's) should get preference instead big national and international NGOs (suggestion). "Participatory action Project" is not totally new in this country. Many of these experiences are fragmental, paochialand segmented what is needed now is the consolidation of those experiences to evolve a sustainable institutional framework. We have a tendency to start everything fresh, ignoring the part. FAP should be aware of this.

Answer: There is no basic disagreement to this statement. However, a line of demarcation should be made between the people and the cooperatives or the NGOs, the latter being the intermediary. At the micro level, reaching the target people should be emphasized. Local NGOs could be effective in the field of social mobilization at the grassroots level. The choice of a NGO as a partner in development depends on its relative efficiency and experience in undertaking a particular task, its management capability and obviously its track record.

Mr. Mostafa Kamal Majumder, The Telegraph, Dhaka

Question: Did you notice during consultation meetings that presence and absence of leaders like MPs and UP Chairman make differences in responses given by village people ? If this is so how you determine the correct picture.

Answer: The people in different spheres of social and political life hold different perceptions. To arrive at a fairly representative picture on a particular issue, it is necessary to interact with cross-section of the people. Effective participation of the people in any forum very much depends on the democratic environment and practice at the grassroots level. During the Feasibility Study opinions of the different social groups such as farmers societies, landless societies, fisherman societies, boatman societies and women groups etc. will be collected separately after that meetings will be held for resolving conflicts.

Mr. Carlos

Question: Change in mental sets of bureaucrats. This means :

- (a) BELIEF in the capacity and local wisdom (and strength) of the poor
- (b) WILLINGNESS to learn from the people.
- (c) READINESS to modify highly centralized policies and procedures that do not encourage local decision-making.
- (d) CAPACITY to embrace errors and temporary lapses in implementing participatory projects ?

Answer: These are all necessary conditions. The sufficient condition is to have a mechanism which ensures accountability to the people and decentralized planning and implementation.

Ms. Yasmin Ahmed, ADAB

Question: In the paper you have mentioned that in a series of workshop/seminar you have consulted NGOs but in the workshop proceedings we have seen that you have consulted a NGO. For example in Sunamganj 'Grameen Janakalyan Sangsad' was the only NGO participant. So it is better to say in singular term rather than panel.

Answer: It is not true that only one NGO participated in the Sunamganj seminar. The representative of IDEA was also present. It may be mentioned that 5-6 NGOs with activities in respective districts were invited in each seminar.

Question: All FAP documents and even the findings of the studies are in English, which general people do not understand. So how they can participate in it, if they don't understand.

Answer: "General people" can not even read Bangla. Hence, more production of reports in Bangla will not necessarily increase its readership. To facilitate better understanding, briefing materials were prepared in Bangla for distribution among the participants at different seminars.

Question: Access to documents are limited to some quarters, without the access to information.

Answer: It is being endeavoured to make the documents more accessible.

Question: FPCO people should learn to accept constructive criticism otherwise how people will be involved in consultation, assessment of project impacts etc.

Answer: It is a pity that persons with power and authority are not used to take criticism sportingly. This attitude should change. This very much depends on the democratization process and practice in the society.

Mr. Van Ellen, FPCO/POE

Question: People's consultation and participation could in principle organized in two different ways:

- (a) Under responsibility of the "Project" which will arrange for all necessary related activities, surveys etc.

Advantage: Easy coordination and integration into project.

Disadvantage: Consultation/participation has to remain within limits of project mandate, which may include one particular technical solution.

- (b) Independent from project, through spontaneous and formal groups and local government institutions. In dialogue with them, the project has to find a solution.

Advantage: People have opportunity to express themselves on wider range of solutions than the one in the project's Mandate.

Disadvantage: Integration into project more cumbersome, occasionally even impossible.

Which approach would you prefer for FAP ?

Answer: A combination of the two will be feasible. This necessitates a set of policy guidelines with enough room for flexibility at the project level. More autonomy at the project level will definitely be advantageous.

Ms. Khushi Kabir, ADAB/Nijera Kori

Question: There are bound to be differences in perceptions and opinions. What measures can be incorporated within the plan to accommodate this? What steps can be taken to ensure continual dialogue and accommodate changes?

Answer: There may be difference in perception and opinion even within a group or organization. How the decision will be taken will, however, depend on the internal structure of the concerned group or agency. In an ideal scenario, a consensus decision is the best decision which may not be achievable in reality. It is necessary to have a fairly flexible operative mechanism to accommodate changes.

Dr. Bilqis Amin Hoque, ICDDR, Bangladesh

Question: You have mentioned that you have integrated people's participation and environmental management. Could you please explain that (briefly)!

Answer: The essence of this proposition is that the participation of the people is a must for environmental management, and the environmental issues can no longer be overlooked. What is being emphasized here is to take into cognisance the environmental significance of any intervention and to accept the role of the people to take care of the environment. Environmental management by the people is no more an exogenous factor. It needs to be integrated within the purview of a project.

Mr. Philip Townsley, FAP-17

Question: Management of flood control by local people & "Water user associations" is recommended by FPCO Guidelines on peoples participation. Local bodies are also more easily controlled by local elites. How can this be avoided?

Answer: Local bodies are perceived as the best available options in

the present setting. It may not produce better results if it is replaced by another "intermediary". With increasing awareness and participation at the grassroots level, the local bodies are expected to undergo a radical transformation.

Mr. M.F.A. Siddiqui, MARS & Association

Question: Your reference at para 5 page on people's participation is distorted. We in the irrigation Department never did such thing as stated. The decision making was never with the expert agencies. It was the Govt who did discharge these responsibilities. Changes in the procedures started taking place with the induction of expatriate consultants who came along with the external aids. It is correct that O&M responsibilities remained with the expert agencies as their experience showed that such induction resulted in poor performances and often damaging to the infrastructure. Also the assumption of administration by the Martial Law of national affairs not only destroyed the age old practices but also removed the last traces of memory of the in built people's responsibilities in the system from the brain.

We had advocated it, we had been recommending it to the Government and we would be doing it also in future but at the same time we advocate that this should be done through legislative measures.

Answer: The intention of the para 5 was to state that earlier projects were prepared detailed discussions with the different conflicting with no such interested group such as farmers, fishermen, boatmen, women, landless, etc. and no detail social study were made as it is now proposed under the Guidelines for People's Participation (GPP).

Mr. Shapan Adnan, Shomabesh Institute

Question: The Questions Raised by the recent independent Review commissioned by Oxfam have not been answered by the FPCO. Could I please request 5 minutes to restate these questions ?

Answer: What are the questions? The paper on People's Participation has not been planned or oriented to respond to the issues raised in the Oxfam-sponsored study. The main objective of the concerned paper is to expound the concept and to express commitment for its realization. We have to go a long way to accomplish it.

Mr. A. S. M. Abdul Khaleque, SWMC

Question: When you are planning at the sub-regional i.e. project level there is scope for people's participation. But when a planning work is carrying out at a regional level, how people's participation can be ensured considering the magnitude of the tasks ?

Answer: At different levels, the term "people" has different connotation. At the regional or national level, people's participation may be facilitated by incorporating the role of higher level forums comprising representatives of the people, such as, the District Council or the Parliamentary Standing Committee.

Mr. G. Nayeem, OXFAM

Question: Do you think an organization like FPCO which has no "legal entity" and not created by any ordinance or any act is equipped enough to carry out the massive job of peoples participation.

Answer: FPCO is a government-sponsored agency with defined terms of reference and mandate. FPCO recognizes the concept of People's Participation as an essential element in the planning and implementation of projects and is trying to find ways and means to evolve policy and implementation framework in this respect. The implementation of the framework will be the task of the implementing agencies including specialized government agencies and the NGO's.

Mr. Ahmed Ali, CPP-FAP-20

Question: People's participation in building projects appears crucial, on the other hand technical and economic feasibility cannot be over-ruled. Peoples' needs assessment vs technical feasibility sometimes ends up in a fiasco !

The knowledge and technological base of the general people (and say, education level) in Bangladesh usually do not match the feedback required from the people in planning, designing and setting a project. It is even seen, people of one village cannot conceive what effect it makes if a khal is excavated towards the next village (influence on the next village).

Do you think, all the people to be consulted ! or only the peoples' representatives (say, Ward Members or Chairman of UP; MP etc.)

Answer: The pertinent question is to consult the people at all levels to appraise a problem. Decision should be taken after careful scrutiny of all the questions raised. Sometimes it is necessary to go beyond the people's representatives. People's representatives in the UP do not have the mandate to represent their electorate on all matters.

(Name: Not available)

Question: You mentioned that we have to find out what suits our culture in practicing people's participation. Is the exclusion of women part of this recognition of Bengali culture. Could you comment, please ?

Answer: The essence of this proposition is that the cultural context should be appraised at the time of interventions. Women's integration in the mainstream of the development process is now a declared goal of all development initiatives and the value system in this respect is definitely changing in favour of their enhanced role. This process has to be accelerated.

Mr. Moinuddin Naser, The Telegraph

Question: The conflicting attitude between NGOs and people's representative over people's participation in making decision will ultimately push the FAP itself into uncertainty. What is your comment on it ?

Answer: Apparently there may be some conflicts in the attitude between the people's representatives and the NGOs, as well as there are conflicts within the NGO camp and also among the people's representatives. Never in our history, changes took place through consensus of all individuals and social forces. However, a process should work to accommodate different opinions in the greater interest of the community.

Mr. M. R. Choudhury, BETS

Question: Who are the people ? The density of population per square mile in Bangladesh is about 1800. What should be basis of selection? What should be the length and level of participation ?

Answer: For the simplicity of understanding, the "people" may be defined as those who would be affected positively or negatively by a particular initiative. The nature and extent of the effect may, however, vary among the impacted population.

Mr. Steve Jones, POE

Question: Could you please elaborate how you consider that women's needs perspectives and priorities can be incorporated into the planning and implementation of flood control and drainage projects ?

Answer: The pertinent question is to recognize the fact that women have their own needs and priorities. This is quite a big issue which is difficult to address within the limited scope of this paper. There should be a separate study on this issue within the framework of FAP.

Mr. A. N. H. Akhtar Hossain, IEB

Question: In the past we had a fine tradition of managing local affairs by the local people themselves. With the introduction of autocratic rule in 1958, all powers have been concentrated in the hands of few bureaucrats, which destroyed all local initiatives. Unless, we are able to identify and remove the obstacles to the peoples managing their affairs, a general statement is meaningless.

Answer: It is important to identify and revive informal institutions for the management of local affairs. There are such institutions at the village level. The political significance of such institutions could be enhanced if these are recognized and linked with the state-managed development process.

Mr. A. N. H. Akhtar Hossain, IEB

Question: The issue of the peoples' participation can only be ensured through democratic institutions at local levels. At present no such democratic institutions exists. Without the existence of powerful local government this issue can not be resolved. There is no reflection of this issue in the paper.

Answer: This issue is being discussed at the highest political level and a commission is already working on it.

Mr. Md. Mohsin, FAP-20

Question: Projects are of time bound attempt. Peoples participation is a gradual and systematic issue. How these two can be combined? Please detail from yours experience.

Answer: Implementation of the physical infrastructure of a project is of time bound, but benefits flow from it over a long period of time. The idea of people's participation is being considered over the entire range of the project period yielding benefits. At different points in time, the form of participation is likely to vary.

Mr. Emaduddin, FAP-25

Question: "People know lot but not all". Is it not to impart formal or informal education to improve understanding. But you advocated patience of the bureaucrats. How to institutionalize the patience in practice under the existing system.

Answer: All concerned should undergo a process of education and training as per the requirement. People's participation is still in the process of implementation. wishful thinking. Effective participation can be ensured when people are educated in the process and also when the implementors are aware of the problems of the people.

Mr. Nirmal Chandra Paul, FAP-6

Question: Rice supply carbohydrate, Fish supply protein, How can we replace one by other. I think, asking the question to the poor people which you prefer whether rice or fish, answer will come up rice. How much it is acceptable if we consider protein is the main source of energy ?

Answer: The optimal choice will depend ultimately on the rate of return at the farm level.

Mr. Mohammed Aatur Rahman, Gono Unnayan Prochesta (GUP)

Question: Do you think FAP studies and compositions are shared within the high ups in Water Development Board ? If not, how do you think the ordinary common people will share and learn from these studies as well participate in their implementation ?

Answer: Yes, the FAP documents are shared within BWDB officials and other concerned parties. The documents are generally distributed; to the; different Government Departments, DGDAE, Director DOF and to the ministries who are members of the Review Committee and Technical Committee of the FAP and also to DG NGO Bureau and some specialists of universities, per their information and comments. One full set of documents of earlier FAP study has been kept in the FPCO Library. Any person can have access to these documents with permission from FPCO officials. The present study phase covers mostly Prefeasibility studies and the documents are maintained at Dhaka. But during the Feasibility and project level studies the documents would also be available at local level BWDB offices, where these will be accessible to all.

PREFACE

The Guidelines for People's Participation in the Flood Action Plan (FAP) are addressed to a diverse, multi-disciplinary audience including the people who would be affected by any future FAP activities, GOB policy makers and the FAP planning teams. Evaluations of a cross-section of FCD/I projects completed in the past show that the agricultural and socio-economic benefits resulting from these projects can be greatly enhanced, their sustainability assured, by integrating local people and their representatives in all stages of project activities.

Indeed, it is now accepted by everyone concerned with development policies and practices that people's participation is the key not only to sustainable flood control, mitigation and water management activities, but overall economic development and growth. These Guidelines suggest a flexible approach to the integration of considerable local knowledge, experience and insights of people living in a given area with professional expertise, resources and efforts. This cross-fertilization will strengthen the process of decision making with regard to local needs assessment, project formulation and implementation, long-term operation and maintenance. The process will also help address fully the needs of diverse local groups - fishermen, boatmen, the destitute entrapped in poverty, disadvantaged women and children, those living outside the embankments, for instance - and minimize the negative effects stemming from conflict of interests.

The Guidelines for People's Participation (GPP) form a part of a series of guidelines that include the Guidelines for General Project Assessment (GPA) and the Guidelines for Environmental Impact Assessment. Other guidelines to be developed in the future would bear on Land Acquisition and Resettlement, Project Implementation, Operation and Maintenance, Monitoring and Evaluation. Interlinked, these guidelines would form the corpus of the Guidelines for Project Planning (Development) in the Flood Action Plan.

The Guidelines stipulate not merely a commitment to a methodology, but a whole hearted adherence to a process that will translate this commitment to a rigorous and invariable practice of all development activities. It therefore follows that these Guidelines will be modified and improved as regional and local experience is accumulated from implementing them in Bangladesh.

ACTION PLAN FOR FLOOD CONTROL GUIDELINES FOR PEOPLE'S PARTICIPATION

INTRODUCTION

Flood Action Plan (1990-95)

1. The Flood Action Plan (FAP) issues from a comprehensive review of flood policy in Bangladesh in the aftermath of the devastating floods of 1987 and 1988. The FAP marks the initial phase in the development of a long-term phased programme of flood control, drainage and water management activities in Bangladesh. The development imperatives of Bangladesh stipulate that comprehensive technically, economically, environmentally and socially sound solutions to the problem of recurrent flooding be found urgently. This principle is reinforced by a! FAP supporting studies and strongly endorsed by both the Government of Bangladesh and the World Bank.

Objective

2. The objective of the FAP is to bring about an environment secure enough to stimulate intensive agriculture, fisheries and integrated rural and urban development. FAP would seek to achieve this by a combination of controlled flooding and drainage measures and a much enhanced state of flood forecasting and early warning, flood proofing, flood preparedness and other related actions. This would facilitate sustained economic and social growth, welfare and security and to ensure a higher quality of life for the people dwelling on the floodplain.

People's Participation

3. In the light of considerable field experience gathered over the years and recent FAP evaluations, it is evident that to ensure sustainable flood control, drainage, water development planning and management, diverse socioeconomic groups of people affected by recurrent flooding must have the opportunity to articulate their needs, identify problems and work out solutions. Experience gained from the process of development planning in Bangladesh demonstrates clearly that due to a lack of an appreciable measure of people's participation,

programmed activities in social and economic development have had only limited success in achieving the stated objectives and ensuring sustained delivery of project benefits. In keeping with the new development perspective of the Government to align participatory democracy with the need for accelerated and sustainable economic development of the country, it is essential that local people participate in full range of programmed activities including needs assessment, project identification, pre-feasibility, feasibility, design and construction, operation and maintenance, monitoring and evaluation. This is intended to replace the traditional approach limiting decision making to a remote centre dominated by professionals and specialists. This alternative development strategy is expected to stimulate the evolution of the process of decentralization in development planning and implementation. The most notable gain would be commitment of the people to generating and sustaining socio-economic development relevant to their needs.

Perspective Plan

4. The FAP's central concern relates closely to GOB policies embodied in the Fourth Five Year Plan (1990-95), which clearly recognizes the crucial importance of people's participation in the process of planning and development, and the necessity to give policy and institutional support in order to direct increasing degrees of that effort to accelerate the pace of economic growth. The FAP would seek to derive as much benefit as it can from people's participation augmented by human resources development, defined in the Perspective Plan (1990-2010) as "the ability of the people, particularly in the rural areas, to identify their problems and plan and implement these plans by themselves in areas which concern them most."

PEOPLE'S PARTICIPATION IN PLANNING

Overview

5. People's participation in planning is a vital process which will enable different socio-economic interest groups in an area develop their capabilities to play a dynamic role in development initiatives. It will also strengthen the commitment to development of a wide cross-section of affected people, elected

representatives, government employees, professional groups, voluntary groups including NGOs, development practitioners and others by giving them an opportunity to share responsibility for key decisions.

Parameters

6. People's Participation involves:
- (a) assessment of local perception/needs assessment through extensive dialogue with all social groups likely to be affected;
 - (b) identification of and consultation with groups likely to be affected both inside and outside the programme area and analysis of conflicting interests likely to affect the project;
 - (c) attention to in particular marginal groups, including
 - i. rural poor
 - ii. ethnic groups
 - iii. minorities
 - iv. women
 - v. fishermen
 - vi. boatmen
 - vii. other disadvantaged people dependent on fragile resources
 - viii. identification of all land and water resources
 - ix. development of an organizational structure for
 - guaranteed representation
 - briefing
 - consultation about technical components
 - negotiations for mitigation, compensation, etc.

Salient Features

7. The process can identify local issues that conventional socio-economic surveys do not fully estimate or clearly bring to light. Close and active

participation of people is the device to ensure that these are taken into account in project formulation and planning.

8. People's participation will ensure that projects take fully into account essential local data on environment, land and water regimes, informal and customary rights, resource usage, and the most directly affected social groups among others, in order to assure that projects do minimum damage to habitats, livelihoods of the people and natural resources. It will also help develop equitable standards for compensation and mitigation.

9. The process will facilitate identification of diverse beneficiary/disbeneficiary socio-economic interest groups and their leaders, traditional organizations and institutions. This will ensure that their collective views are reflected in project development and its management.

10. Early forging of partnership between the Planning Team and the local people is the key to their effective participation in the subsequent stages of construction, operation and maintenance, monitoring and evaluation.

11. It also sharpens the focus on the needs of the poor and disadvantaged with a view to ensuring that their interests are taken into consideration in assessing project impacts and to target short - and long - term benefits to them.

Linkages

12. People's participation is not an isolated activity; rather complements information gathering techniques such as RRA, PRA, sample surveys and key informant interviewing, etc. It involves activities and institution building at different levels of society and administration. The institutional development will involve Ministries, NGOs and other interest groups and help establish extensive inter-organizational linkages, with well-defined accountability at all administrative levels. The objective at the project level is to achieve effective co-ordination.

PROJECT CYCLE

Project Scale Factor

13. This intensive participatory planning process might not be equally practicable for water management projects of different sizes. Some FAP efforts have a distinctly local focus, for example, compartmentalization, flood response, flood proofing, small scale FCD and irrigation structures. Other FAP projects are much larger in scope. The scale of the project will largely determine the approach used.

- (a) **Small: Local Area Development:** For small projects restricted to a village, union or thana, it should be possible to optimize the active involvement of the people in all project stages through local level groups.
- (b) **Large: Larger Area Development:** Large scale projects covering larger areas are common in the FAP and pose special problems of their own in terms of people's participation. Methods of organizing the project development process are of necessity quite different from those appropriate in smaller localities. It is especially difficult to conduct large area feasibility studies in a participatory manner. Planning teams, however, must still foster participation by organizing extensive consultation sessions in selected locations to elicit predominant development issues and concerns of the people. Multidisciplinary teams of ecologists, social scientists, engineers and other appropriate specialists could assess needs, describe development alternatives, likely benefits/disbenefits, environmental effects and socioeconomic benefits of each. These projectwide consultation programmes for needs assessment and appraisal of environmental and social effects would suffice provided that all concerned parties receive essential information and opportunities for consultation.

Note: *Details of composition of the Planning Team and expected inputs are at Annexure-A.*

- (c) **Stages:** People's participation in the FAP projects and programmes should effectively begin at the inception or the prefeasibility stage with preliminary survey of an area for needs assessment, and continue throughout the life of any given project. Broadly speaking, at least the following six stages of people's participation can be identified:
- i. **Prefeasibility study:** local people, their elected representatives and local officials are to be involved in needs assessment. This includes technical, environmental and social appraisal of an area's problems, analysis of alternative project options, and possible selection of project or programme. The results may be used to adjust any existing project concept in accordance with the findings.
 - ii. **Feasibility study:** As a project takes shape local people are involved in more detailed technical, environmental, social and economic appraisal. Also, at this stage the representatives of diverse local socio-economic groups and the local councils can interact, discuss and concur in project concept including mitigation and land compensation measures. This process will help develop methods of people's involvement in project design, construction, management, operation and maintenance, monitoring and evaluation.
 - iii. **Detailed design:** once a project is deemed feasible, there must be ongoing interaction between local people and technical planners in developing criteria and specifications for many vital project or programme considerations, e.g., the location, size, and distribution of project works, land acquisition, relocation plans and mitigation measures. A **Project Co-ordination Committee (PCC)** should be set up at this stage to ensure that these issues are satisfactorily resolved. PCC will continue.

- iv. **Implementation/Construction:** PCC will monitor implementation in order to ensure that design standards and implementation are carried out as agreed. Both formal and informal communications with local people should be as open as possible. The plan itself and any modifications should be explained to them and their views taken into account. The monitoring group would identify and analyze unforeseen problems and offer suggestions to resolve them. It may also seek expert advice if problems are severe or threaten the projects.

- (d) **Operation and Maintenance:** the operation and maintenance stage should directly involve the local population. However, the degree of direct local control and management will vary according to the nature of the infrastructural works to be built and operated. Operational manuals must be drawn up with this in mind including the legal responsibilities for ownership, labour and financial resource provision, day to day operation, routine and emergency maintenance and repair work. The criteria for deciding operational procedures must be drawn up with the consensus of local people.

- (e) **Monitoring and Evaluation:** In order to learn from experience of a project and influence future development, the PCC should constantly monitor performance, and initiate remedial actions as necessary. This will require intensive liaison with local people both directly in the area and those affected outside it. It will need to address both the positive and negative ways in which people are affected at all stages of project development.

PEOPLE'S PARTICIPATION IN PREFEASIBILITY PLANNING

Rationale

14. The FAP will seek to enhance the economic security and quality of life of the floodplains population by means of improved water management techniques. Sustained and extensive consultation with the people in particular areas and their active participation in the process is essential to assess local needs, highlight topographic, hydrographic and other geophysical characteristics, potential opportunities and constraints as well as the associated socioeconomic conditions that will crucially affect the probability of success in planning and implementing projects.

Techniques

The following techniques may be useful in gaining a multidisciplinary perspective:

- (a) Village scoping sessions in which Planning Team presents these priority development choices. This consultative/iterative process should include relevant levels of all concerned GOB departments, elected officials, GOB specialists, and most importantly, the people of the proposed programme, and adjacent areas.
- (b) Consults various socioeconomic groups and their representatives in a series of meetings, or public hearings, Official representatives of these interest groups also may be consulted;
- (c) Questionnaire surveys of sampled households to elicit views of a truly representative cross-section of the affected population;
- (d) Discuss with local people and their representatives positive and negative environmental, social, economic implications. If any or all are unacceptable to any interest group, this should be noted.

15. The prefeasibility study must show that any proposed development alternative is:

- (a) consonant with the expressed needs and wishes of the local peoples including social and environmental imperatives
- (b) likely to be institutionally, administratively practicable.
- (c) capable of being implemented without creating major social disruption or irretrievable damage to any social group, particularly the poor.

PEOPLE'S PARTICIPATION IN FEASIBILITY PLANNING

16. At the Feasibility Planning Stage which involves indepth examination of the technical, economic, financial, environmental and social viability of a programme or project concept in a particular area, planning and engineering study groups would move to detailed baseline studies of environmental and social effects (FAP Manual for Environmental Impact Assessment), local surveys and overall blueprint designs. All study and design groups must interact with each other and with the local community or communities during the Feasibility Study stage.

Needs Assessment

17. Inputs for the feasibility study would accrue from

- (a) crucial identification of the needs of various interest groups and the potential of a proposed project area is the most crucial activity at the feasibility stage. In a departure from the traditional dependence on assessment performed by professionals or specialists in a detached, "top down" fashion, the emphasis now is on the people belonging to different social groups voicing their own perceptions of the existing problems, potential solutions, including ideas about technical solutions, their implications and probable impact. Projects conceived,

designed and implemented on the basis of complementary needs of the people or an appreciation and/or reconciliation of the competitive interests of the various socioeconomic groups in the area have better than average possibility of yielding sustained FCD/I benefits over time.

- (b) Interviews a wide range of concerned groups of people and individuals to solicit the views and comments of:
 - o landholders
 - o assetless/landless people
 - o farmers, fishermen, artisans
 - o women
 - o transporters, shopkeepers etc.
 - o those who manage or operate existing projects, to learn from their successes and failures
 - o elected officials or existing multi-agency task forces
 - o NGOs or others in a position to represent large interest groups

- (c) Data collection by a multi-disciplinary team, cross-checking data by triangulation, carrying out a diagnostic RRA prior to a PIE to assess probable
 - o direct impact on hydrological conditions.
 - o changes in fisheries, livestock, agriculture, ecological, social and economic parameters
 - o combined impact of several factors, such as, physical, biological, human and environmental, especially potential negative impacts;

- (d) The needs assessment should elicit from the various interest groups their perception of:
 - o present water management regime;
 - o main flood control and drainage problems and trends; and
 - o preferred solution to any problems identified.

- (e) The needs assessment survey also should include communities living outside the proposed programme area, who are likely to be affected by any interventions under consideration.
- (f) The needs of poor and marginal groups must be given special attention during feasibility planning. Special efforts would be required to
 - i. consider the several technical possibilities available to bring about a change in their circumstances
 - ii. enable marginal groups voice their interests, consider the several technical possibilities available to bring about a change in their circumstances
 - iii. offer their own suggestions
 - iv. choose leaders to represent them in various deliberations
- (g) Formation of consultative groups in wards, thanas, districts, and creation of regular forums for regional planning deliberations in which discussions of specific issues, even negotiations between competing groups, can occur.

18. Direct Planning Team efforts, 'contract with government rural development agencies or suitable NGOs are some of the ways to perform local organizing functions. Experience also confirms that development of existing potentials might be thwarted by numerous factors. A multidisciplinary approach leavened by wide participation of people is therefore essential not only to acquire detailed information about the prospective command area, but also develop appropriate solutions and programmes.

Environmental and Social Considerations

19. Planning Team specialists should seek to understand people and their perceptions, detail basic data on local environmental and social conditions, and enumerate:

- (a) all socioeconomic groups in order to identify, analyze and understand the livelihood strategies of diverse groups and conflict of interests. Special efforts would be necessary to identify and involve the poor and marginal groups -landless, poor fishermen, destitute men and women, groups depending on scant resources etc. in any intervention planned;
- (b) all land and water resources, local assessment of these resources and interdependencies and importance of livelihood strategies;
- (c) all customary and formal/informal rights to use particular natural resources;
- (d) major cultural properties;
- (e) local leaders and officeholders, organizations and associations including traditional groups, cooperatives, development organizations e.g., Grameen Bank, etc., and
- (f) government institutions and agencies.

Development Alternatives

20. The information gathered from each of the interest groups should be combined into need assessments "**pictures**", in which all natural and social elements are integrated into a coherent whole. The Planning Team should add to these assessments other development targets based on national priorities and the judgements of team specialists. These various needs would then be translated into development alternatives, and grouped into major types of interventions and evaluated both generally as well as by a simplified version of the multicriteria analysis specified in the Guidelines for Project Assessment (GPA). Once prioritized, the two or three major options should be developed in more detail, describing each in terms of:

- o needs addressed
- o expected positive effects
- o expected negative impacts, and

- o the structural and institutional measures needed to implement them.

Consultation Process

21. Feasibility planning would require the planning team to play an energetic role. It would be required to initiate a series of relatively structured consultations in multiple locales.

22. All comments and suggestions gained in this consultation process should be recorded. Sectoral specialists should then review all the issues that emerge from the consultative exercise, and note key questions, comments, and areas of conflict.

Recommendation

23. The Planning Team should evaluate the feedback gained in the consultation exercise and revise each development alternative as necessary and/or possible. Finally, the Planning Team should recommend one development alternative to be taken on to the Feasibility Study stage. Before making this recommendation it is essential that actual or potential conflicts e.g., outsiders vs. insiders, large vs. small farmers etc. are identified, their implications assessed, and the possibilities for compensating those adversely affected are worked out. It would be futile, even counter-productive, to allow a project to proceed without addressing such conflicts and attempting to resolve them.

PEOPLE'S PARTICIPATION IN DETAILED DESIGN

24. There is now a wide recognition that despite the dominance of the technical construction aspects, water management activities are no less social than they are technical processes. Indeed, one broad reason for the failure of many such schemes is the insufficient attention given to social aspects of project design. Many of the problems could have been avoided if local people had been closely consulted. Projects are distinctly shaped by their respective contexts, objectives, approach, anticipated achievements, financial basis and so forth. Hence, it is essential that the PCC (3.2.3) is formed at this stage and carefully

briefed on issues that emerge during detailed design. The main task of the PCC during this stage is to prepare for a role in the implementation of the project. Depending on the project, PCC will perform specific roles in construction, operation, and maintenance. In projects with a substantial irrigation component, beneficiary groups might form Water Users Associations either independently or as subcommittees of the original PCC. These latter Water Users Association should be configured in such a way that they eventually can take over ownership of small scale irrigation systems.

Interest Group Organization

25. In this phase people's participation ought to grow from the individual and unorganized level to that of formal organized interest group representation. It may be noted here that at the interest group level large landholders, shopkeepers and businessmen, transporters and transport workers, leasehold fishermen, NGOs and Cooperatives already will be well organized. On the other hand, landless labour, women especially destitute women (single heads of households), capture fishermen, brick kiln workers, marginal groups depending on foraging for grass or wood, etc. may not be organized at all. This has two major aspects:

- (a) **Encourage** specific socioeconomic interest groups and resource users, especially this second collection of social groups, to organize themselves sufficiently to ensure that their interests are taken into consideration in project planning. This denotes choosing leaders to represent them on the Project Coordination Committee (PCC) to define interests, determine positions, and decide on acceptable compensation and mitigation measures.
- (b) Organize a Project Coordination Committee (PCC) at the project level.

Composition of Project Coordination Committee (PCC)

26. The responsibility for organizing the committee should be that of the Ministry of Irrigation, Water Development and Flood Control. In the case of distinct and identifiable FAP components, relevant

ministries/agencies, such as Local Government and Co-operatives Division, BRDB etc., would have to take the initiative to form PCC to help implement programmed activities.

- (a) Once a development alternative has been selected, chosen representatives of the likely affected social groups should be organized into a Project Coordination Committee (PCC). In addition to area socioeconomic interest groups, including women, this Committee should include representatives of government technical departments, local NGOs, those responsible for project design, as well as members of the former Planning Team. It should be chaired by the elected officeholder closest in the governing hierarchy to the project level.
- (b) Interest groups should be encouraged to get organized at the appropriate project level - village, ward, union, district, multidistrict with membership clearly reflecting the size and complexity of the project. Despite the size of the project area, all social and resource user groups must have representation on the committee. This includes the poor, marginal groups, and women.
- (c) The Project Coordination Committee exists primarily to represent the interests of the affected social groups at the detailed design, implementation and O&M stages. Specifically, the committee will
 - i. discuss with the Design Team all aspects of programme or project design;
 - ii. resolve conflicts between social groups over aspects of project design;
 - iii. develop acceptable compensation and mitigation plans as necessary.

Sub-Committees

27. Sub-Committees of the PCC may be formed depending on project needs.

PEOPLE'S PARTICIPATION IN IMPLEMENTATION

28. The emphasis in these guidelines is on participation of the people in comprehensive decision-making on the

- i. definition and articulation of key issues
- ii. formulation of viable solutions
- iii. initiation of project implementation activities

29. This is based on the recognition that goals of development interventions can not be reached without the understanding and support of local communities, whose knowledge of local conditions and resources, ideas and cooperation are crucial to the technical success of a project.

Role of Project Coordination Committee (PCC)

30. Resolution of issues of implementation, operation and maintenance (O&M) would depend on several factors such as the goals of each intervention, the sources and terms of funding, and most importantly, the broad direction given by national policy makers. The PCC would provide the all-purpose vehicle for the participation of individuals and groups of people directly in the activities of the project, enabling them to gain better understanding of its objectives and likely impacts, and develop pride in the work carried out. PCC's efforts would be best directed to help

- (a) develop human resources and promote active participation
- (b) design and adjust a flexible implementation schedule as the requirements and constraints of the people become more clearly understood

- (c) review implementation to agreed schedule and standards
- (d) develop and adjust recommendations for operation and maintenance (O&M) of any assets created by the project, together with continuous monitoring and evaluation (M&E)
- (e) equitably distribute project benefits.

Further,

- i. a strong indication that planning and design are based on the needs of local people would be their participation by contributing in cash or labour during the construction of tertiary structures and other works, particularly the re-excavation of khals and the (re)building of embankments
- ii. Where appropriate to the specifications earth works should be contracted to the maximum possible extent to Landless Contracting Societies (LCS) in order to benefit landless people. If LCSs do not exist in the project area, they should be encouraged to be formed with the assistance of BRDB or local NGOs. At least half of the earth work should be reserved for female LCSs
- iii. these LCSs should be made up of disadvantaged groups both within and outside the protected area. Providing opportunities to participate through LCSs in the implementation/construction of the project should be a major concern of the PCC.

PEOPLE'S PARTICIPATION IN OPERATION AND MAINTENANCE

Operation

31. The operation of FCD/I structures varies from making or cutting open temporary closures of tertiary and secondary channels, to opening and closing multi-vent regulators along major rivers and the operation of pump houses. In consequence

- (a) operating manuals must be produced in simple Bangla for all projects and for all levels at which operation takes place within projects. These manuals will present technical, operationally useful information in language that even those who are not highly educated can understand. There must be a procedure for training people in their use and updating them regularly in the light of experience gained and changing field requirements;
- (b) the operating manuals will have to cover the operating options at all levels, given the whole range of possible external parameters. This range will have to include a number of possible disaster scenarios including structural failure, sabotage, flood levels surpassing design levels, etc.;
- (c) the PCC will have the freedom to operate the system as needed in accordance with rules and, of course, within the operating options and external parameters as determined by the BWDB; PCC will be also responsible for setting up training programmes.
- (d) facilitate sustainable water management, i.e. acceptable to all concerned (conflicting interests), Relevant GOB department officials may advise and assist the committee members, or any other affected person who might wish to discuss aspects of a given project.

Maintenance

32. Yearly maintenance needs for a local system can be assessed by the PCC after each flood season. The relevant GOB officials will be charged with preparing a detailed proposal, including a budget, for the maintenance of all works under the authority of the committee. The budget should include financial provisions for contingencies that might arise from time to time.

- (a) Upon verification and adjustments as necessary, the committee will formally approve the maintenance proposal. In the case of self-governing irrigation systems that can levy users fees to fund maintenance, the Committee should be able to do all of this themselves.
- (b) Regular maintenance of roads and road and embankments may be awarded to local group including women's groups. In all cases employment of women's groups should be encouraged. Experiments may be conducted to find ways of combining such maintenance with the use by these women of roadside, embankments, borrow pit, etc. for productive purposes.
- (c) Earthwork and turfing wherever appropriate to the specification will be done by LCSs.

Funding of O&M

33. Funding of O&M must be seen in the wider context of project sustainability and resource generation at the grassroots level. No easy solutions are expected, and experimentation together with ongoing monitoring and evaluation will be needed for workable arrangement. Planning and Design Teams should investigate the following in particular and suggest ways and means:

- (a) Local resource commitment for income - producing FCD/I projects is most likely where resources generated are directly ploughed back into the project. Tertiary committees would need some freedom to decide on a fair way to levy charges.

- (b) The larger the area covered by a project (i.e., secondary and primary level committees), the more difficult it will be to generate local resources for O&M. Possible sources are:
- o market/sales tax
 - o land taxes
 - o property tax
 - o licence fees
 - o service fees etc.
- (c) A system of government subsidies perhaps in the form of a matching grant, may be needed to stimulate local resource generation.

ANNEXURE: "A"**FEASIBILITY PLANNING TEAM COMPOSITION AND INPUTS****1. Composition**

- (a) The Feasibility Planning Team, part and parcel of the overall project planning team, is drawn in the main from the staff of the project. Its composition should reflect the principle features of the socioeconomic setting of the prospective programme or project area.
- (b) In general the Participatory Planning Team would include at least:
 - i. a male sociologist or social anthropologist,
 - ii. a female sociologist or social anthropologist,
 - iii. a water and land use specialist (or drainage/irrigation engineer),
 - iv. a fisheries specialist (riverine or marine),
 - v. an agronomist (in most cases rice),
 - vi. an institutional specialist,
 - vii. an ecologist, and
 - viii. male and female village organizers (to serve as a bridge to poor and marginal groups),
 - ix. co-opt local body representative.
- (c) The Planning Team Leader should be a senior specialist with experience in conducting Rapid Rural Appraisals (RRA), possibly including Particularly Rural Appraisals (PRA), which is an emerging RRA methodology and should be increasingly tested and employed in Bangladesh. His or her main assignment is leading the team. This means in leading the team the team leader would be responsible inter alia for framing and scheduling the general approach, organizing

logistics, overseeing reporting schedules, mediating disputes among team members, and taking responsibility for the quality of work performed.

(d) The Planning Team members be:

- i. willing and able to conduct extensive field work and learn from people (i.e., experts who are too sure of what they know or will find before they go into the field may not be suitable for this kind work);
- ii. trained and preferably have experience in RRA methodologies;
- iii. have experience of FCD/I projects; and
- iv. able to report their findings in written English and Bangla.

2. Specialists covering such areas as infrastructure, communications (river and road transport), marketing, wildlife, forests, urbanization, industrialization, etc. should be added as needed.

Flexible Timing and Schedules

3. Planning for the appropriate water management project or nonstructural program in an area is a time consuming process. Although theoretically project phases are timed linearly e.g. needs assessment, tentative development alternatives, consultation about alternatives, etc., in practice each phase may reveal issues that are as yet unclear and for which part of the previous phase(s) may have to be repeated. Depending on the complexity of the situation, the extent to conflicts of interest, and the experience of the Planning Team, the planning process may take more time than originally planned.

Needs Assessment and Project Formulation

4. A careful preliminary survey of the area should precede actual needs assessment in the field. The following information should be collected and analyzed:

- i. contour and other maps (4" and 8" to the mile);
- ii. satellite and aerial photography;
- iii. district gazetteers (relevant for historical data and long term trends);
- iv. national, regional and unionwise socioeconomic statistical data;
- v. the social and political history of the area, with reference to national, regional and local politics;
- vi. national, regional and local water management projects completed, being implemented, or planned in the proposed programme area, or which are or may affect the area;
- vii. all other GOB projects at all phases that have a bearing on the environment, or could affect fisheries and agricultural development in the proposed programme area;
- viii. NGOs and their programmes in the area
- ix. women in development programmes/projects

5. RRA/PRA methods should be used to conduct fieldwork for the needs assessment. The needs assessment must spring from the likely affected socioeconomic groups passed over by the specialists conducting the assessment. It is most important to listen and learn from the people, instead of pressing one's own insights and views on local people. The ability to ask non-leading but probing questions during needs assessment interviews will determine the quality of the work during this phase. Pre-fieldwork training and seminars should specially focus on this. Only those Specialists should be included on RRA/PRA teams who respect the knowledge that local people have about the land and water resources upon which they depend. To this end, Specialists should use Participatory Rural Appraisal methods wherever appropriate, thus allowing local people to assemble their own information and devise their own simple scales to

prioritize needs and measure effects. This includes hydraulic charts, social mapping, resource and resource usage mapping, work diagramming, local calendars (agrarian, fishing, social), listing and diagramming customary and informal rights, etc.

Logistics

6. The Planning Team may need a variety of means of transport (including one or more small 4WD vehicles) to move from area to area. Once in the area, local transport - rickshaw, vans, boats, etc. may be used. Care should be taken by the team to keep as low a profile as possible. In practice, this often will mean walking into and around the area where interviews/consultations are to be held.
 - (a) Team interaction is of great importance. This would help verify the importance and trustworthiness of information gathered by the different specialists. If gaps or discrepancies are found, it would still be relatively easy to return to the area to collect more information. It would also help all team members gain an integrated view of the area. Very often potential social and environmental effects can only be identified and understood when specialists combine their knowledge and data.
 - (b) To facilitate such intensive team interaction, common lodging facilities for the whole team are necessary, preferably in or as close as possible to the proposed project area.

Reporting

7. Team members should use their own notebooks and diaries, and their own methods, to record data collected in the field. However, team members should have prior agreement on the checklist to be used by each of the team members.
8. At appropriate times during the study, each specialist should report his/her information to the Planning Team in a predetermined form. This report should include the following:

- (a) agreed-upon chapter headings, subheadings, tables, etc. (use FPCO standardization);
- (b) a chapter entitled: "Own Views and Observations" to record his/her own perceptions/observations/ recommendations. Separate sections on the views expressed by local people will thus remain free of the specialist's judgements;
- (c) a chapter containing issues that need to be followed up, either because;
 - i. there was not sufficient time to get the information, or
 - ii. the information collected from different people or interest groups is conflicting; or
 - iii. the information collected differs from the generally accepted opinion in the relevant field of specialization, or
 - iv. the information collected was found to be unique to that specific locality or interest group.
- (d) Planning Teams need secretarial support to ensure that reporting requirements are met. Given the complexity of the research and interaction among specialists, portable computer, printing and photocopying facilities should be available at the field office.

TECHNICAL SESSION II

May 18, 1993

(16:15 - 17:30 Hrs.)

Chair: Dr. Q. K. Ahmad
Chairman, Bangladesh Unnayan Parishad

Rapporteur: Mr. M. A. Wadud Bhuiyan
Executive Engineer
Joint River Commission

Topic: Inter Regional Impacts of FAP Projects
by Mr. M. H. Siddiqi
Chief Engineer, FPCO

TECHNICAL SESSION ON INTER-REGIONAL IMPACTS.

Presented by Mr. M. H. Siddiqi, Chief Engineer, FPCO

1. Mr Chairman, ladies and gentlemen, in the previous sessions we have had papers and topics based on on-going issues. However, I am going to talk briefly on an issue that does not yet exist but I feel must be carefully considered for the future. This issue of inter-regional impacts is vital for the development of FAP and for the country as a whole. I do not propose to speak for long and it is my intention to provoke the thinkers and stimulate discussion.

2. The regional studies are nearing completion and definite options or likely options are emerging from the regional plans. FAP is approaching the crossroads and choices will have to be made on the direction to proceed. The few priority projects which have or shortly will be taken through to the detailed design stage, we do not think will have a significant external impact. These projects have been selected as a priority intervention in the region and/or to test out new concepts of water management. However, when the regional plans are brought together and their recommendations are collectively reviewed we shall have to decide on a national prioritized program. For this program to become effective we will need to study the various impacts of the proposed projects.

3. We will need to carefully assess the resource requirements of the program bearing in mind our own limitations. No less important will be the social and environmental impacts of the various projects and the long-term equity effects. To date the regional studies have not looked outside their geographical area and for this reason we now think an inter-regional impact assessment is timely and essential.

4. The impacts are many and have many dimensions. Broadly they can be classified into three groups, these are:

- (a) Hydromorphological
- (b) Socio-economic
- (c) Environmental

The hydromorphological impacts are more straightforward than the other two. The former can be ascertained by existing institutions (FPCO, BWDB, WARPO, RRI) but these institutions are not equipped to assess the socio-economic and environmental impacts. For this work to be done effectively we will require a very broad debate to build a national consensus which in turn will allow phasing of the long-term national investment plan.

5. Hydrological and morphological issues could be addressed through a series of studies and FAP 25 have already initiated work on the subject. However, at this stage we should read too much into the figures but we should rather look at the concept. The first scenario that has been looked at is the existing embankments along the Brahmaputra and Teesta, the Pabna Project embankment and the Chandpur Project embankment. This is the base case - Scenario 1. Scenario 2 shows the extension of the Ganges left embankment and construction of the Brahmaputra left embankment and Scenario 3 incorporates many other options which have been developed by the regional studies. These various scenarios can be subjected to various sensitivity tests, such as what would be the impact if the embankment were set back one kilometer what would be the rise in water levels downstream. The modelers have also developed another scenario which incorporates the existing (on the ground) situation and a sea level rise of 35 cms. On this option the model predicts that there is little effect during the monsoon season but the effect will be high in the dry season. Our aim will be to integrate the various stand-alone studies and determine their overall hydrological and morphological effects.

6. The socio-economic impacts to date have occurred through both natural and man-made disasters. In the early 1950s for example the MIWDFC carried extensive excavations in the Chalal Beel Area which was an important source of fish. This work caused over-draining of the beels and the fishermen were badly effected. In the Noakhali area there was severe natural erosion and floods prior to the construction of the Meghna Cross Dam and the Coastal Embankments which caused seasonal migration of the inhabitants. Because of salinity rises in the southwest drinking water supplies have become contaminated and this led to a migration of people from the region. The health hazard has become very acute and people are having to having to drink water which is three times more polluted than the level prescribed by WHO. There are examples of man-made or natural impacts and we are aiming to mitigate against these impacts to improve health and productivity of the land.

7. However, the question needs to be asked whether such improvements are sustainable and whether agriculture can continue to provide increasing economic wealth and employment. Although agriculture can be expected to intensify and benefit from improved water management, it is likely that non-farm activities and employment will grow in importance. FAP will need to be much broader in its outlook than have been the previous approaches in the water sector.

8. Each regional plan has studied the environmental impacts of its proposals and these investigations are freely available for all to read. Environment has been addressed as a total subject involving soil, water, people, birds and plants. This approach has allowed us to identify the danger areas and I would like to highlight one of these.

9. The environmental disaster that is in the making with the unilateral withdrawal of water from the Ganges poses many challenges and will need to be addressed in an inter-regional context. Over the last two days we have heard recommendations on alleviating this problem with head-works at the Gorai River mouth and a barrage across the Ganges. But this year, in March, the low-flow of the Ganges was 9,200 cu/s and we need to ask ourselves if a 2 km long barrage will be a viable proposition on its own. Augmentation of dry season flows will be essential to save the southwest area but to make it viable we will probably need more than 9,000 cu/s and we need to think of transferring water from elsewhere to supplement the flow. For example the Begumganj area has great potential but lacks adequate levels of irrigation water. This problem could be solved by transferring Meghna water through Dakatia and we should study this option. Equally, to safeguard the southwest's urban areas and the Sundarbans we need to fully investigate all potential water transfers. Obviously such decisions will need to be taken at the political level but we will have to advise our political masters on the best course of action.

10. Mr. Chairman I would like to stop here and allow for questions as I feel the subject is one where we need to listen to all the opinions.

Many thanks.

TECHNICAL SESSION - INTER REGIONAL IMPACTS

Answers given by Mr. M. H. Siddiqi, Chief Engineer FPCO and other FPCO/POE members.

Mr. M. A. Quassem: BWDB

Question: The regional studies, as has been presented during the last two days, have so far indicated sub-basin small projects, and no umbrella project incorporating those small projects. This conflicts with the underlying expectation from your statement made yesterday during inaugural session, "one of the experiences of 1987 and 1988 floods is that small projects become ineffective against such big floods. They may be effective only within the umbrella of big project". May I invite your response to my remarks?

Answer: Reference of umbrella project was made to indicate some small FCD projects that did not suffer catastrophic damage being under the shadow of BRE. The sub-basin development emerging out of regional studies are divisible components of total regional plan and in suitable cases they comprise parts of a big umbrella project.

Question: During normal annual floods, 1/3rd of the country go under water and act as the drainage basin/outlet for the Ganges-Brahmaputra-Meghna river system. Is it possible to contain this flood volume within the existing river system by embankment and drain to the sea? Answer to this question fixes the framework of any flood protection or mitigation strategy for our country. From the presentations made so far, it appears that this question has not been answered. If I am wrong, would you please explain how?

Answer: The cross-boundary flows if confined within the stream may not efficiently drain out, but would not overflow and contribute to the floodplain already inundated by accumulated rainfall-runoff, thus reducing depth of flooding significantly.

Question: I hope you will agree that all projects should be evaluated to see whether the desired impacts have been achieved. But this is not usually done. So, I would suggest to plan and design post-project impact/effectiveness evaluation of the FAP projects at the planning stage.

Answer: Yes, the evaluation should be built in the life cycle of a project.

Engr. Aminur Rahman: Research and Advisory Services

Question: The South-West Regional Study (FAP-4) calls for urgent study of water management under this study due to unilateral withdrawal of water at Farakka. But it is seen from the progress report of FPCO that the study of this region is lagging far behind those of the FAP-2 and FAP-3. What is the precise reason for this?

Answer: Works on FAP 2 & FAP 3 started in early 1991 while that on FAP 4 in late 1991. Hence the delay. Besides, substantial changes were made in the TOR during the course of the study.

Mr. Amjad Hossain Khan: Consultant

Question: In the model 8 boundary status consider the present situation of inflow from outside with sea level rise and climate changes, we may expect more floods and droughts. Continued up-stream developments will further reduce dry season flow. Are we preparing any model with such scenarios?

Answer: Yes, FAP 25 modelling exercise is building up such scenarios, here only a part was shown as example.

Dr. A. M. Choudhury: SPARRSO

Question: I think the interregional impacts of FAP should be undertaken before implementation of any of FAP projects as otherwise there may not be any option left for correcting any adverse impacts.

Answer: No question, even a portfolio of projects cannot be prepared now on the basis of priority. The only pilot project taken up is hydro-morphologically inert/neutral.

Mr. J. U. Chowdhury: BUET

Question: There exists non-homogeneity among five regional studies in terms of scope of study, criteria for planning units, price index, etc. How this problem of non-homogeneity would be overcome while integrating the five regional plans and assessing the inter-regional impacts?

Answer: Planning criteria and price indices are homogeneous. Physical heterogeneity of five regions cannot be reconciled.

Syed Anwar Yusuf: River Research Institute

Question: Your statement that regional plans have been studied in isolation has confused me. Do you need a new FAP component to study the inter-regional impacts at this stage?

Answer: Study of inter-regional impacts is an imperative, it may be continuation of present efforts or new if necessary.

Md. Azizul Haque: Executive Engineer, Joint Rivers Commission

Question: The northern part of the FAP-5 area is a deeply flooded area. Would you please elaborate whether flood depth in this area will be further increased as a result of the planned flood control activities in the area under FAP-3 and FAP-6?

Answer: Works of FAP 3 and FAP 6 would not aggravate flooding downstream.

Mr. M. Q. Mirza: BISS

Question: One can hardly find the information generated by MPO due to lack of proper management. Is FPCO preserving the information collected by the consultants in any computer system?

Answer: I don't agree, FAP and other consultants of WDB have been using NWP data base extensively. However, all data generated by FAP are computerized and stored systematically.

Dr. Peter Rogers, Eastern Waters Initiative

Question: Inter Regional Impacts are important, but what about inter sectoral impacts ? So far the only macro-economic study by the FAP has focussed upon the evaluation of Flood Control benefits in the water sector. Is there any plan to do an intersectoral planning study ?

Answer: Inter sectoral evaluation will be done in due time by GOB while preparing national investment plan. FAP is yet far from it.

Mr. J. Bird: Asian Development Bank, Dhaka

Question: Now that the regional plans are being finalized, are the regional hydraulic models and data being transferred back to FAP-25 for future modelling of inter-regional impacts.

Answer: Yes, in addition these will be essential for the proposed impact study.

Dr. G. T. Keith Pitman: ISPAN

Question: Mr. Siddiqi said "the regional FAP studies have been carried out simultaneously and independently". What institutional proposals does he have to integrate the regional FAP studies and the supporting studies ?

Answer: A summary report would be prepared in mid-1994 by FPCO integrating all regional studies but final integration will await the impact evaluation.

Professor Wybrand F. T. van Ellen: Panel of Expert

Question: It seems as if, often independent of FAP, embankments are in place along the greater length of the main rivers. Even if they are not continuous, they probably will have some hydro-morphological effects. Is there any mechanism in place to control such developments?

Answer: There is no practical mechanism in place, but FAP is striving for it.

Dr. Dilip K. Barua: FAP 24

Question: Why do you think that the understanding of hydro-morphological impact is simple. We know that because of poor understanding of hydro-morphological system, embankments with regulators/sluices were eroded away or became redundant due to siltation.

Answer: The intention was to indicate that engineering computations fall under exact science, hence relatively simpler than socio-economic behaviour.

Question: The results of surface water model runs show only hydrological impacts. How do you like to see the morphological consequences at the given scenarios.

Answer: That is why the new study is proposed.

Mr. Tom Franks: FAP 2

Question: Is there a need for a detailed and intensive morphological study of the possible impacts of combined inter-regional development.

Answer: Yes, there is, to determine national priority.

Dr. Dilip K. Barua: FAP-24

Question: Why the greater Chittagong area is not included as any regional projects? We know that local river flooding as well as saline coastal flooding (during storm surge) is a great problem in the area.

Answer: Greater Chittagong was not as badly hurt as rest of the country. Local problems prevail everywhere.

Mr. Saeed A. Rana: World Bank

Question: What are FPCOs plans and timetable for putting together results of individual studies for establishing priorities of investments and actions at the national level.

Answer: The first attempt should be ready by mid-1994.

Mr. T. Herman: World Bank

Question: To do the interregional analysis of the type described, all the regional plans should have the comprehensive approach exhibited by FAP-6. Why are the TORs and budgets of the other studies not similar (i.e. to enable the same comprehensive approach) ?

Answer: All the components were launched nearly simultaneously and great hurry was a key factor. It is rather difficult to achieve homogeneity on heterogeneous issues.

Mr. S. N. Anwar: FAP 2

Question: Flood study stressed on co-operation among countries in the region in mitigating flood. We knew of discussion of dry season sharing. Did we think of floodflow sharing out to the sea, specially the Ganges.

Answer: Joint studies were conducted with all upper riparians, the reality is, upper riparian would not accept flood flows and the accompanying hardship. We got to do whatever we can for our survival.

Mr. Mian Akbar Hussain: SCI Service Civil International

Question: In your presentation you did not mention the people living in Jamuna char and other coastal areas, who will be displaced due to implementation of the proposed plan approx 6 million people are likely to be affected.

Answer: We are not yet aware whether people will be displaced at all or how many, because the plan is not yet ready.

Mr. Moinuddin Nasir: The Telegraph

Question: It is said in FAP-4 study that the viability of Ganges barrage is dependent on the upstream releases or Ganges water. But it seemed that the upper riparian is very much rigid on the point. So do you think any alternative to keep water reserved for dry season augmentation in Gorai. What would be the impact of that alternative?

Answer: Yes, we have to have our own plan to keep our rivers flowing. The impact is being assessed.

Dr. Abdus Sattar Syed: PROSHIKA Centre for Human Development

Question: You have proposed economic activity based on serious centralised planning. Based on atmosphere prevailing in 1990's. do you think such is feasible ?

Answer: FAP has proposed no economic activity based on serious centralized planning. On the contrary, People's Participation is a core theme in FAP and that is the key to decentralization.

Mr. Mostafa Kamal Majumder: The Telegraph, Dhaka

Question: To any environmentalist the assertion that "perhaps a new environment will have to be created through FAP interaction" sounds like sacrificing the existing environment for a new one. In such a case what will happen to the mutually reinforcing biological communities that maintain environmental balance ? Because they will be affected.

Answer: By new environment is meant enhancement of environment for a better living for the people. We cannot drown the people to make room for reptile - let them have separate habitats.

Mr. H. Bruhl: FAP 21/22

Question: What would be the possible institutional set-up for ranking the priority projects of the various regional studies to come to the National Long-term Plan.

Answer: If FPCO cannot do it during its life time, the onus is on NWP to formulate the Long Term National Plan.

Question: If not, are there already initiatives to come to such an institutional set-up

Answer: Yes.

Mr. Marcel Van Opstal: Commission for European Communities

Question: Could you elaborate on any initiatives that the government and /or FPCO have taken to set up an administrative system to ensure a full assessment and monitoring of the inter-regional impacts of FAP studies!

Answer: FPCO will supervise and monitor.

Prof. Shapan Adnan: Research and Advisory Services

Question/Statement: It was good to have your public acknowledgement of the fact that more than 3 years after FAP has started, the need for having an inter-regional study is being considered at last.

Question: However, does your concept of finding out resultant water levels and setback distances from embankments exhaust your ideas about even hydro-morphological planning on an inter-regional (national) scale?

Answer: No, it does not.

Question: Your ideas on socio-economic planning are interesting but elementary. Don't you think you should focus your mind more in your own area of competence, and give some more imaginative ideas about hydro-morphological issues on an interregional scale ?

Answer: Experts in respective fields would do own work. I wish everyone practices what they preach.

Mr. Tim Martin: ISPAN/FAP-19

Question: Data bases, information maps, results from regional studies will be needed for any organized inter-regional assessment. Has any effort or consideration been given to a system for preserving these data and for making them readily and freely available to others in the future?

Answer: Storage and retrieval are under serious consideration.

Mr. Mohammed Mozammel Hoque

Question: With the present mathematical modelling capability in Bangladesh or elsewhere, it is possible to study the regional or inter-regional hydraulic behaviour of the river networks of Bangladesh. But I have doubt about the development of a morphological model which will be able to simulate the complex morphological changes of our river system. Please comment in terms at regional and inter-regional morphological study under FAP.

Answer: Yes, morphology is yet a less understood subject, but we have to give it a start somewhere.

**SPECIAL SESSION ON MACRO-ECONOMIC ANALYSIS
FOR FAP PROJECTS**

May 17, 1993
(19:00 - 21:00 Hrs.)

Moderator: Mr. M. N. Huda
Chairman, Panel of Experts
Flood Plan Coordination Organization (FPCO)

Topic: (a) Macro-Economic Impact Analysis of the FAP
- An Appraisal
by Prof. Kh. Mustahidur Rahman and
Dr. Qazi Shahabuddin
Panel of Expert, FPCO

(b) An Attempt to Quantify the
Macro-Economic Impact
by Mr. Joel Maurice, CFD, France

Proceedings: Special Session on Macro-Economic Impact Analysis

**MACRO-ECONOMIC IMPACT ANALYSIS OF THE
FLOOD ACTION PLAN - AN APPRAISAL**

**K. Mustahidur Rahman
Q. Shahabuddin**

**Paper Presented at Special Session on
Macro-Economic Analysis**

May 18, 1993

**FLOOD PLAN CO-ORDINATION ORGANIZATION (FPCO)
MINISTRY OF IRRIGATION, WATER DEVELOPMENT
AND FLOOD CONTROL**

MACRO-ECONOMIC IMPACT ANALYSIS OF THE FLOOD ACTION PLAN - AN APPRAISAL

Background

1. The need for macro-economic modelling study was first emphasized by Maurice and Schubert (1989), during the discussion of the French Consortium Study about its suitability to undertake measures in order to combat the devastating floods in Bangladesh. It was argued that in a country like Bangladesh, where floods frequently devastate the economy, large investment in flood control would seem to improve the overall growth prospects of the economy and if the nation is risk averse (which is most likely), standard direct economic benefits from micro-project need to be adjusted upward in order to reflect the overall improvement in the growth prospects of the economy. While the argument was convincing, there was neither any methodology to study this nor there was any evidence to support the contention nor there was any adjustment factor readily available for application on standard benefits in project evaluation.
2. Since then a detailed agenda for research was drawn up following the fact-finding study for methods of economic analysis by J. P. Azam in September 1990 and research on macro-economic impacts was first initiated by two French Institutions.
3. The study aimed at assessing the potential macro-economic impacts of the Flood Action Plan (FAP), including possible multiplier effects of the FAP investment on regional and national economies, and the implication of major water sector investments on the sectoral allocations of resources and overall investment planning in the economy. In particular, the research aimed at developing a methodology for assessing the "corrective factors" by which standard direct benefits derived from controlled flooding might be adjusted upward reflecting the improvements in the growth prospects due to large scale controlled flooding investments in the growth prospects due to large scale controlled flooding investments in Bangladesh economy. Also, there were some econometric exercises testing the impacts of floods on key macro-economic

variables, such as impacts of flooding on technical progress in rice production and their impacts on rural real wages and hence the rural poor and the impacts of flood on manufacturing output and investments.

4. The first phase of research, which is now almost complete, was jointly undertaken by CERDI at the University of Auvergne, Clermont-Ferrand, and the CCCE in Paris, France. Eight papers were produced in this study.

5. These papers fall into two broad categories. The first three papers, one by Maurice and Diallo and the Other two by Motel, are simulation exercises, aiming at capturing the various impacts of floods on the economy as a whole, and the social value of the reduction in the entailed risks. The papers distinguish two aspects in the impact of floods : the destruction effect and risk effect. From time to time, at irregular intervals, floods occur and destroy a part of the flow of the income and of the capital stock. The productive capacity of the economy tends to be smaller, the more frequently floods have occurred in the past. Then there is risk effect whereby economic agents have an incentive to have a different behaviour from the one they would have in a riskless world. The way by which agents try to protect themselves against the risk of floods, determines more fundamentally the macro-economic impacts of floods. The risk of floods exerts two conflicting influences in the long run: the destruction effect of a more frequent floods tend to lower investment by reducing the means to implement it; the risk effect of a high probability of floods tends to increase investment, as a partial insurance against large scale reduction in consumption.

6. The three papers presented adopt various modelling strategies based on different sets of simplifying assumptions since a comprehensive and rigorous modelling of a growing economy subjected to random shocks like floods along a long run growth path is extremely cumbersome. They combine the destruction and risk effects in different ways, resulting in differences in emphasis and prediction. The common elements of these three papers were, use of social utility function with different values of relative risk aversion parameters and the project return period, assumption of no entry to perfectly competitive insurance and capital markets, exogenous foreign aid, etc.

7. All the models were tested with Bangladesh data as well as some assumed values of the various parameters. The main practical outcome of these exercises is the formulation of corrective factors, which may be applied for upward adjustment of the present value of the standard net benefits of the flood

control projects for taking into account the effect of risk aversion for large investments in controlled flooding.

8. The next four papers are econometric exercises testing the impacts of floods on key variables of the Bangladesh economy. The two papers by Azam are devoted to agricultural sector analysing the impact of floods on technical progress in rice production and their impact on rural real wages. The two papers by Arnaud are devoted to the manufacturing sector analysing the impact of floods on manufacturing output and investment. The last paper by Azam presents an excellent summary of the first seven papers listed above.

9. The earlier version of these papers were first reviewed by a group of Bangladeshi economists in Dhaka in October, 1991 and later at CERDI in February, 1992. Finally, these were presented in a seminar held in Dhaka in March, 1992. These are recorded in (1) Proceedings of Informal Session on Draft Macro-economic Research Reports for FAP 13-14, October, 1991; (2) Note written to prof. J. P. Azam at CERDI by Rahman, February 14, 1992; and (3) Proceedings of the March Seminar on FAP, 2-5 March, 1992.

10. Several useful comments were made for improvement of the research papers presented for discussion. These were recorded in the proceedings of the sessions. The papers were revised incorporating the comments as far as practicable given the time and resource constraints and the revised version were sent to FPCO for review. These papers now represent considerable progress in research in developing a methodology to assess "corrective factors" by which standard benefits from controlled flooding may be adjusted upward reflecting the overall growth prospects due to large investments in controlled flooding, reduction of losses of capital stock improving the long run growth prospect of the economy, positive impact of risk reaction on the society's choice of discount rate, etc. However, at present, assessment of the corrective factors depends on a lot of simplifying assumptions and use of preliminary data. Significant improvement could be achieved in this regard depending on the modification of assumption and specification of the model and use of accurate data from Bangladesh economy. Since the results of the rigid planning method (by Maurice and Diallo) appears to be robust, some upward adjustment of micro-project benefit would be sensible in principle, although an accurate assessment of corrective factors would be imperative. However, some results could be achieved if corrective factors are used in a sensitivity analysis of a project instead of incorporating it in the base case of project evaluation.

The Need for Further Research

11. Although macro-economic modelling exercises, which represented high level of professional competence, made substantial contribution to develop a methodology to capture macro-economic impacts of large flood control investment for the standard micro-project benefits, its endeavor to assess an accurate set of corrective factors appear to be less successful.

12. It has been established that there is much scope for enhancing the effectiveness of this research both by relaxing some of the restrictive assumptions in the structures of models and by improving the data base. Mono-sector modelling approach may be expanded so as to incorporate at least few important sectors of the economy. One may also assume that flood protection benefits are realized over a longer period of time rather than being realized at once, at the beginning of the period. The model may also incorporate the negative impact due to possibility of project failure.

13. There is also an overriding need to explicitly incorporate in the exercise the cost of negative externalities (environmental impacts) that such flood protection measures would entail, and their implication for practical planning decisions properly analysed. The results may also be directed to establish more clear link between macro-economic modelling exercise and project evaluation. The second phase of research may involve further modelling exercise incorporating the considerations discussed above and field surveys to collect relevant data to capture the difference in economic behaviour in the protected and non-protected areas, improvement of macro data base and improvement in the computer programmes to assess corrective factors. These ventures may be undertaken jointly by the French and the Bangladeshi economists.

Observations on Maurice-Diallo Approach

14. As mentioned earlier, in the seminar held in Dhaka during 13-14 October, 1991, economists from Bangladesh had the opportunity to appreciate and comment on the research endeavor to come up with a methodology in order to assess the corrective factors' corresponding to different assumptions with respect to risk aversion and project return period for upward adjustment of standard direct benefits derived from controlled flooding reflecting the improvement of growth prospects due to controlled flooding investments in Bangladesh economy. The comments made in that Seminar with respect to

Maurice and Diallo Paper suggested the following improvements.

15. Incorporation of technical progress in the production function (if possible both embodied and disembodied technical progress) in order to improve the predictive power of the model.
16. Incorporation of the non-linearities which would appropriately take into account of the effects of large scale investment in controlled flooding.
17. Direct estimation of the aggregate production function by using available data (either Cobb-Douglas or CES type).
18. Using an alternative specification of the Society's Utility function with declining relative risk aversion parameter since increasingly more and more investments in controlled flooding may produce changes in the societies' attitude towards risk and thereby produce declining risk aversion parameter for the society. There will be no unique solutions to steady state capital and consumption when changes but in this case a growth of capital will have to be assumed.
19. The cost of foreign aid and the time path of the aid inflow merit further investigation. The assumption of perpetual indebtedness for the economy may be changed to incorporate assumption of declining dependence of foreign aid over time in the economy.
20. For a considerable period in future, Bangladesh economy is likely to remain labour surplus. In this context, an alternative, whether a Harrod-Domar type production function (with technical progress) would better reflect the reality deserve serious consideration. It should be mentioned here that for infinite time-horizon steady state analysis of production function may be more appropriate, while for the transition period, a Harrod-Domar type production function may be more appropriate.
21. Further, instead of approaching a steady-state path, one may also assume an average growth rate of capital and evaluate its impact.
22. Improvement of flood damage assessment should be carried out or else several alternative estimates should be used. A realistic model should incorporate the probability of failure of projects (for a given design flood return period) in

order to provide flood protection due to breach and construction defects. The assumption in the present model is that FCD projects provide full protection from floods for which these are designed which is not very realistic.

23. There is much scope for enhancing the effectiveness of this research both by relaxing some of the restrictive assumptions in the structure of the model (as outlined above) and by improving the quality of the data base. Monosector modelling approach should be expanded so as to incorporate at least few more prominent sectors and monetary effects (if possible) and also assuming that flood protection system could be realized over longer period over time instead of assuming that those are realized at once, at the beginning of the period. To enhance the reality, the data base, particularly, those involving key macro-economic parameters deserve special attention.

24. There is an overriding need to explicitly incorporate in the exercise the costs of negative externalities that such flood protection measures would entail and their implication for practical planning decisions properly analysed.

25. The linkage of the macro modelling exercise with project evaluation need to be more clearly established.

26. The improvements that have been carried out are: (i) incorporation of technical progress, (ii) incorporation of the effect of non-linearities and (iii) direct estimation of the production function, and (iv) assumption of declining aid dependence, among other things. However, utility function with decreasing relative risk aversion, using a Harrod-Domar type of production function for transition period and later steady-state path, and improvement on flood damage estimation have not yet been done. Also, the models could be more useful and its predictive power would improve by allowing agents to choose other portfolios and providing opportunities to diversify risk. There is also ample scope to expand the model in order to incorporate prominent sectors (multisector analysis) incorporate the probability of project failure and finally, the overriding need to explicitly incorporate in the exercise the costs of negative environmental effects (externalities) that such investments would entail and their implications for major parameters of the economy as well as practical planning decisions should also need to be worked out if such models are to be used in order to assess the corrective factors. The paper also had some improvements in the use of data but the exercise leaves considerable scope for further improvement in the data base.

27. It needs to be emphasized here that Maurice and Diallo model did not incorporate monetary sector and declining relative risk aversion as suggested earlier. They did so in order to highlight two important issues, namely optimal control (shift to optimal steady growth path from the case without project to the case with project) and highlight the importance of risk aversion in the society. These along with the suggestion of making the model multi-sectoral will be difficult and time consuming (in particular in order to coverage towards steady state growth path). However, it is felt that such improvements though difficult to achieve in practical is not impossible.

Some Suggestions for Future research

28. In view of the above, macro-economic impact study in the future should centre around the following objectives:

- (a) Improvement in modelling exercises; which would involve modification in the model structure considered feasible in the context of Maurice/Diallo study.
- (b) Upgrading and updating of data base in order to estimate the model parameters, and carry out model simulation exercises.
- (c) Developing at the FPCO, the computing capability for simulation exercises of the improved model by using the specially designed soft-ware for the project which would involve transfer of technology from the French to the Bangladesh side.

29. The scope of the suggested study will involve the following:

- (a) Review of the existing macro-economic impact analysis with special emphasis on the Maurice/Diallo model in order to identify the deficiencies.
- (b) Modification in model structure which is feasible in the context of Maurice/Diallo Model.
- (c) Updating of macro data set for the estimation of the model parameters, and carry out model simulations.

- (d) Collection of relevant data through field survey to capture the difference in risk behaviour between the protected and unprotected areas.
- (e) Development of the specially designed soft-ware for the estimation of the parameters of the modified model, and carry out model simulation, exercises.
- (f) Development of the computational capability at the FPCO by using the specially designed soft-ware for simulation exercises of the model through transfer of technology from the French to the Bangladeshi side.
- (g) Formulation of the long-term agenda for fundamental restructuring of the model and its possible application for FAP projects in Bangladesh.

Concluding Remarks

30. Finally, we would like to express appreciation for the attempt on the part of the French researchers to derive a set of 'corrective factors' corresponding to different assumptions with respect to risk aversion and steady state growth for upward adjustment of the standard benefits derived from controlled flooding reflecting the growth prospects due to controlled flooding investments in Bangladesh economy. We believe the results of such a research endeavor will be of practical significance for designing investment programmes in the Flood Action Plan and also contribute to long term planning process in Bangladesh.

**An Attempt to Quantify Macro-Economic Impact
by Mr. J. Maurice and Mr. Amadou Diallo**

SUMMARY

1. The issue arises whether it is relevant to apply the usual method of micro-economic analysis to projects relating to Controlled Flooding in Bangladesh, and more broadly to any project aimed at protecting against Major Natural Disasters.

2. As a matter of fact, the fundamental justification of any economic analysis relies on the maximization of the criterion "expected net present social utility (ENPSU)":

$$\max ! ENPSU , \tag{1}$$

with:

$$ENPSU = \sum_{t=1}^{\infty} \frac{P_t}{(1+q)^t} EU(c_t), \tag{2}$$

where:

- t = date of the year (e.g.t = 1 in 1990)
- P = population
- c = consumption per head
- U = social utility function
- E = mathematical expectation(with respect to given probability distribution of a set of relevant random variables)
- q = discount rate.

"Without project", the criterion takes the value 'ENPSU₀'.

"With project". corresponding to an investment 'W', the criterion takes the value ENPSU(W), and the optimal size of the project is the solution W^* of the equation:

$$\frac{\partial ENPSU(W)}{\partial W} = 0 \tag{3}$$

This solution is suitable provided that:

$$ENPSU(W^*) \geq ENPSU_0 \tag{4}$$

2. In the usual micro-economic project analysis, several simplifications are assumed, among which the following ones.

- (a) The envisaged investment is very small (micro economic) and modifies neither the other separate investments, nor the macro-economic growth path of the country.
- (b) The social utility is supposed to be a linear function $U = Ac+B$, which corresponds to a degenerated case of the widespread concave function:

$$U = Ac^{1-\alpha} + B \tag{5}$$

in which the risk aversion ratio 'a' (alpha) would be nil.

3. Consequently, from the general equations (2) and (3) it can be derived the standard simplified condition, according to which the optimal investment W^*_{micro} gives the same value both to the marginal expected costs and to the marginal expected benefits:

$$\frac{\partial E \text{ benefits}}{\partial W} = \frac{\partial E \text{ costs}}{\partial W} \tag{6}$$

3. But both conditions 2.a/ and 2.b/ here above are questionable in the case of Controlled Flooding in Bangladesh, and probability in the case floods in the case of other Major Natural Disasters.

∂ = delta.

- (a) In Bangladesh, floods have a macro-economic impact, that can be detected by econometrics, tentatively through the following relationship:

$$\ln Y_t = 11.1450 + 0.04168 t - 0.00026985_t^{1.3} / (1 + 0.002698) S_t^{1.3}$$

(4831) (44.36) (6.97)

$$R^2 = 0.998977 \tag{7}$$

where:

Y is the GDP at constant 1972/73 market prices, (unit: Taka million; source: World Bank report of 16/3/90)

S is the inundated surface, in 10³ km² (source:FAP 25)

This latter is found to follow a Gumbel probability distribution:

$$S(T) = 24.87 + 13.03 \left[-\ln \left\{ \ln \left(1 - \frac{1}{T} \right) \right\} \right]$$

(28.7) (8.4) (8)

Where T is the flood return period (in years).

4. So, there is some empirical evidence that GDP depends on the inundated surface through a significant negative correlation, even if more precise econometrical assessment would be desirable.

Therefore, the annual GDP can be seen as the result of a macro-economic production function, suffering losses due to floods.

$$Y_t = (1-u_t)F(L_t, K_t) \tag{9}$$

where:

- L is the efficient labour force (with technical progress correction),
- K is the productive capital stock,
- F is the macro-economic production function,
- u is the percentage of losses caused by floods to the output.

5. These losses caused by flood to output, and accordingly to incomes, have a negative impact on consumption, but also on savings and consequently on the productive investment, thus hampering the macro-economic growth potential of the country. In addition, floods also cause damage to the productive capital stock. This increases the share of mere replacement investment to the detriment of net incremental capital, and so slows down the macro-economic growth:

$$K_{t+1} = (1 - c - v_t) K_t + I_t \tag{10}$$

where:

- c is the average annual capital evaporation ratio,
- u is the percentage of losses caused by floods to the capital stock,
- I is the annual investment flow.

6. The probability distribution of 'v' should be assessed carefully, which would require relevant data on the losses caused by floods to productive capital. As a very tentative stage, the following relationship could be envisaged:

$$v_t = \frac{4.18 \cdot 10^{-11} S_t^{4.8}}{1 + 5.70 \cdot 10^{-10} S_t^{4.8}} \tag{11}$$

7. It seems more suitable to consider a concave utility function, rather than the linear one used in the standard micro-economic analysis, for several reasons among which the following ones:

- (a) Major floods (as well as other Major Natural Disasters) are regarded as catastrophic by national decision-makers along with multilateral and bilateral donors, revealing that the social impact is felt to be more severe than the economic loss assessment.
- (b) The utility of a marginal unit of consumption can reasonably be assumed bigger when the annual flow of consumption is low than when it is high.
- (c) The economic agents would probably prefer to reduce the variability of their incomes, even through some insurance cost or contribution to physical protection system.

8. Accordingly, it would be preferable to use a social utility function (see 5) with a positive risk aversion ratio, reaching at least 1 and possibly 2 (value quoted for instance for peasants in Nepal), while waiting more specific econometrical tests.

9. In the attached contribution, it is proposed to apply the general method recalled in paragraph 1 here above, using the following set of assumption.

- (a) The risk aversion ratio ' α ' is a parameter, comprised between 0 and 2.
- (b) The probability distribution ' u ' and ' v ' of losses caused by floods respectively to the output and to the capital stock are given by (6) and (10), the probability distribution of the inundated surface being given by (7).
- (c) The optimal sequence k_t of capital per efficient labourer, which determines the optimal macro-economic growth path, is itself determined through the rigid planning process¹ as the solution of the following system of equations:

$$\frac{\partial \text{ENPSU}}{\partial k_t} = 0 \quad \text{At } \geq 2 \quad (12)$$

This results in a relationship between three successive variables k_{t-1}, k_t, k_{t+1} of the form:

$$G(k_t, k_{t+1}, f a_t - d_t) = H(k_{t-1}, k_t, f a_{t-1} - d_{t-1}) \tag{13}$$

where:

G and H are specified functions, depending on the parameter ' α ',

$f a$ is the annual foreign aid per efficient labourer (without project),

d is the annual cost of the project (debt flow, along with operation and maintenance) pre efficient labourer.

In particular, the asymptotic value k_s of the steady capital per efficient labourer is the solution of the equation:

$$G(k_s, k_s, 0) = H(k_s, k_s, 0) \tag{14}$$

(d) The macro-economic (mono-sectoral) production function is of COBB-DOUGLAS type²

$$f = f_0 k^{1-\beta} \tag{15}$$

where:

$$f = F(L, K) L \tag{16}$$

10. In the case "without project", assuming "rational expectations", it is possible to derive the parameters of the production function ' f_0 ' and ' β '.

11. It is found that, when the risk aversion ratio ' α ' varies, they keep respectively very close to:

$$\begin{array}{l} f = 212 \text{ per head ('f' and 'k' in US\$ per head |} \\ \text{of efficient lab.)} \quad | \\ \beta = 0.82 \quad | \end{array} \tag{17}$$

 More sophisticated approaches have been investigated in separate papers by CERDI.

It would of course be possible to assume more elaborated function, like for instance CES.

- (a) In the case "with project", dimensioned for a "project return period T^* " the losses 'u' and 'v' are suppressed for any flood having a return period ' $T \leq T^*$ ', and further more an additional percentage of output '(-uu, negative loss)' would be made available -.
- (b) The investment cost of the project 'W' is an increasing function of ' T^* ', which should be derived from the Flood Action Plan underway, and is very provisionally drawn from the FEC Pre-feasibility Study³. The percentage 'w' of annual operation and maintenance cost of the project should also be better specified.
- (c) The annual debt cost of the project depends on the grant element of the foreign aid devoted to the project, which is assumed to be 50%.

12. A computer program has been developed which, for each value of the risk aversion ratio ' α ' and of the project return period ' T^* ', provides a set of outcomes "with project", among which:

- (a) the optimal steady capital per efficient labourer k^* ,
- (b) the optimal sequence of desired capital per efficient labourer k^* , leading from the initial value k_1 to the asymptotic k^* ,
- (c) the optimal criterion "expected net present social utility $ENPSU^*$ ".

The changes with respect to the case "without project" are found as follows:

The macro economic optimal growth path is shifted upward. This can be seen through the relative strengthening of the optimal steady capital per efficient labourer:

$$(K^* - K_1)/K_1$$

³ French Engineering Consortium (May 1989).

Unit : per cent

T* / a	0.0	0.5	1.0	1.5	2.0
10	3.33	3.24	3.12	2.79	2.79
20	4.24	4.18	4.10	3.99	3.83
40	4.80	4.80	4.79	4.74	4.65
60	5.03	5.07	5.09	5.08	5.04
80	5.15	5.21	5.26	5.29	5.28
100	5.25	5.32	5.40	5.45	5.47

- (d) The criterion "expected net present social utility" is improved much more sensitively, mainly due to risk aversion.

$$(\text{ENPSU}^* - \text{ENPSU})/\text{ENPSU}$$

(19)

Unit : per cent

T* / a	0.0	0.5	1.0	1.5	2.0
10	4.33	7.42	12.15	19.65	32.78
20	5.57	9.68	15.94	25.86	42.77
40	5.99	10.47	17.32	28.23	46.63
60	6.03	10.56	17.59	28.65	47.55
80	5.99	10.52	17.56	28.66	47.74
100	5.94	10.00	17.50	28.62	47.79

- (e) Given the risk aversion ratio, α (alpha) when the project return period T^* increases, the criterion ENPSU at the first increases and finally decreases, after reaching inbetween its maximum (even if this appears to be rather flat) for the optimal value of the project return period $T^{opt/macro}$. It is then possible to compare this $T^{opt/macro}$ to the $T^{opt/macro}$ derived with the same data from the standard micro analysis.

Macro-optimum/micro-optimum shift

Risk aversion ratio	0	0.5	1.0	1.5	2
Optimal Project Return Period (Yrs.)					
. Macro	56	62	66	73	82
. Micro	55	55	55	55	55
. Macro minus micro	1	7	11	18	27
Optimal relative improvement of Expected net Present Social Utility(%) with respect to the cas "without project".					
. Macro					
. Micro	6.03	10.58	17.62	28.67	47.84
. Macro minus micro	5.78	5.78	5.78	5.78	5.78
	0.25	4.80	11.84	22.89	42.06

It is so apparent that the macro-economic analysis justifies a bigger optimal project return period than the standard micro economic analysis. The higher the risk aversion, the stronger the flood protection (which is of common sense!)

13. Could it be possible to reach the outcomes here above, which are provided by a rather cumbersome computer program, through a simplified way? In the appended contribution, it is suggested to search by which corrective factor (1+CF) the benefits should be multiplied in equation (5) of the standard micro-economic method, so as to obtain a corrected $T^{opt/macro}$ equal to the desired $T^{opt/macro}$. The outcome is given here after:

Corrective factor (1+CF*) to be multiplied by the Expected Benefits.

α	0	0.5	1.0	1.5	2.0
1+CF*	1.025	1.133	1.204	1.327	1.482

On these basis, it could be suggested to use the micro-economic method while applying a corrective factor of at least 25%.

14. It is obvious that the outcomes depend on the numerous assumptions detailed in the contribution.

(a) It would be desirable to use more accurate data regarding the Bangladesh economy and even more the probability distributions of losses caused by floods to output and to capital stock, as well as the costs of the project (investment, operation and maintenance). The model has been transferred to the Bangladesh Flood Plan Co-ordination organization (FPCO), who is so able to implement these improvements. FPCO could also easily substitute a CES production to the COBB-DOUGLAS one.

(b) Other comments have been stated on the limits of the model, which is mono-sectoral, does not integrate money and assumes that risk-aversion is steady over time. The authors have neglected these aspects in order to focus on two issues:

- optimal control (shift of the optimal steady growth path from the case "without project" to the case "with project", optimal transition period of investment,...)

- Risk aversion (which seems to be of first importance when? At Natural Major Disasters).
 - They seem it probable that the elaboration of a more sophisticated model (multi-sectoral, integrating money, with decreasing risk-aversion) would be very time consuming (in particular in order to converge toward a steady growth path) and would likely provide only second order improvements with respect to the present model, which seems robust and gives self evident outcomes.
- (c) In any case, the authors remain available for further discussion in these fields.

**Proceedings of the Special Session on
Macro-economic Impact Analysis in the
Third Conference on Flood Action Plan
held on May 17, 1993
at 7:00 PM in Hotel Sheraton**

1. A special technical session was held to review the progress and outcome of macro-economic impact analysis conducted by CCCE (now CFD), and also to indicate the future directions of this study. The session was chaired by Mr. M. N. Huda, Chairman, POE. The participants included the representatives from the Government Organizations, International Agencies, Research Institutes, Universities, NGOs and different FAP study teams. The list of the participants is shown in Annexure-I.

2. At the outset, Mr. Joel Maurice presented the paper on "Controlled Flooding in Bangladesh: Method of Economic Assessment -An Attempt to Quantify the Macro-economic Impact" which he jointly authored with Mr. A. Diallo earlier. The paper, he emphasized, analyses the possible macro-economic impact of a controlled flooding project on the growth prospects of Bangladesh. As floods cause losses both to the GDP and to the capital stock on a large scale, they hamper the growth potential of the country. Consequently, a controlled flooding project could improve the growth path through a strengthening of the productive investment. This, Joel Maurice argues, would provide an additional social utility, which is not taken into account by the standard microeconomic analysis of the direct costs and benefits. The macro-economic impact itself depends on the social utility function; the bigger the social risk aversion, the larger is the indirect benefits. If the outcomes of this paper are considered to be relevant, then, Joel Maurice concluded, it might be recommended to modify the standard microeconomic analysis by multiplying the expected benefits by a corrective factor at least 1.25, which follows from the maximization of Net Expected Present Value (NEPV) in order to determine the suitable project return period.

3. After Joel Maurice presentation, the Chairman invited Dr. Quazi Shahabuddin, (POE) to make a review of the progress of macro-economic impact analysis, particularly those pertaining to work completed by Maurice and Diallo, and also make specific suggestion for future research in this field. Dr. Shahabuddin made his intervention on the basis of the appraisal paper on Macro-economic Impact Analysis which he jointly authored with Dr. K. M. Rahman. The appraisal paper was circulated among the participants of the session. He

first provided the background of the macro-economic research study of Flood Action Plan. A detailed agenda for research was drawn up following the fact-finding study for methods of economic analysis by Prof. J. P. Azar in September 1990 and research was first initiated by two French institutions. The study aimed at assessing the potential macro-economic impacts of the Flood Action Plan (FAP), including possible multiplier effects of FAP investments on regional and national economies. In particular, the research aimed at developing a methodology for assessing the "corrective factors" by which standard direct benefits derived from controlling flooding might be adjusted upward reflecting the improvements in the growth prospects due to large scale controlled flooding investments in Bangladesh economy. Also, there were some econometric exercises testing the impacts of floods on key macro-economic variables, such as impacts of flooding on technical progress in rice production and their impact on rural real wages and hence the rural poor and the impact of flood on manufacturing output and investments.

4. The first phase of research, which is now almost complete was jointly undertaken by CERDI at the University of Auvergne, Clermont-Ferrand, and the CCCE in Paris, France. Eight papers were produced in this study. The earlier version of these papers were first reviewed by a group of Bangladeshi economists in October 1991, and later at CERDI in February, 1992. The papers were revised incorporating the comments as far as practicable given the time and resource constraints and the revised version were sent to FPCO for review.

5. These papers, Dr. Shahabuddin continued, represent considerable progress in research in developing a methodology to assess "corrective factors" by which standard benefits from controlled flooding may be adjusted upward reflecting the overall growth prospects due to large investments in controlled flooding, reduction of losses of capital stock, improving the long run growth prospects of the economy, positive impact of risk reduction on the society's choice of discount rate etc. However, at present assessment of the corrective factors depends on a lot of simplifying assumptions and the use of preliminary data. Significant improvement could be achieved in this regard depending on modifications of assumptions, model specification and use of accurate data from Bangladesh economy.

6. Dr. Shahabuddin then emphasized the need for undertaking further research in this field. This is because although macro-economic modelling exercise, which represented high level of professional competence, made

substantial contribution to develop a methodology to capture macro-economic impacts of large flood control investment for the standard microproject benefits, its endeavor to assess an accurate set of corrective factors appear to be less successful. In fact, there is much scope for enhancing the effectiveness of this research both by relaxing some of the restrictive assumptions of the structure of the Maurice-Diallo model, and by improving the data base.

7. In this connection, Dr. Shahabuddin made some specific suggestions for undertaking future research in this area. He feels that macro-economic study in the future should centre around the following objectives:

- (a) Improvement in modelling exercise, which would involve modification in the model structure considered feasible in the context of Maurice-Diallo study.
- (b) Upgrading and updating of data base in order to estimate the model parameters, and carry out model simulation exercise.
- (c) Developing at FPCO the computing capability for simulation exercise of the improved model by using the specially designed software for the project, which involve transfer of technology from the French to the Bangladesh side.

8. The Chairman then invited Prof. K. M. Rahman to provide his comments on macro-economic impact study. Prof. Rahman broadly agreed with comments and suggestions made by Dr. Shahabuddin that there is much scope for enhancing the effectiveness of this research both by relaxing some of the restrictive assumption in model structure and by improving the data base. For example, mono-sector modelling approach may be expanded so as to incorporate at least a few important sectors of the economy. One may also assume that flood protection benefits are realized over a longer period of time rather being realized at once, at the beginning of the period. The model may also incorporate the negative impact due to the possibility of project failure. There is also an overriding need to explicitly incorporate in the exercise the cost of negative externalities (environmental impacts) that such flood protection measures would entail, and their implication for practical planning decisions properly analysed. The research may also be directed to establish more clear link between macro-economic modelling exercise and project evaluation.

9. Prof. Rahman suggested that the second phase of research may involve further modelling exercise incorporating the considerations discussed above and field surveys to collect relevant data to capture the difference in economic behavior in the protected and non-protected areas, improvement in macro data base and improvement in the computer programme to assess corrective factors. These ventures, Prof. Rahman concluded, may be undertaken jointly by the French and Bangladeshi economists.

10. The Chairman then opened the discussion to participate from the floor to offer any comments and suggestions or to make any queries on the macro-economic impact study.

11. Prof. Peter Rogers commented that alternative modelling approaches were available to capture the macro-economic impact of natural disasters such as floods, drought etc. on the economy. He enquired whether such models have been studied by Maurice and Diallo before developing their own model to ascertain the macro-economic impact of flooding in Bangladesh.

12. Dr. Asaduzzaman offered the following comments on this study:

- (a) The relative improvement in expected social utility appears to be rather insensitive to project return period, beyond twenty years. The implications of this should be brought out more clearly in the study.
- (b) The macro-economic optimum as it stands now is very sensitive to the risk aversion parameter, a yet-to-be determined factor. The literature indicates both gambling and risk-aversion behavior among the farmers in Bangladesh. What this would mean in terms of aggregate social behavior needs to be ascertained both analytically as well as empirically.
- (c) What does capital mean in a land-dependent basically agrarian economy? How does land enrichment or land degradation rather than capital affect the results?
- (d) Again, the question of risk aversion becomes important. In page 34, it is shown that $K_t = K_s$ for any t . This is strictly true for zero risk aversion. If so, how can one later go back

and make the interpretation on the basis of high risk aversion? Indeed, if much of capital is land, then $K_t = K_s$ may be quite true which by implication should mean risk aversion in the aggregate to be zero or small.

- (e) Equation 206 is based on only eight observations which appear to indicate a positive relationship between surface area inundated and GDP. The equation on the other hand, indicates otherwise i.e. $\delta y / \delta s$ is non-positive. In any case, basing a strong conclusion on only eight observations seems to be unwarranted. Furthermore, the formulation itself appears to be analytically flawed as it assumes any inundation to be bad which in real life we know is not true. S should perhaps be redefined as inundations beyond a certain level of depth and duration.

13. Dr. Sajjad Zohir then made the following observations on the macro-economic study:

- (a) Risk is captured only partially upon considering α in the preference function. Such inclusion of (subjective) risk preference does result in (within the model) trade-off between consumptions of different periods, and between consumption and investment (through equation 19). The more important element of risk, relevant in comparison across states of non-protection and protection, is that associated with production and investment. It is commonly acknowledged that protection reduces uncertainty in production, thereby investment risk. One could consider stochastic production function, and the variance of the random variable could be assumed to be much lower under protection.
- (b) A number of discussants had pointed at the possibility of significant differences across projects and had suggested that the same "corrective" factor may not be applicable for all projects. In the light of these questions, it is heuristically suggested that attempts be made to identify one or more measurable variables that may allow one to distinguish between major project types.

14. Dr. Mustafa Mujeri then made detailed observations on Maurice and Diallo paper. These are summarised below.

15. The analysis by Mauric and Diallo focuses on the macro-economic impact of a controlled flooding project on the growth prospects of Bangladesh. A controlled flooding project could improve the growth path of an economy, thereby providing additional social utility which is not considered by standard microeconomic analysis. The issue is very relevant for Bangladesh, and their analysis provides a very useful starting point to pursue it further to provide a more realistic and satisfactory mechanism to modify micro level analysis. Some of the technical and other aspects of the model which may be reexamined and respecified in this respect are already mentioned in Rahman and Shahabuddin Appraisal paper. These should be considered on future research.

In general, one should emphasize on the adequacy of the theory and empirical information embodied in the model i.e. the realism of the model. For example, one should examine how far the results of the first-best world of optimality presented in the model are realistic for Bangladesh? Moreover, the problem of optimality, as treated in the model, is rather simplistic which neglects a number of issues e.g. optimizing behavior of the agents within the economy with their budget constraints, relation between social objectives and objectives of the agent etc. It is true that many of the issues associated with optimization may not be resolved but it may be worthwhile to be aware by their implications for the problem under study. The assumption that the Bangladesh economy follows the optimal steady growth path without project seems to be unrealistic. In many respects, statistical testing of various relations and equations, and their adequacy in representing the behavioral and structural characteristics of the economy should form a major agenda for future research.

16. The empirical information and the data base of the model need updating. The model results indicate that the macro-economic impact critically depends on the nature and extent of social risk aversion. However, information on the issue (both at aggregate and disaggregate levels); its intertemporal, interregional and interclass changes and their implications for social risk aversion parameters are inadequate. The issues should be examined for better comprehension of the modelling exercise.

17. Dr. Mujeri summed up his discussion by emphasizing that the future efforts should focus on two directions: relaxing some of the restrictive (and in

some cases, unrealistic) assumptions of the model to make it flexible so that it becomes suitable to generate and test the issues and possible to evaluate the performance in a real life environment; and secondly, improving the data base of the model. I agree with the suggestions put forward by Rahman and Shahabuddin on the broad directions of future research in order to develop the in-house capacity to analyze the issues and come up with realistic assessment of macro-economic impact of flood protection projects in Bangladesh.

18. Mr. Steve Jones (POE) raised the problem that if "corrective factors" are applied to upgrade the standard benefits of FAP projects to take account of possible macro-economic impact of controlled flooding on the growth prospect of the economy, this procedure may discriminate against other sectoral investments whose rate of return computation do not usually incorporate such indirect benefits.

19. Mr. Joel MAURICE expressed his warmest thanks to the various participants who made very relevant and useful comments. He recalled that his paper basically considered that the traditional cost-benefit analysis relied on simplified assumptions (such as small scale projects with respect to DGP, or linear utility function...) which seemed to be inappropriate to projects related to Major Natural Disasters. He had precisely tried to relax these assumptions, benefitting from discussions he had with several economists of Bangladesh and of the World Bank. His model of course was not exclusive of others, which could usefully be applied to the issues of controlled flooding. He also agreed that the same method should be applied to other Major Natural Disasters (such as cyclones or droughts in Bangladesh).

20. He found that, when taking into account the improvement of the steady growth prospects and more specifically risk-aversion, the optimal protection was bigger than according to usual cost-benefit analysis. Although he thought these findings to be rather robust, he of course agreed on the interest of improving the investigations in the various directions recommended, in particular by Dr. Shahabuddin, Dr. Rahman and Dr. Mujeri. He confirmed he was available to transfer the model to Bangladeshi economists and to facilitate their taking over for further improvements, with the back-up of French economists.

21. Mr. M. N. Huda in his concluding remarks mentioned that the French study has made significant contribution in developing models to analyze the macro-economic impact of controlled flooding in Bangladesh. The authors of

the study deserve appreciation for carrying out this task. However, the participants of the session has pointed to some limitations and deficiencies in the study and also made specific suggestions for improvement in the modelling exercise. These should be seriously looked into while conducting further research in this area to derive an appropriate "corrective factor" to upgrade the standard microeconomic benefits of FAP projects, preferably with joint collaboration between the Bangladeshi and French economists.

22. The meeting ended with a vote of thanks from the Chair.

BANGLADESH
FLOOD ACTION PLAN

LOCAL CONSULTATIONS GROUP

ANNUAL REPORT
1992-1993

April 1993

**PREPARED BY THE MINISTRY OF IRRIGATION,
WATER DEVELOPMENT AND FLOOD CONTROL**

447

SUMMARY

Purpose and Scope of Report

1. This report describes progress on the Flood Action Plan's activities during the period March 1992 to April 1993 including the responses to the key issues discussed by the Government and the development partners at the Local Consultations Group meeting in March 1993. It also reviews the agenda for the upcoming year.

Progress during the reporting period

2. Substantial progress has been achieved by all FAP components throughout the reporting period and constructive professional interaction has taken place between the Flood Plan Coordination Organization (FPCO) assisted by the Panel of Experts and the FAP study consultants. This has led to a consistently high professional standard of report being submitted to the Government's FAP review process. Indeed, several final reports are being considered for hard-cover publication and eventual worldwide circulation. Of FAP's eleven main components (FAP 1 - 11), six have issued final reports, three more will be completed during this calendar year and the remaining two activities are being considered for a second phase. Likewise with the Supporting studies and pilot projects (FAP 12 -26), six activities have been completed and one more is expected to be finalized by October 1993. The remainder have longer term objectives and they will provide a flow of information and new technology over the next several years.

3. With reference to the key issues that emerged from last year's conference and were recognized by the Government and its development partners as requiring special attention; FAP has been extensively debated within the Parliament and in the nationwide public consultation process that FPCO has, and continues to carry out. Members of Parliament, local leaders, non-governmental organizations (NGO) and interest groups have been involved in the process and the regional studies have been guided by the feedback. The commitment to public participation has been further strengthened by the preparation of guidelines (GPP) which now form an accompanying document to the Guidelines for Project Appraisal. The GPP has distilled the knowledge gained from the

intensive consultation process carried out by the regional studies and now, as FAP's project appraisal phase begins, it will be possible to ensure a consistent approach to public participation in the project cycle. Similarly, guidelines for environmental impact assessment have been adopted and these will be applied to all the emerging water development projects. However, difficulties still remain with the timely supply of rainfall and river level data from other countries in the Ganges/Brahmaputra/Meghna watersheds. No effective flood forecasting and early warning system can be developed in Bangladesh without such data.

4. The regional studies have identified a group of potentially viable projects which will provide the basis of the country's future water resources development program. Not all of these projects are concerned with flood management but they do reflect the priority actions that have emerged from the intensive multi-disciplinary analysis of regional water management issues and the inter-linkages that exist in Bangladesh's water regime. As originally perceived by the Government and the development partners, there will be a need to integrate these FAP findings into the National Water Plan (NWP), and, where appropriate, refine the NWP. The respective public and private sector roles will become more evident as the regional studies are completed and, the defining of a likely investment pipeline and the identifying of supporting studies will provide the Government with the knowledge it requires to make judgements on the future institutional framework for the sector.

5. Together with peoples participation, the water management impact on fisheries and resettlement of effected people have arisen as major issues in the development of viable projects. Much of the previous data on fisheries resources has been called into question by the work of FAP 17 and the regional studies. FAP 3.1 (Jamalpur Priority Project) has decided to carry out an intensive fisheries survey before finalizing its appraisal and other project initiatives can be expected to follow a similar course. Resettlement difficulties have already delayed two of the emergency projects (Bank Protection and Cyclone Protection) which were subsumed into the FAP process. The lesson learnt has been that realistic resettlement plans should be prepared at the earliest possible date as this not only give more time to work out effective solutions but often avoids complications caused by the arrival of opportunistic squatters. However, the problems surrounding resettlement are immense and there is a strong case to further the work that was initiated under FAP 15.

6. While the Flood Modelling and Management Study (FAP 25) is developing the capability to more accurately predict the inter-regional hydrological impact of potential projects, FPCO and several development partners consider there is a need to improve the knowledge on the possible morphological changes that could take place in the major river beds. The environmental and social impacts of river bed changes are often more severe and have a longer time-frame than the impacts of seasonal flooding. FPCO, with the assistance of several river morphology specialists, will, in the next several months, review the situation and recommend on a future course of action.

Management and Coordination

7. Under the UNDP/GOB technical assistance project the Panel of Experts (POE) has been greatly expanded. In its technical assistance management role the Bank has now been able to provide FPCO with a full multi-disciplinary group of professionals for the critical analysis of reports. The number of national experts has been increased from four to fourteen with the inclusion amongst others, of, two economists, an environmentalist, a fisheries specialist, a sociologist and a group of institutional specialists. The development partners continued their valuable manpower support to the POE and this also was expanded with the addition of a fisheries specialist and social development adviser. Building on the UNDP sponsored institutional needs assessment, a working group of senior institutional specialists from the POE are assisting the Government develop options for improving the planning, implementation and operations and maintenance arrangements in the water development sector.

8. FPCO with the assistance of the Bank has published a comprehensive coverage of the proceedings of the second FAP conference and an Update (November 1992) on FAP activities. These documents have been distributed nationwide and amongst the development partners. The Update booklets, which also document the genesis and immediate objectives of FAP, have been produced in bangla and english. Five thousand copies have been distributed to date and interested local NGOs have ensured that the booklets have reached village level in those areas most effected by floods. The transparency of the FAP process has been reinforced by making all FAP documents available for public scrutiny at FPCO and the World Bank's Resident Mission Library.

Agenda for 1993-1994

9. The FAP agenda for the forthcoming year will include the completion of the regional studies and an extensive program of detailed design work on the priority projects. A second phase of the Flood Forecasting and Early Warning System Project is planned and there will be continued output from the long-term supporting studies and pilot projects. (include 2.01) The completion of the regional studies will provide the information needed for preparation of an initial Flood Action Plan draft and the articulation of institutional responsibilities for planning, implementing and managing water development activities.

PROGRESS DURING THE REPORTING PERIOD

10. This chapter describes the progress made on the individual Flood Action Plan activities in the period April 1992 to March 1993. The elements of FAP are summarized in Table 1.1, which shows the supporting development partners, the estimated cost of each activity and the expected completion date. There are 11 main components and 15 supporting studies and pilot projects. In addition, there are guidelines for appraisal, assessment of environmental impact and peoples participation.

Main Components

11. **FAP 1 - Brahmaputra River Training Study** Initiated prior to the formulation of the FAP but subsumed into it, this study has focussed on a long-term plan for the protection of the Brahmaputra Right Embankment (BRE) and to design measures for protection at critical sections along the right bank for immediate implementation. The Draft Final Report was completed in January 1993. A summary of the Master Plan is contained in the report but a detailed master plan document will not be published until May 1993. The report predicts that the present westward movement of the right bank will continue for several decades, probably at a similar rate to that experienced over the last 35 years. At the same time the river is expected to become steadily wider. Guidelines have been established for the prediction of the evolution of aggressive bends and a direct link has been demonstrated between bank erosion and char building, although there is often a time lag between the two processes. The

report includes the long-term and short-term measures for river training, implementation measures, the basis for cost analysis, operation and maintenance and finance arrangements. The Master Plan summary also includes a description of the situation as it exists in terms of river behavior, with predictions for the river's future behavior and an assessment of the consequences of different levels of intervention. Further consideration is given to the status of the BRE, to sociological, economic and environmental aspects of implementation, river transport, and construction management. The study's short-term recommendations for bank protection identified Sirajganj, an important regional center where the present protection works have deteriorated and which would be seriously at risk in the event of a major flood, and the reach of bankline between Sariakandi and Mathurapara, where serious bank erosion is making the breakthrough into the Bangali River an increasingly likely event. These priority locations (rationize in the light of the comments above - hard points) are being addressed under the proposed GOB/IDA Bank Protection Project.

12. **FAP 2 - Northwest Regional Study** This study has assessed the flood control, drainage and water management options in the region and carried out a feasibility study on a high priority area surrounding Gaibandha. The Draft Final Report for a Regional Plan and the Gaibandha Feasibility Report (project size) were completed in January 1993. In addition to the Gaibandha proposal, the main recommendations of the regional plan include the sealing of the Brahmaputra Right Embankment (BRE) to the extent possible, and an associated program of flood proofing in those areas that are particularly susceptible to damage from breaches through the BRE. The plan suggests that developments behind the BRE related to the "second line of defence" should await the outcome of the Compartmentalization Pilot Project at Sirajganj. A sub-regional plan should develop the concept of the "Green River" in the Lower Atrai and undertake a feasibility study for the stabilization and improvement of the Chalan Beel Polders C and D. Development of flood control and drainage measures by others in other areas is supported, notably Kurigram South under JICA, Bogra Polders 2 and 3 under the Early Implementation Project (EIP) and improvement of Gazarla-Ichamatl under the Water Board's Systems Rehabilitation Project (SRP). Flood proofing (embanking) and protection of towns and other infrastructure in the upstream reaches are recommended. Major interceptor and cross drains and the Hurasagar Tail Regulator were found to be non-viable and are not recommended for inclusion in the regional plan. Two priority activities are recommended for action. These are implementation of the Gaibandha

Improvement Project (FAP 2.1) and a Sub-regional plan with feasibility studies for priority projects in the Lower Atrai (FAP 2.2). Implementation of the Gaibandha Improvement Project will involve further planning and detailed design leading to a program of river training works, controlled flooding and drainage and area development.

13. FAP 3 North Central Study & FAP 3.1 Jamalpur Priority Project

The study has examined alternative water control strategies and the regional plan has recommended a group of priority actions. The Final Reports for both FAP 3 and FAP 3.1 were submitted in February 1993. The main flood-prone areas are in the south and west which are subject to inflows from the Jamuna and its distributaries and, in some years, through overbank flow. The flood problem is compounded by poor natural drainage. However, the study has shown there is scope for improved drainage in the northern part of the region and potential for improving water control through reducing inflow from the Jamuna and its distributaries. The FAP 3.1 Study has focussed on an area of 90,000 ha which could benefit from a reduction in overbank flooding and improved drainage. The initial study work on project options has shown a complexity of impacts that could occur outside the project area and it has been decided to carry out a more detailed analysis of the key impacts prior to finalizing an investment proposal. This continuing work will look at the relevant floodplain fisheries, the potential resettlement issues and the status of those areas immediately adjacent to the proposed project site. The regional study has also identified a promising development area to the south of Jamalpur. The new area stretches down to the site of the proposed Jamuna bridge and eastwards to the Bangshi River. It offers similar challenges to those at Jamalpur with probably more emphasis on controlled flooding and protecting kharif season crops.

14. FAP 4 South West Regional Study The study aims to produce a long-term plan for water resources development with the identification of priority development areas. It will also carry out feasibility studies of selected priority projects. The Draft Final Report is expected in May 1993. The three major water management issues that have been identified are (i) acute shortages in the whole region of surface water resources in the dry season; (ii) flooding, primarily from the Ganges/Padma and the Lower Meghna and (iii) drainage congestion, mainly in the coastal polder areas but also in inland areas where natural drainage is inadequate. To these issues may be added concerns over the availability and management of groundwater resources, concerns about salinity

intrusion and grave concerns of the sustainability of a number of important rivers. Deterioration of the Sundarbans ecosystem due to a lack of fresh water flows from the north is also cause for concern. Provisional recommendations from the study favor a focus on improving dry season flows in the Gorai River (head works and dredging - Ganges Barrage). Augmentation through the Gorai would provide an increase in fresh water flows to large areas in the region and assist in redressing the ecological imbalances causing by longer salinity intrusions. The study has investigated various options for solving drainage congestion problems and it would appear that dredging coupled with amalgamating certain polders offers the best choice in the Bagerhat, Satkhira and Dumunia areas. With minimal investments it is thought the existing flood embankments along the Ganges and Padma could be brought up to a satisfactory standard.

15. **FAP 5 South East Regional Study** This study was initiated prior to the FAP and has been concerned with year-round water management issues. Its objectives have been to prepare a regional plan to address the problems of floods, drought, drainage congestion and storm surges, and to carry out feasibility studies of potential priority projects. The Draft Final Regional Plan is expected by August 1993 together with feasibility studies for the proposed Noakhali North and Gumpti II projects. A range of options for the use of surface and groundwater, including the possible transfer of water from the Meghna to the Muhuri, have been investigated but the study has proposed that the first priority should be given to drainage. The Noakhali North area of 140,000 ha appears to be the most attractive. This would improve the drainage of the Begunganj depression, an area suffering from drainage congestion through the continuing accretion of new land along the Noakhali coast and the silting of the natural drainage channels.

16. **FAP 6 North East Regional Study** The study is preparing a regional water management plan with a prioritized portfolio of policies, programs and projects. A Draft Regional Plan was submitted in September 1992 and the study consultants expects the final document to be completed in August-September 1993. Pre-feasibility studies of the most promising initiatives are expected to be finalized by October-November 1993. The initiatives have originated from the public consultation process that has been carried out throughout the region. Non-structural initiatives include environmental management, research and education as well as environmental quality and water quality monitoring. Work is also

being carried out on fisheries related FCDI engineering, on the concept of fish sanctuaries and with public participation in water resources infrastructure planning, implementation and operations and maintenance. Structural initiatives being looked at involve partial flood control, full flood control, drainage improvement and area water resources development. Innovative way should be stressed

17. **FAP 7 Cyclone Protection Project** The work of this study has been concluded and the consultants submitted their final report in July 1992 to the Bangladesh Water Development Board (BWDB). The study recommendations are being developed under a proposed joint GOB/EC/IDA Cyclone Protection Project.

18. **FAP 8A Greater Dhaka Flood Protection Project** The study has formulated a Master Plan for the comprehensive flood control and storm water drainage for the Greater Dhaka Area covering some 85,000 ha. The Final Report of the Master Plan was submitted in November 1991 and a feasibility study completed in June 1992.

19. **FAP 8B Dhaka Integrated Town Protection** This activity was initiated prior to the development of the FAP but it was brought into the Plan to benefit from the multi-disciplinary review process. A feasibility study was carried out on the flood protection works for the Greater Dhaka area and its recommendations have become part of an approved GOB/Asian Development Bank project.

20. **FAP 9A Secondary Town Protection Study** In a similar fashion to FAP 8B the feasibility studies on secondary town protection start prior to FAP but were brought into the Plan for the same reasons. The feasibility studies have since been incorporated into an approved GOB/ADB project which is ready for implementation.

21. **FAP 9B Meghna Left Bank Protection** Also a pre FAP activity the objectives of study were to recommend measures to combat river bank erosion at critical points on the Meghna. The study's final report was submitted in July 1992 and its recommendations are being considered by the proposed GOB/IDA Bank Protection Project (dead may be in the near future).

22. **FAP 10 Flood Forecasting and Early Warning** The objective of this project has been to upgrade the capacity of the Flood Forecasting and Early Warning Center of the Bangladesh Water Development Board (BWDB). In the long-term the project aims to extend the shortwave radio network, overhaul and calibrate the weather radar, design and install weather satellite receivers, upgrade computer systems, develop data exchange with the Bangladesh Meteorological Department and develop flood forecasting models. The initial phase of the project was completed in November 1992 with the successful installation of the weather satellite receivers and the computer local area network. Funding is available for the supply of balance of the hardware and the Government is presently discussing further development partner support for several key technical assistance posts. (refer to summary comment)

23. **FAP 11 Disaster Preparedness** Under the direction of the Ministry of Relief and Rehabilitation the study's consultants have completed the first stage of a disaster preparedness study. A series of working papers on the key issues have been prepared and discussed with the relevant sectoral representatives. A second phase of technical assistance support has been prepared and this proposal is currently under discussion between the Government and UNDP.

Supporting Studies

24. **FAP 12 FCD/I Agricultural Review** The final report of the study was submitted in February 1992 and adopted by the Government in May 1992. The report is widely considered to be an outstanding contribution to the understanding of project impacts on agriculture and the natural environment. It has already received a wide circulation within Bangladesh and consideration is being given to its publication in a hardback version for international distribution and sale. Its principal conclusions are that technically simple projects of moderate size seem to have the best chance of satisfying local needs. Many of the problems inherent in the reviewed projects stem from weaknesses in project planning and failure to understand local needs and take account of conflicting interests. In successful projects, improved water control has led to more productive wet-season cropping patterns. Drainage congestion due to high river levels presents problems in many projects. FCD/I often have an adverse impact on capture fisheries and fishing families. Landless households probably benefit less from FCD/I schemes than landowners, but crop intensification provides significant additional employment and normally raises wage rates.

25. **FAP 13 Operations and Maintenance Study** The objectives of the study were to identify the main constraints to effective O&M of water control projects; to provide guidelines for improving O&M; and to recommend ways to increase the participation of beneficiaries and the rural poor in O&M. The final report of the study was submitted in January 1992 and adopted by the Government in May 1992. In a similar fashion to FAP 12, the study has provided an invaluable insight into the existing problems of O&M. The study found that, in almost all projects, there was scope for improving O&M. In part, O&M difficulties arise from weaknesses in the project planning and design. Although there has been some involvement of beneficiaries it has not been effective. But, this could in part be because of failures to consult the local people in the project concept. A second phase of the study has been approved by the Government in February 1993 and this new work will focus innovative approaches to public participation in O&M.

26. **FAP 14 Flood Response Study** The study's aims were to provide a better understanding of how individuals and communities in flood vulnerable areas respond and adapt to the floods. The Draft Final Report was submitted in September 1992 and a joint guideline report from FAP 14 and FAP 23 was submitted in January 1993. The study reports that flood characteristics and problems vary considerably from one "flood environment" to another which calls for careful adjustment of programs/projects to local conditions. Although the preparation for floods was not found to be extensive at the household level, the two most frequently adopted measures were storing or fuel and fodder. The widespread response to crop losses was to increase cultivation of subsequent crops in the rabi season. This action underlines the need of having adequate supplies of seeds and inputs available in the effected areas immediately following the fall in water levels.

27. **FAP 15 Land Acquisition and Resettlement Project** The main objectives of the study were to identify the key constraints and recommend the appropriate changes to existing laws and procedures which would make the process of acquisition more efficient and ensure that negative impacts were minimized. The work would include recommendations on changes both in the regulations and ways to ensure that households whose land is to be acquired, participate in decisions on relocation, rehabilitation and resettlement. The Final Report was submitted in February 1993. The study has provided a detailed set of actions that are intended to improve the overall process of land acquisition

and resettlement. Recommendations on changes to the legislation will be reviewed by the Law Ministry but other actions could be implemented in the short-term to vastly improve the existing situation. The strongest message received from people who were interviewed was that compensation had to be prompt and fair. Consideration is being given to a second phase of the study which would look at practical resettlement approaches and actions.

28. **FAP 16 Environmental Study** The study was to prepare guidelines for environmental impact assessment (EIA) of water sector projects and a user's manual for data collection and analysis; undertake case studies and special studies as needed to develop and test assessment methodologies; develop recommendations for managing impacts especially adverse ones; and assess EIA training needs training is in progress. After final review by the Department of the Environment, the EIA guidelines were issued in October 1992. All three cases are expected to be completed by May 1993. Special studies on the Impacts on Vector-borne Diseases and on the Demographic and Health Impacts of Meghna-Dhonagoda Project were completed in December 1992. The Nutritional Value of Fish Bio-diversity study issued its first draft in March 1993 and the Charlands and Soil Fertility studies are expected to be completed by May 1993.

29. **FAP 17 Fisheries Study and Pilot Project** This study has four main objectives: to establish the present status of floodplain fisheries in different regions; to predict the possible bio-physical, economic and social impacts of flood control interventions on capture fisheries; to assist in designing engineering and fisheries management measures to optimize fisheries benefits in FCD projects; and to carry out a pilot project to explore new approaches to aquaculture and restocking. Because of protocol delays the study's work did not begin in earnest until March 1992. Over the past year the study has worked closely with the fisheries experts on the regional studies and developed its own work program. The Inception Report was submitted in October 1992.

30. **FAP 18 Topographic Mapping** The project aims to provide FAP studies and projects with the necessary topographic maps, thematic maps, aerial photography, satellite imagery, and vertical and horizontal points. The main focus during the reporting period has been on providing second order levelling in the North Central and North East Regions. The production of high quality topographic maps from previous aerial photography has continued and plans have been made to complete the required aerial photography in the North West and

South West Regions. In conjunction with FAP 24 the use of radar photography will be explored during the coming monsoon season to visually record inundation levels through cloud cover.

31. **FAP 19 Geographic Information System (GIS)** The project will provide a GIS facility to assist in planning and managing the geographic information for FAP. Considerable assistance has been provided by the project to the core regional studies during the reporting period. Technical reports have been produced on the application of radar technology, comparison of BWDB and FINMAP elevation data, comparison on classification of flood depth and extent using GIS and the MIKE 11 Model, a GIS Atlas for Tangail and pilot study for GIS in Disaster Management. The institutional future of the GIS and its long-term role in the provision of data/information to the water sector are issues which need to be addressed in the coming year.

32. **FAP 20 Compartmentalization Pilot Project** The specific objective of the project is to test the compartmentalization concept. In this concept, an area enclosed by an embankment would be provided with a comprehensive water control system designed and operated to satisfy the needs of the people within the project area. The two sites of the pilot project are at Tangail and Sirajganj. To date the project has focussed on the Tangail location. After the initial project phase it has become apparent that a much longer time frame will be required to fully address the complex nature of the project concept. (elaborate) Accordingly, the GOB and the relevant development partners are recasting their commitments.

33. **FAP 21/22 Bank Protection and Active Flood Plain Management Pilot Project (AFPM)** The objectives of the project are twofold: First to evolve new designs and construction materials to combat bank erosion by full scale trial works at selected locations on the Jamuna River and to monitor their behavior. Second to develop methods and pilot projects for active flood plain management (AFPM) of the main rivers in order to control bank erosion by channel diversion or stabilization. Reports have been produced for the River Training/AFL Pilot Project (December 1992) and a Planning Study (January 1993). FPCO and the participating development partners have discussed the scope for the second phase of the project.

34. **FAP 23 Flood Proofing Study** This study aims to identify ways to avoid or reduce the adverse impact of floods on the various social groups and

their assets, and on public and private infrastructure and facilities. It also provides for pilot projects to test flood proofing measures. A final report was submitted in December 1992 and joint planning guideline with the FAP 14 study submitted in January 1993. The study's main conclusions are that: flood proofing should be complementary to flood protection and flood preparedness, and should aim to provide long-term non-structural or minor structural measures to mitigate the effects of floods; individuals, communities and certain institutions already use their personal resources to implement many flood proofing measures but these often suffer from inadequate information on the changing characteristics of floods; water supplies, grain and fodder storage and livestock sheds are strong candidates for flood proofing around the homestead; and flood proofing measures need to be planned and designed on the basis of local needs and local resources, and their implementation requires active participation from local communities.

35. **FAP 24 River Surveys Program** The objectives of the program are: to collect accurate hydrological and morphological data at a number of key stations on the main rivers; to undertake studies on the long-term behavior of the river systems; and to upgrade and strengthen the capability in Bangladesh in the fields of hydrological and morphological data collection and river studies. After initial delays, the study became operational in mid 1992 and is now nearing the end of its Phase 1 plan. An Interim Report was submitted in March 1993. The study proposes to sponsor an international workshop on morphological issues that would assist GOB in their long-term morphology study program.

36. **FAP 25 Flood Modelling and Management** The project has three components. The Flood Hydrology Study is designed to establish the hydrological basis for engineering design criteria along the major rivers and to develop common modeling standards and techniques for the FAP studies. A Coordination Advisory Team (CAT) has been set up to advise the Resident Modeling Coordinator, to ensure consistency and compatibility in modeling, and to coordinate with the Surface Water Modeling Center (SWMC). A Flood Management Model is being developed for flood forecasting and the formulation of flood management studies. Work is on-going in all three components. The CAT team made its fourth visit to Bangladesh in December 1992 and its main findings, presently being reviewed by FPCO, were: the MIKE 11 modeling system is appropriate for the regional studies but has limitations in analyzing long-term morphological; accurate topographic and hydrometric data are

important for model development; an inter-regional component is needed to study the combined effects of FAP proposals on flood levels and river morphology; and an annual updating of SWMC models is needed.

37. FAP 26 Institutional Development Program The aim of this program is to develop and equip the various public and private entities that will become involved in the planning and implementation of FAP activities. A first step in the program was taken with the establishment of FPCO and technical assistance support to it in the form of the Panel of Experts (POE). During the reporting period the POE was expanded, largely with national specialists, to provide a full multi-disciplinary team of specialists. New national specialists include two economists, an environmental specialist, a fisheries expert, a sociologist, a media specialist and a group of institutional specialists. The development partners continued their valuable manpower support to the POE and this was also expanded with addition of a fisheries expert and a social development advisor. A Needs-assessment survey carried out by a UNDP consultant was discussed with GOB and this work is being followed up the POE's institutional specialists. They are now preparing an analysis of the key issues and options for consideration by the Ministry of Irrigation, Water Development and Flood Control.

38. Guidelines for Project Assessment (GPA) The guidelines have been prepared to ensure the FAP plans and feasibility adopt a consistent approach to project evaluation and impact assessment. They detail multi-criteria analysis to be used in FAP project planning and describe the approaches to be used in assessing project impacts. The aim of the Guidelines is to ensure that all project impacts, positive and negative, are taken fully into account in the planning of FAP projects. In this respect, they are an advance on previous approaches to water sector planning in Bangladesh which tended to be mainly concerned with agricultural benefits and costs and tended to overlook other impacts. During the reporting period the Guidelines were revised (April 1992) and an annex added containing the Environmental Impact Assessment (EIA) guidelines (October 1992). A final draft of the guidelines on peoples participation has been circulated and FPCO hopes that it can shortly be included as a supporting annex. During the refinement of the GPA it has often been difficult for the FAP study consultants to fully respond to new and more detailed project assessment requirements as their original contracts set specific limits on their manpower allocations. However, the GPA as it now stands, will allow for the first

generation of FAP projects that have been identified in the regional studies to undergo a comprehensive and consistent analysis.

Public Discussion and Participation

39. During the reporting period the Flood Action Plan was discussed extensively in the parliamentary process. A detailed brief was prepared for a Parliamentary Select Committee and aims and objectives of FAP were discussed with the Parliament itself. In addition, the FPCO has, and continues to carry out a nationwide public consultation process in the areas cover by the main regional studies. The work has been done in conjunction with the relevant FAP study teams and their assessments of the water management issues have been discussed with a wide range of individuals, groups and organizations. There has been representation from Members of Parliament, local leaders, non-governmental organizations, journalists and other interest groups. To date 15 meetings have been convened with a total attendance of between 5-6,000 people.

40. In mid-1992 the FPCO initiated the preparation of a set of guidelines on how planners should involve all interested people in the project cycle. Supported by expertise from the POE and sociologists and planners from the regional studies and from FAPs 14, 20 and 23 a draft document was extensively discussed both inside and outside the FAP. In April 1993 a final draft (Guidelines for Peoples Participation - GPP) was published and circulated to all FAP activities. A bangla language version will be available in May 1993 and FPCO intends to regularly update the GPP with feedback received from project personnel and beneficiaries.

41. Following last year's conference, FPCO with the Bank's assistance prepared a record of the proceedings. Prior to publication the draft was widely circulated and placed on public display for comment. Subsequently 1000 copies of the finalized document were distributed to all conference invitees. To publicize the concept and structure of the FAP further, the "Achievements and Outlook" paper of the Proceedings was updated and published in November 1992. The paper was published in both bangla and english with an initial printing of 3000 copies. All Members of Parliament received a copy and through the public consultation process on the regional studies the paper was distributed throughout the country. The participating development partners each received 100 copies for distribution in their home country. The public response in

Bangladesh to the paper has been encouraging and to date a further 2000 copies of the bangla version have been printed. Much of the demand for extra copies has come from the NGO community.

42. Public access to all FAP documents has been provided through the FPCO and World Bank Resident Mission libraries. However, the librarians report a very limited interest in the documents and this has been disappointing considering the strength of the previously expressed demands.

Agenda for 1993-94

Review of Flood Action Plan activities 1990-94

43. It is expected that all the regional studies will have finalized reports by the end of 1993 or at the latest by early in 1994. The short-term supporting studies will also be completed. The remaining FAP activities have been scheduled to explore new technology over a longer time period and this work will continue to provide refinements to future developments in the sector. Building on the above work it is suggested that by May 1994 a draft review of FAP activities should be prepared which would clearly articulate the future planning requirements, the likely investment pipeline and the institutional needs to effectively execute such a program. The Flood Plan Coordination Organization (FPCO) with assistance from the Panel of Experts (POE) would be responsible for preparing and submitting the review document for discussion between the Government and the development partners, possibly at the next FAP conference. or other suggestion

Elaboration of the National Water Plan by FAP

44. The FAP was originally concerned with wet-season water control, but it has now come to cover broader aspects of year-round land and water development. This is because a number of components which predated the FAP have been included, either to take advantage of the FAP's quality control and procurement procedures, or because of a logical relationship to the FAP's objectives. For example, three of the regional studies (Northeast, Southeast, and Southwest) are comprehensive studies of year-round water management and much the same can be said of the Cyclone Protection Project. Also, many of the supporting studies have wider applications than flood control and/or drainage; for example, surveys and mapping, fisheries, surface water modeling, river surveys, and GIS. A major objective of the FAP is to find ways to make FCD projects more successful than in the past. According to the recently completed National Water Plan, FCD projects would account for the bulk of future public investment in water resource development. Thus, there is a need for FAP to contribute to the further elaboration of the NV/P and ensure that there is a two-way flow of data between the Water Resources Planning Organization (WARPO) and the Flood Plan Coordination Organization (FPCO). It will be necessary to

undertake an early review to identify where to strengthen WARPO's role in data collection and analysis and subsequently, when the results and implications of the FAP activities have been thoroughly reviewed it will be necessary to update and refine the relevant parts of the National Water Plan.

Continuing activities

45. As has been noted in the comments on the existing status of the FAP activities, there are several areas that may require support beyond their original time frame and funding allocations. The Flood Forecasting and Early Warning Project - FAP 10 utilized all its funding by November 1992 and has since been temporarily closed. This project is an essential non-structural part of flood management and when fully functional it will provide a much more accurate and timely assessment of flood threats. All the necessary hardware has been committed to the project but the executing agency, the Bangladesh Water Development Board (BWDB), require some additional technical guidance and training to make the new equipment and systems operational. The matter is under discussion by FPCO, BWDB and an interested development partner. Building on the excellent work carried out by FAP 15 there is an urgent need to develop practical and workable solution to the difficulties surrounding land acquisition and resettlement. Resettlement issues are causing delays to the proposed Cyclone Protection and Bank Protection Projects and similar delays are presently likely to occur in other FAP projects. Population pressure on land resources guarantees that such problems will assume an increasing importance and they will need to be addressed at a early stage of the project cycle. Consideration could be given to a case study approach that would develop workable resettlement and/or compensation mechanisms in an actual project situation. Such an approach could be initiated through a second phase to the FAP 15 study. All of the regional studies have made mention of the influence that inland water transport has on any proposed water management regime. A study to look at the demands of this important sub-sector and recommend ways in which conflicts can be avoided could provide invaluable knowledge for future planning in the water sector explain.

Public Relations

46. While substantial progress has been made in Bangladesh with explaining FAP's aims and objectives, its international image has remained negative. Unfortunately the media and some environmental and social activists have often

painted a picture of a program which would displace millions of people and irrevocably damage the natural resources. Through a mix of miss-information and general ignorance FAP is perceived as an anti-environmental and anti-social program. This has raised the concern of many people in the contributing countries. Unless there are efforts in the international forum to fully explain what FAP is doing and what is expected from it, there is a real likelihood of countries being forced to withdraw their support in the sector.

SUMMARY OF DISCUSSIONS

AT THE LOCAL CONSULTATIONS GROUP MEETING

May 20, 1993

1. The meeting was chaired by Mr. Asafuddowlah, Secretary, Ministry of Irrigation, Water Development and Flood Control (MIWDFC) and held in the BARC Conference Room. All donors supporting the Flood Action Plan (FAP) were represented in the meeting, either at Ambassador or Counsellor level.

2. The Secretary opened the meeting saying that the Flood Plan Coordination Organization (FPCO) had produced and circulated a briefing paper as a background for the meeting. He made three main points:

- (a) the conference had heard 'many positive' and 'some negative' views and given the size and complexity of FAP, one should not expect consensus;
- (b) the FAP had taken more care in pre-feasibility planning (the regional studies and supporting studies) than any other development program ever undertaken in Bangladesh;
- (c) the government 'could not conceive of a plan that would adversely affect the population' and would not 'embark on any scheme that did not have the full support of the people'.

He said also that he looked forward to next year's 'synthesis' report of the FAP.

3. The Chief Engineer, FPCO - Mr. M. H. Siddiqi then reported on the progress of FAP since the last annual conference in March 1992 and made the following points:

- (a) good progress had been achieved as a result of good interaction between FPCO, supported by the Panel of Experts, study team leaders and local people 'to whom projects belong';

- (b) studies for the main FAP components that had been completed were FAP 1, FAP 2, FAP 3, FAP 3.1, FAP 7, FAP 8, FAP 9A and 9B;
- (c) main studies expected to be completed in this calendar year included FAP 4, FAP 5, FAP 6, with FAP 10 and FAP 11 going for a second phase;
- (d) the quality of the regional studies had been good because of the positive interaction and the review process, which, may at times appear arduous, but was very necessary;
- (e) supporting studies that had been completed were FAP 12, FAP 13, FAP 14, FAP 15, FAP 21/22 and FAP 23. FAP 16 was expected to complete in October 1993, FAP 13 and FAP 15 were expected to go for a second phases and FAP 21/22 would move into its testing phase.
- (f) supporting studies were also of good quality and some parts would be translated into Bangla and circulated widely, including to FAP beneficiaries.
- (g) at the second FAP conference, the Prime Minister and the government's participating development partners suggested that the results of the FAP studies should be taken ' , the people in the regions. This process started in June 1992 and to date there had been 15 meetings outside Dhaka with MPs and local influential people, including NGOs. A number of MPs participated in the Third Annual Conference and all MPs had received FAP briefing documents.
- (h) regional studies had identified potential projects at pre-feasibility and reconnaissance levels in a multi-disciplinary way. Ultimately FAP should be under the framework of the National Water Plan (NWP). An inherent weakness of the NWP was that it was irrigation-oriented and not focussed on flood control. If FAP became part of NWP it would enrich and strengthen it and make it easier for the government to choose courses of action.

Comments on specific studies:

- i. the Fisheries study (FAP 17) had picked up speed but its TOR limit its activities to freshwater fisheries - the important brackish water fishery (shrimps) had been covered;
- ii. FAP 3.1 was planned for design and would provide an opportunity to test flood control and fisheries interventions;
- iii. FAP 18 had suffered a set-back for reasons beyond FPCO's control but it was now on course;
- iv. FAP 21/22 had gone well and procurement was expected to be completed in time for testing activities to start next dry season;
- v. FAP 24 had made good progress and had been designed to transfer specialist skills to Bangladeshi counterparts;
- vi. FAP 7 (the Coastal Embankments Rehabilitation Project) had been delayed because of resettlement problems. Plans were underway to resolve the issue and ensure that genuinely displaced people obtained benefits rather than opportunistic squatters;
- vii. FAP 13 (Phase II) would work closely with the Systems Rehabilitation Project and involve establishment of field stations as pilot demonstration projects for O&M; and
- viii. FAP 25 - there would be a seminar later in the year to discuss inter-regional morphological issues.

4. The Panel of Experts (POE) had been expanded from 4 to 14 local experts from a wide range of disciplines. New expatriate members of the POE included a Fisheries Specialist and a Social Development Adviser. The new

local members of the POE included four institutional specialists who had in a short time made a good contribution to the objectives of FAP 26. It was proposed, similarly, to put together an environmental working group.

5. With the assistance of the World Bank, a hardcover version of the proceedings of the Second Annual Conference had been produced and circulated widely. The main paper "Achievements and Outlook" had been also printed separately (5000 copies) in English and Bangla and widely circulated, with district authorities and NGOs asking for large numbers of copies.

- (a) The FAP program over the last year had emphasized participatory discussions and many meetings had been held in local communities by the study teams. This had not been previously tried in the water sector.
- (b) Agenda for the next year: preparation by FPCO of a report synthesizing the results of the regional and other studies, with advice to the government on priorities.

6. The Secretary then invited the development partners to seek clarification on any points. The Chief Engineer suggested that the Netherlands should start by informing the meeting about the results of their FAP review mission, which he had heard were broadly favorable.

7. Netherlands - Mr. T. Schulte: The report of their review of FAP was not yet final. It had still to go to the Minister and to Parliament. However, the Netherlands had prepared a note for the meeting based on the main findings of the review. This had been circulated and read.

- (a) The Netherlands government review had been undertaken because of the increasing criticism of FAP in its country. The aim had been to assess the validity of the criticisms and assess the implications for the Netherlands bilateral program in Bangladesh. It had involved an extensive review of literature and a mission to Bangladesh in early 1993 during which critics and supporters were interviewed and FAP 20 (the Compartmentalization Pilot Project which the Netherlands was supporting) was visited.

- (b) Main conclusions of the review:
- i. FAP was an important step in the development of water resources in Bangladesh;
 - ii. Impressed with the studies and guidelines produced over the last 3 years;
 - iii. Unique effort in donor coordination under the World Bank;
 - iv. Unique effort to take account of environmental, social and economic considerations in designing physical works;
 - v. Some criticisms were valid and these included unanswered questions regarding technical and economic feasibility and environmental implications for different target groups, the limited civil-engineering perspective of the plan despite first steps towards an integrated approach, and an adequate institutional solution which did not appear to be in sight in the short run.
- (c) The review mission had recommended that Netherlands involvement in FAP after 1995 should be dependent upon:
- i. an adequate institutional framework in which flexibility, an interdisciplinary approach, improved information and improved learning capacity were key elements;
 - ii. a clear target group approach, in which the interests of different groups were taken into account;
 - iii. a far-reaching inter-disciplinary approach in which environmental and fisheries implications were taken into consideration together with economic and technical aspects.

- (d) The Netherlands Government emphasized that more information needed to be collected before major structural works could be implemented. A cautious approach would be needed because of the enormous impact that physical works could have on millions of people in Bangladesh, as well as on the natural environment. Inequality could increase and the impact on agriculture and fisheries could be adverse. Environmental consequences were unclear, maintenance of physical works could be high and the country could have difficulty in meeting these costs. The Water Board did not seem to be in a position to introduce a truly interdisciplinary approach to water management in Bangladesh, for which inter-departmental cooperation would be a prerequisite.
- (e) Conclusions:
 - i. The pressure to start implementation of physical works in the short-run should be resisted.
 - ii. Construction should only start on urban protection schemes on condition that there was adequate provision for maintenance.
 - iii. The results of the FAP studies should be adequately analyzed and summarized, and incorporated in a coherent and consistent plan of action for the period after 1995.

8. The Asian Development Bank - Mr. van der Linden noted that FAP was entering a new phase and there was a need to make the transition from studies to action. Achievements of the FAP were noted:

- (a) FAP had learned a great deal in the last three years and had moved from a narrow FCD view to a multi-disciplinary approach to water management;
- (b) A great deal of openness by FAP in the conduct of its studies (e.g. the last two annual conferences at which the government had opened FAP to criticism and a wide range of views);

- (c) The supporting studies, which had proved valuable and contributed to the regional studies and needed to be taken into account in the design of investment projects.

9. The ADB representative indicated five points that should be considered while making the transition from studies to action:

- (a) A better institutional framework would be needed to ensure the inter-disciplinary approach to planning and implementing projects. FAP 26 would be important in moving away from a narrow engineering approach.
- (b) People's participation would be critical to detailed design and implementation. FAP is evolving in the right direction. It would be critical to avoid past problems and thus participation should be central to the planning process. The importance of the draft act on public participation (presently before Parliament) in providing the necessary legal framework.
- (c) Environment meant more than EIA and the design of mitigation measures. All investment proposals should be subject to comprehensive review at an early stage and tangible impacts integrated into the economic analysis. If this cannot be done, a cautious approach would be needed. If environmental consequences were uncertain, the project should be avoided.
- (d) Inter-regional planning would be needed to ensure that projects were assessed in terms of their impacts inside and outside the region. FAP should be seen as a national planning process. Care should be taken to maintain data collected by the regional and other studies.
- (e) Implementation Phase - there would be a need for the government to decide on the priority it gave to FAP/Water Resource Development projects, compared with other areas of priority and what level of funds it would provide for water sector investment. Also to establish the criteria to be used in

setting priorities. It should avoid 'picking up individual projects just because they were ready and a funder is available'

ADB was generally pleased with progress in FAP and with the conference. It would like the review over the next year to address the above concerns.

10. The United States - Mr. W. Milam considered the LCG a useful way to finish the conference. He highlighted the following issues:

- (a) Placing FAP under the framework of the National Water Plan was an important decision and he hoped that this would lead to a prioritized water resources development program which would in turn would form part of a prioritized country development program. The US would support this approach;
- (b) FAP was coming to a crossroads and he thought there was a need to slow down and consider which direction it should take after 1995. This did not mean that the US was losing faith with FAP, but it considered it important to complete the supporting studies and form a responsive institutional framework;
- (c) The US was impressed with the focus on participatory planning but there was still a long way to go. There was a need to institutionalize the ways of involving the public in planning based on a sound understanding of potential implications; and
- (d) The US supported the World Bank's role in FAP. World Bank continued to play a valuable coordinating and guiding role and the US would be loathe to see it reduced. The World Bank's role in coordination was vital.

11. The World Bank was asked whether it would continue to coordinate FAP in view of the speculation in the local press. The Chief of Mission, Mr. Willoughby, indicated that this was under review in the Bank following recent management and staff changes, and the Bank was in close contact with UNDP, the main funder of the technical assistance support to FPCO. The

indications were that the Bank review would be positive and it would continue to coordinate donor activities under FAP for another 12 months. Extension beyond 12 months would depend on the outcome of the next year's program. However, the matter is still under consideration.

12. Canada - Mr. Soutter supported the Netherlands, ADB and USA and made the following comments:

- (a) In the allocation of financial resources to the water sector, it would be important to do it right rather than do it quickly;
- (b) The term Flood Action Plan had led to mis-understanding and was perhaps not appropriate;
- (c) Long-term environmental impacts should be taken into account as part of an integrated and inter-regional plan. Canada endorsed the idea of an environmental cell, but suggested that it could be located in the Department of the Environment, which would be more neutral.
- (d) There was a need to allay fears and demonstrate transparency by ensuring public access to information on FAP. Information should be preserved, documented and available.
- (e) There was no institution in Bangladesh suited to implementation of multidisciplinary and participatory development. Thus, if FAP should move to implementation, much attention would be needed on institutional matters.
- (f) In future conferences, it would be better to have more open agenda. Some of the discussions at the conference were less than constructive and involved unnecessary confrontation on both sides of the meeting.
- (g) FAP had made constructive progress. For it to continue to do so, all participation, environmental and institutional issues should be seriously considered.

13. The Secretary agreed on the need to be open and pointed out that no program in the country had ever been as open as FAP. But, he considered that this openness had been abused by the FAP critics. FAP had undertaken a structured consultation process which had been the first of its kind in Bangladesh. He also pointed out that the democratically elected government had made a decision not to 'live with the floods' and the FAP must proceed.

14. Germany - Mr. Scholtyssek commended the World Bank's excellent assistance in the coordination of FAP donor activities. They hoped that the World Bank would continue in this role well into the next phase of FAP. On general FAP topics he stressed the following:

- (a) There was a growing awareness of the public in Europe concerning the critical issues in FAP. He said it was reassuring that massive embankments were no longer under discussion and that the importance of social impacts of FAP projects were agreed by all.
- (b) Good that the conference discussed people's participation and environment and he encouraged FAP to continue to do so. The regional studies were impressive - well conceived and prepared. The need now would be to mould them into a national prioritized strategy. The Government was asked to give this a high priority.

15. Denmark - Mr. Nielsen stated that while good progress had been made on a number of issues raised at the Second FAP Conference, he thought some issues needed more attention:

- (a) Institutional Development. Denmark considered that very little progress had been made on FAP 26 and noted that UNDP's Institutional Needs Assessment had been rejected by the Government. Denmark felt there was a need for a clear statement of roles and responsibilities for both public and private organizations in the water sector. They also noted the weakness of the Department of Environment which appeared unable to shoulder the responsibility for the review/approval of the FAP EIAs;

- (b) Environment. Denmark trusted that environmental issues would be fully incorporated in the follow-up on all projects. It was noted that the GPA and EIA guidelines had established procedures but Denmark was concerned that FAP was moving into the design project phase before the EIAs had been endorsed; The creation of an environmental cell would be supported financially if needed;
- (c) Capture fisheries. Denmark reiterated its concern on this issue and noted that the Final Report of FAP 17 would not be out until mid-1994;
- (d) Synchronization. Denmark considered it vital that supporting studies were allowed time to catch up before moving to detailed design and investigating inter-regional impacts. They were happy that FPCO said that inter-regional impacts would be shortly examined;
- (e) People's participation. The regional planning teams had made a valuable impact, but more attention should be paid to grass-roots issues. There would be a need to modify the Guidelines for people's participation as new information comes to hand, and
- (f) Denmark proposed a further LCG meeting in 3-4 months. A similar meeting had been proposed last year but it did not eventuate. It was suggested that institutional development should high on the agenda of such a meeting.

16. The UNDP - Mr. M. Constable made three points:

- (a) The Draft Project Agreement for the continuation of the technical assistance to FPCO (funding the Panel of Experts) had been approved by the Government and UNDP. The UNDP hoped for an early approval of the document by the World Bank;
- (b) More attention was needed to the environmental implications of FAP and there may be a need to synthesize the results of

the environmental assessments done under the regional studies. The UNDP would be prepared, in principle, to contribute to such a synthesis either through an environmental cell, or separately;

- (c) FAP 11. The Government had requested assistance from UNDP in building national capacity in disaster preparedness and management, to be channelled via the new Disaster Management Bureau. UNDP had recently completed assistance in preparing the project. The approach was broader than envisaged in FAP 11 and this should be reflected in FAP documentation.

In conclusion, the UNDP representative stressed the importance of the participatory approach, which is critical for human development.

17. For ODA - Mr. Chard thanked the Government for the organization of the Conference and hoped that the opinions expressed by the participants would provide guidance for the next conference. ODA noted the Government's clearly expressed intentions in respect of floods, and stressed that the question was how to intervene in complex systems with the greatest benefits and least cost.

18. ODA made three main points:

- (a) The importance of completing the supporting studies before implementing projects. FCD investments needed full social and environmental knowledge, which would come, inter alia, from FAP 17, FAP 20 and the inter-regional study (in respect of char dwellers and those who suffer from riverbank erosion). It was felt that the planning process should be completed before going on to investment.
- (b) FAP deserved credit for introducing the guidelines for people's participation. Ultimately, the public authorities must be accountable and there was a need for an accountable and responsible local government system. ODA welcomed the meetings with MPs and stressed the need for FAP to be considered inside and outside the Parliament. One of the aims

of people's participation should be to encourage a sense of ownership of local people in infrastructural development. The best measure of this would be some kind of cost-sharing which would be tried under FAP 13-Phase II.

- (c) Opportunity cost. Internal and external financial resources were not infinite. FCD and water management projects should be subjected to rigorous economic analysis. Funds should be used where they contribute the greatest economic return.
- (d) Other points highlighted:
 - i. Need for coordination among different sectors in integrated water resource planning.
 - ii. Need to establish longer term institutional framework for FAP including the role and contribution of the Panel of Experts, FPCO only guaranteed to late 1994.
 - iii. ODA welcomed the central role of the World Bank in coordination and hoped that it would continue.
 - iv. To capture western tax-payers' money, FAP must be seen to pay serious attention to the environment.

19. France - Mr. Degallaix indicated that after four years' support for FAP its 'enthusiasm remained intact' and it gave its support for the agenda of 1993/94. It would like to proceed with detailed design of FAP 3.1. France made three main points:

- (a) It supported the general review of FAP in early 1994 and suggested it might be appropriate to have a coordinated public communication activity next year in Europe. This could be organized by the Government, World Bank, EC and other countries. France would be happy to host such a meeting in France.

- (b) It supported the idea of merging FAP with NWP which might be agreed at a major conference and concluded with a pledging session.
- (c) The financing agreement between France and Bangladesh on Jamalpur stressed the importance of participation, consultation and listening to all views.

20. The World Bank thanked donors for their endorsement of its coordination role and complemented the Government and FPCO for the good organization of the conference. The conference had illustrated the considerable achievements of FAP over the last year. The Chief of Mission said:

- (a) There was a need to produce a review paper on the FAP findings as soon as possible (say April/May 1994). By that time it might not be possible to produce a firm investment plan since few projects will have been fully studied for their technical, economic, environmental and social impact. The main content of the review might be a listing of projects, next steps and a timeframe for more detailed studies on each, including a degree of contrast and comparison with NWP findings and recommendations.
- (b) The World Bank shared concern about the need for rigorous implementation of the GPA in assessing economic rates of return. However, the Bank did not agree with the ADB representative that the Government should decide on some indicative annual allocation for the sector.
- (c) The World Bank agreed on the need to take stock of the situation but stressed the importance of some urgent elements:
 - i. Alternatives for water management in the Southwest Region.
 - ii. A pilot project on people's participation in the decision-making process and cost-sharing was needed. Such a project could address the responsive

development of infrastructure to meet felt needs of the people (BRAC's experience was noted). This was because FAP 20 had been designed as a pilot project to test the engineering concept of compartmentalization, not participation.

- iii. Sharing of river level and rainfall data between neighboring countries.

21. The World Bank agreed with France that greater exposure was needed in Europe and North America to allay misunderstanding and give an opportunity to raise questions. The Bank also welcomed the idea of a further meeting next year once the review paper had been completed and the idea of a seminar on morphology. The Bank suggested that consideration be given to a similar seminar/workshop on environmental issues.

22. The Chief Engineer, FPCO made the following points:

- (a) The review paper would be Output 1 of the new UNDP TA project which the Government had submitted, and
- (b) He considered that the proposed pilot project on people's participation had already been covered by FAP 20 and FAP 3.1. However, he felt that additional pilot activities could be incorporated in FAP 3.1.

23. The Secretary made the following points:

- (a) He endorsed the idea of an environment seminar;
- (b) He agreed with the need to more fully address the problems of the Southwest Region. Government urgently wanted to go for action and agreed to the need for a broader range of studies. As future ADB funding was uncertain he would request World Bank for the use of TA VI funding for this effort. This could be done together with ADB but the Government needed to immediately initiate the work, and

- (c) He complimented the World Bank Resident Mission, which had been positive throughout the FAP process. It was always supportive when it was needed.

24. The European Community - Mr. van Opstal complimented the Government on the organization of the meeting. It supported the general aims and activities of FAP was pleased with progress on the EC-funded projects and studies. The representative made the following points:

- (a) the studies so far showed the importance of fully investigating and analyzing socio-economic and environmental factors;
- (b) the EC agreed with the need for an inter-regional study to integrate the findings of the completed studies;
- (c) the EC noted that ADAB was not invited as a discussant on the people's participation session. NGOs had begun to make a constructive contribution to the FAP process and could have provided a useful input in the discussions;
- (d) the EC considered that more needed to be done to make information available to the public. The public access to all FAP documents in the FPCO and World Bank Mission Libraries had been a step in the right direction. The EC noted that a number of donors had offered to fund an information cell at FPCO and it supported the idea;
- (e) The EC supported both the preparation of a FAP review paper and the holding of a conference in Europe. It also supported the integration of FAP with NWP based on a rational prioritization of options, and the World Bank and POE in supporting FPCO in its multidisciplinary role;
- (f) The EC shared the Government's concerns with the downstream impacts of the Farakka Barrage and would encourage regional discussions on the sharing of water;

25. The Chief Engineer said that ADAB had been officially invited to the conference and that the FPCO Library had been established and open to the public for over three years.

26. Japan - Mr. Ota was highly appreciative of the Conference and congratulated the Government on the organization and quality of the presented papers. On general issues they felt that FAP had made excellent progress in the field of people's participation. The voices of criticism against FAP did not seem to realize the coverage of FAP extended beyond structural solutions. Japan thought that the World Bank and FPCO deserved high credit for their coordination work and hoped that this effort would continue.

27. The Secretary closed the meeting by thanking the participants and stressed his door was always open for formal and informal discussions on FAP.

Third Conference on the Flood Action Plan

Invitation List

May 17 - 19, 1993

MINISTERS:

Mr. Mirza Golam Hafiz, Law, Justice & Parliamentary Affairs
Major General (Retd.) M. Majid-ul-Haq,
Agriculture, Irrigation, Water Development and Flood Control
Mr. A. S. M. Mostafizur Rahman, Foreign Affairs
Mr. M. Saifur Rahman, Finance
Mr. Abdus Salam Talukder, Local Government, Rural Development and
Cooperatives
Col.(Retd.) Oli Ahmed, Communication
Mr. Chowdhury Kamal Ibne Yusuf, Health and Family Planning
Mr. Shamsul Islam Khan, Industry
Mr. Mohammad Keramot Ali, Telephone & Telegram
Mr. M. K. Anwar, Trade and Commerce
Mr. Tariqul Islam, Social Welfare & Women's Affairs
Mr. Md. Shamsul Islam, Food
Barrister Nazmul Huda, Information
Mr. Abdul Matin Chowdhury, Home
Dr. Khondoker Mosharaf Hossain, Energy and Minerals Resources
Barrister Rafiqul Islam Mia, Public Works
Mr. Abdul Mannan Bhuiyan, Labour & Manpower
Barrister Jamir Uddin Sircar, Education
Mr. Abdullah Al Noman, Environment & Forestry and
Fisheries & Livestock
Mr. A. S. M. Hannan Shah, Jute
Mr. A. M. Zahir Uddin Khan, Planning

STATE MINISTERS:

- Principal Md. Yunus Khan, Education
- Mr. Md. Kabir Hossain, Land
- Mr. Majibur Rahman, Finance
- Prof. M.A. Mannan, Religion Affairs
- Mr. Sadeque Hossain Khoka, Youth and Sports
- Mr. Md. Nurul Huda, Establishment
- Major (Ret.) A. Mannan, Textile
- Mr. Abdul Mannan, Civil Aviation and Tourism
- Mr. Lutfar Rahman Khan, Relief
- Prof. Jahanara Begum, Cultural Affairs
- Mrs Sarwari Rahman, Social Welfare and Women's Affairs
- Mr. Harun-Al-Rashid, River Transportation
- Mr. Md. Fazlur Rahman (Patal), Communication
- Mr. Mosharef Hossain Shajahan, Irrigation, Water Development and Flood Control
- Mr. Gayeshwar Ray, Environment, Forestry and Fisheries & Livestock
- Mr. Md. Aminul Haq, Law, Justice & Parliamentary Affairs

DEPUTY MINISTER

- Mr. Abdul Hai, Local Govt., Rural Development and Cooperatives
- Mr. A. B. M. Zahidul Huq, River Transportation
- Mr. Serajul Huq, Health and Family Planning

MEMBER OF PERLIAMENT

1. Mr. Sheikh Razzaque Ali, Hon'able Speaker
2. Mr. Humayun Khan Panni, Hon'able Dy Speaker
3. Mr. Khondkar Delwar Hossain, Hon'able Chief Whip
4. Mr. Ashraf Hossain, Hon'able Whip, Khulna Division
5. Mr. Md. Shahjahan, Hon'able Whip, Rajshahi Division
6. Mr. Abdul Karim Advocate, Hon'able Whip, Dhaka Division
7. Mr. Mahbubul Alam Tara, Hon'able Whip, Chittagong Division
8. Mr. Md. Abdul Ghani, MP, Meherpur-2.
9. Mr. Md. Ahsanul Huq Molla, MP, Kushtia-1
10. Mr. Abdur Rouf Chowdhury, MP, Kushtia-2
11. Mr. Alhaj K. M. Abdul Khaleque, MP, Kushtia-3
12. Mr. Miah Md. Monsur Ali, MP, Chuadanga-1
13. Mr. Moshiur Rahman, MP, Jhenaidah-2
14. Mr. Shahiduzzaman Beltu, MP, Jhenaidah-4
15. Mr. Mosharaf Hossain Monjgu, MP, Bakhergonj-3
16. Mr. Mazibur Rahman (Sarwar), MP, Bakhergonj-5
17. Mr. Md. Shajahan Omar, MP, Jhalakathi-1
18. Ms. Syeda Nargis Ali, MP
19. Ms. Begum Salina Rahman, MP
20. Mr. Md. Abdus Salam Pintu, MP, Tangail-2
21. Mr. Khandaker Abu Taher, MP, Tangail-6
22. Mr. Khandaker Baduruddin, MP, Tangail-7
23. Dr. Md. Serajul Huq, MP, Sherpur-3
24. Mr. A. K. M. Fazlul Huq, MP, Mymensingh-4
25. Mr. Khandaker Amirul Islam (Hira Miah), MP, Mymensingh-6
26. Mr. Md. Abdul Khaleque, MP, Mymensingh-7
27. Mr. Anowarul Hossain Khan Chowdhury, MP, Mymensingh-9
28. Mr. Al-Haj-Amanullah Chowdhury, MP, Mymensingh-11
29. Mr. Abu Abbas, MP, Netrokona-2
30. Mr. Lutfuzzaman Babar, MP, Netrokona-4
31. Mr. Major (Retd.) Akhtaruzzaman, MP, Kishorgonj-2
32. Mr. Mowlana Aatur Rahman Khan, MP, Kishorgonj-3
33. Mr. Amiruddin Ahmed, MP, Kishorgonj-6
34. Mr. Hazi Dr. Abdul Latif Bhuiyan, MP, Kishorgonj-7
35. Mr. Harunur Rashid Khan, MP, Manikgonj-2
36. Wing Commandar (Retd.) M. Hamidullah Khan (BP), MP, Munshigonj-2
37. Mr. Md. Amanullah, MP, Dhaka-3

38. Mr. Salahuddin Ahmed, MP, Dhaka-4
39. Mr. Major (Retd.) Kamrul Islam, MP, Dhaka-5
40. Mr. Mir. Shawkat Ali, MP, Dhaka-8
41. Mr. Syéd Md. Moshin, MP, Dhaka-11
42. Mr. Md. Niamatullah, MP, Dhaka-12
43. Mr. Md. Ziaur Rahman Khan, MP, Dhaka-13
44. Mr. Shamsuddin Ahmed, MP, Norshindi-1
45. Dr. Abdul Moin Khan, MP, Norshindi-2
46. Mr. Sardar Shawkawat Hossain Bakul, MP, Norshindi-4
47. Mr. Abdul Ali, MP, Norshindi-5
48. Mr. Ataur Rahman Khan, MP, Narayangonj-2
49. Prof. Md. Rezaul Karim, MP, Narayangonj-3
50. Ms. Begum Bani Ashraf, MP
51. Ms. Begum Farida Hasan, MP
52. Ms. Begum K. J. Hamida Khanam, MP
53. Ms. Begum Shamnu: Nahar Khawza Ahsanullah, MP
54. Mr. Khandaker Abdul Malik, MP, Sylhet-1
55. Mr. Akbar Hossain, MP, Comilla-8
56. Mr. A. T. M. Alamgir, MP, Comilla-10
57. Prof. Mohaminad Abdullah, MP, Chandpur-4
58. Mr. Jainul Abedin Faruque, MP, Noakhali-1
59. Mr. Salahuddin Kamran, MP, Noakhali-3
60. Mr. Md. Shajahan, MP, Noakhali-4
61. Advocate Khairul Anam, MP, Lakshimpur-3
62. Mr. Syed Ohidul Alam, MP, Chittagong-5
63. Mr. Amir Khasru, MP, Chittagong-8
64. Ms. Halima Khatun, MP
65. Ms. Begum Rozi Kabir, MP
66. Dr. A. K. M. Quamruzzaman, MP, Comilla-11
67. Mr. Abu Yusuf Md. Khalilur Rahman, MP, Joypurhat-2
68. Mr. Azizul Huq Mollah, MP, Bogra-4
69. Mr. Md. Helaluzzaman Talukdar (Lalu), MP, Bogra-7
70. Mr. Md. Akhtar Hamid Siddique, MP, Naogaon-3
71. Mr. Md. Alamgir Kabir, MP, Naogaon-1
72. Mr. Md. Azizur Rahman, MP, Rajshahi-5
73. Mr. Mirza Muraduzzaman, MP, Sirajganj-2
74. Mr. A. Mannan Talukdar, MP, Sirajganj-3
75. Mr. M. Akbar Ali, MP, Sirajganj-4
76. Mr. Mohammad Ansar Ali Siddiqui, MP, Sirajganj-6

77. Mr. Kamruddin Yahya Khan Majlish, MP, Sirajganj-7
78. Mr. Saiful Azam, MP, Pabna-3
79. Mr. Md. Sirajul Islam, MP, Pabna-4
80. Ms. Khurshid Jahan Huq, MP
81. Begum Rebeka Mahmud, MP
82. Prof. A. Mannan, MP, Meherpur-1
83. Mr. M. A. Awal Mian, MP, Kushtia-4
84. Prof. Rafiqul Islam, MP, Jessore-2
85. Mr. Khan Tipu Sultan, MP, Jessore-5
86. Dr. Mozammel Hossain, MP, Ragerhat-1
87. Mr. Sheikh Harun-ur-Rashid Mian, MP, Khulna-1
88. Mr. Sheikh Fazlul Karim Selim, MP, Gopalganj-2
89. Col. (Retd.) Shawkat Ali, MP, Shariatpur-2
90. Mr. Mesbauddin, MP, Chandpur-1
91. Prof. Md. Waliullah, MP, Noakhali-6
92. Mr. Mirza Azam, MP, Jamalpur-3
93. Dr. Md. Mizanul Huq, MP, Kishoreganj-4
94. Mr. Md. Mizanur Rahman Manu, MP, Dinajpur-4
95. Mr. Mohammad Nasim, MP, Sirajganj-1
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97. Mr. Rahmat Ali, MP, Gazipur-1
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