1.4 FAP: Flood Action Plan

1.4.1 Introduction

A number of studies were initiated and carried out under bilateral and multi-lateral arrangements following the severe floods that hit Bangladesh in 1987 and 1988. It was evident from these studies that much of the technical, economic and environmental information needed to make choices between various options for addressing the flood problems were inadequate. The Government of Bangladesh (GOB) requested the World Bank (WB) in June 1989 to coordinate the efforts and prepare a programme of studies and pilot projects that would form a basis of a long term comprehensive flood management plan. The WB convened a meeting in Washington in July 1989 which was attended by a delegation from the GOB and leading experts involved in the previous studies. The participants represented a range of views on long-term objectives and strategies and there was full agreement that before implementation of any measure for mitigating flood it would require thorough and detailed studies. It was decided to concentrate on an Action Plan for the next five years as the first step in formulating a long-term programme. A central feature of the plan was a programme of regional studies that would recognize the wide regional differences in the nature of flooding and the drainage problems in different areas of the country. It was also decided that some of the studies would encompass project preparation works and a range of supporting technical, socio-economic and environmental studies was also envisaged. Thus a programme for undertaking 11 main and 15 supporting activities was drafted. This programme became known as the Flood Action Plan (FAP).

The draft of programme of FAP was presented at a meeting of the development partners in London in December 1989. All the participants endorsed it and financing of approximately US$150 million was committed for the various components of FAP, a major share (about $55 million) of which was directed to pilot projects to test various innovative approaches, such as, controlled flooding, compartmentalization, bank protection and active floodplain management.

The component studies under FAP are presented in Table A1.4-1 (Slightly different from the original plan). These studies and pilot projects have been supported by UNDP, European Union, Asian Development Bank, World Bank and eleven bilateral donors (UK, Japan, France, Canada, Finland, Sweden, USA, Switzerland, the Netherlands, Germany and Denmark).

The Flood Plan Coordination Organization (FPCO) was set up in 1990 under the Ministry of Water Resources (MoWR) to coordinate, supervise and review the various activities and studies taken up under FAP initiative. The FPCO has been supported on technical and coordination matters by a Panel of Experts (POE) composed of national and international professionals of different disciplines. UNDP financing has supported the FPCO since 1990 and UNDP and several development partners have supported POE. The World Bank acted as coordinator of FAP activities on behalf of the donors.

The projects and studies that constitute FAP were, with a few exceptions, initiated between 1990

and 1991. The year 1990 was spent in formulating the Terms of References (TOR) and TAPP of various studies, and finalizing the funding arrangements with the donors. There were some delay in selection and fielding of study teams. By 1994, most of the studies were completed and FAP moved to follow-up activities. Several Guidelines, namely the guidelines for project assessment, environmental impact assessment and people's participation have been prepared under the aegis of FAP. These guidelines, the lessons learnt from the supporting activities, evaluation of various pilot projects, and the availability of updated database and hydrodynamic models facilitated the preparation of comprehensive regional studies at prefeasibility level. Soon there was a shift in policy as FAP moved from flood mitigation to flood management, this too shifted further to integrated water management. FAP approach now effectively stands for round the year water management.

During the past five years, many national and international seminars, symposia, conferences and workshops were held on selected issues on the evolving approaches of FAP. This way the stage was set to chart the course of the water development in Bangladesh and have the documents reviewed and updated before the next phase of activities was taken up. An evaluation of the progress made it possible to identify some of the issues and aspects that were not taken into consideration appropriately and needed to be duly addressed. There were some other issues that were deferred for consideration at a later stage.

FAP was planned as a five-year rolling plan to be updated every two years. The review of the first phase set out the action plan for the next phase. The Summary Report, however, summarizes the findings of the various FAP components upto 1995.

The aim of the Summary Report is to:

- summarize the findings of various studies and investigations carried out during 1990-1994;
- critically review the findings for developing the strategies of water management for future;
- develop the strategy for the country's integrated water management programme;
- identify future project proposals and further studies and investigations needed; and
- review environmental, participatory planning and institutional issues pertaining to water sector activities.

1.4.2 Origin of the FAP

Bangladesh experienced one of the most catastrophic floods on record in 1988. It caused a major setback to the economy which was still reeling under the shocks of the severe flood of 1987. There was widespread damage to crops, property, human life and infrastructure and a great deal of the rehabilitation and reconstruction work undertaken after 1987 flood was reduced to an exercise in

futility.

Soon after, the Government of Bangladesh had a report prepared to tackle the problem of recurrent floods in the country. A number of countries offered to help in finding ways to mitigate the effects of natural disasters. Four major studies were initiated by bilateral and multilateral agencies to examine options for flood mitigation. A UNDP-Bangladesh team carried out a flood policy study, a team from Bangladesh and France prepared a pre-feasibility study of flood control, USAID sponsored an eastern waters study and a team from Japan reviewed options for flood management. It became evident from these studies that much of the technical, socio-economic and environmental information needed to choose between options was missing. However, this in no way precluded the scope for regional cooperation.

In June 1989, the government requested the World Bank to coordinate the various efforts and prepare a programme of studies and pilot projects that would form a basis for addressing the flood problem more fully. This approach was endorsed by the G-7 Summit in Paris in July 1989. Its communique said:

> "It is the matter of international concern that Bangladesh, one of the poorest and most densely populated countries in the world, is periodically devastated by catastrophic floods.
>
> "We stress the urgent need for effective, coordinated action by the international community, in support of the Government of Bangladesh, in order to find solutions to this major problem which are technically, financially, economically and environmentally sound. In that spirit, and taking account of help already given, we take note of the different studies concerning flood alleviation, initiated by France, Japan, the USA and the United Nations Development Program, which have been reviewed by experts from all our countries. We welcome the World Bank's agreement, following those studies, to coordinate the efforts of the international community so that a sound basis for achieving a real improvement in alleviating the effects of flood can be established."

As a first step the Bank convened a meeting in Washington in July 1989. This was attended by a delegation from Bangladesh and by leading experts involved in the studies already made. The participants represented a range of views on long-term objectives and strategies and there was full agreement that any measure to mitigate flooding would require comprehensive studies before implementation. It was decided to concentrate on an action plan for the next five years for formulating a longer-term flood control (subsequently transformed into management) programme within the territory of Bangladesh. A central feature of the plan was a programme of regional studies that would recognize the wide regional differences in the nature of the flood and drainage problems. It was also decided that the plan would encompass the ongoing project preparation and a range of supporting technical, socio-economic and environmental studies. The key experts who had been involved in the UNDP, USAID, French and Japanese studies participated in the preparation of a framework document called the Bangladesh Action Plan for Flood Control. The eleven Guiding Principles enunciated during the UNDP study provided an important basis for this document.

This was presented at a meeting of the development partners at Lancaster House in London on December 11-12, 1989 and all the participating countries and agencies endorsed the overall framework and the proposals for the Flood Action Plan (FAP). The development partners agreed to provide about $150 million for the FAP activities, of which over $55 million was directed to pilot projects for testing approaches to river bank protection and floodplain management.

The projects and studies that constitute FAP were, with a few exceptions, actually initiated between 1990 and 1991. By 1994, most of the studies were completed and FAP moved to follow-up activities and some pilot projects. FAP has also prepared guidelines for project assessment, environmental impact assessment and participatory planning.

These guidelines and the lessons learnt from the supporting activities and evaluation of various pilot projects as well as the availability of updated database and hydrodynamic models facilitated the preparation of comprehensive feasibility studies. During the past four years, many national and international seminars, symposia, conferences and workshops were held on selected technical issues as well as on the evolving approaches of FAP. This way the stage has been set to chart the course of the Flood Action Plan and have its documents reviewed and updated before the next phase of activities is taken up. An evaluation of the progress make it possible to identify some of the issues/aspects that were not taken into consideration appropriately and needs now to be duly addressed. There were some other issues that were deferred for bringing into considerations at a later stage. A major shift in policy was for FAP to move away from flood mitigation to flood management. Soon, this too shifted further to integrated water management. FAP prove now effectively stands for round-the-year water management.

This document sets out the future approaches of FAP as have emerged. Initially FAP was seeu as a five-year rolling plan to be updated every two years. The year 1990 was spent in formulating the terms of references (TOR) of various study and finalizing the funding arrangements with the donor agencies. There was also some delay in the selection and fielding of study teams. The overall major review of FAP was, therefore, deferred till 1995.

1.4.3 Northeast Regional Study

(1) Geography, Climate and Hydrology

The Northeast Region has an area of 24,200 sqkm and a population of 18 million (Map A1.4-1; Map A1.4-2). The region has five main landforms: Sylhet Depression (25% of the region), Lowland Floodplains (55%), Uplands (8%), Piedmont Floodplains (4%), Alluvial Fans (6%) and Terraces (2%). About 50% of the region lies below 8 m elevation and 25% lies below 5 m.

Annual rainfall ranges from 2,200 mm to 5,800 mm, with the higher values in the northeast of the region. Over 90% of the rainfall is produced by the southwest monsoon during March to October. During the wet season, there is an enormous inflow of water from India. These rivers rise in areas with the world's highest rainfall. As a result, between May and November, almost 60% of the

region is flooded to depths exceeding I m. The deepest flooding, up to 5 m, is in the Sylhet Depression. Flash floods can also occur in the pre-monsoon months of March and April.

The Sylhet Depression is a low-lying bowl-shaped basin covering 6,000 sqkm Virtually all of this land is below 8 m and is flooded to a depth of 5 m and more during the monsoon. Saucer-shaped, seasonally-flooded interfluvial areas called haors characterize this unit; the small permanent lakes in the lowest pockets are called beels. The main rivers traversing the Depression include the Surma, Kalni, Kushiyara, Baulai and Dhanu. These rivers have 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. During the last two centuries, landuse has been altered to meet the needs of an ever-expanding human population. The forest has been consumed and in its place dry-season rice (boro) is now being cultivated. The beels and haors have been drained out for agriculture and submersible embankments have been constructed in many places.

The lowland floodplains, created by deposition and erosion from the Surma, Kushiyara, Meghna, Old Brahmaputra and Jamuna cover 13,260 sqkm. Land elevations typically range from 16 m to 9 m on the Surma/Kushiyara floodplain, from 22 m to 9 m on the Old Brahmaputra floodplain and are less than 7 m on the Meghna floodplain. The main pattern within the Surma/Kushiyara floodplain is at least one, and often two, rice crops annually. In the Old Brahmaputra and Meghna floodplains, the dominant pattern is at least one rice crop in combination with a rabi crop.

Uplands occur as outliers extending into the region from the Tripura hills and cover 1970 sqkm. These hills are composed of weathered 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 there are some areas of rubber, pineapple and other citrus fruits.

The piedmont floodplains are found along tributary streams rising in the Tripura hills that join the larger mainstream rivers and cover 960 sqkm. Land elevations range from 24 m to 9 m. Gradients of the streams are generally steeper than the mainstream rivers and they have meandering sand-bed channels often with natural levees of sand and silt. The dominant cropping pattern is two-rice annually.

The alluvial fans are found along the foot of the Meghalaya plateau and cover 1490 sqkm. The fans are formed where steep mountain streams exit from their canyons and deposit sand and gravel. 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.

The terraces occur along the western edge of the region and confined portions of the Old Brahmaputra and cover 500 sqkm. Elevations range from 10 m to 8 m. The dominant cropping pattern is two rice crops followed by a rabi crop.

(2) Existing Water Management Works (Figure 7.14)

Early efforts at water management, dating back more than a century, were mainly in the form of low embankments to protect the dry-season rice crop from flash floods. These were private ventures built by landowners. Public investment in water resources began in the 1970s and since then about 30% of the agricultural land or 4,000 sqkm has works providing some degree of flood management and irrigation. During this period there has been rapid growth in irrigation of the boro crop using farmer-owned lowlift pumps. One of the main objectives of the public works has been to protect this crop from early floods. The aim of these schemes was to increase rice production, but these benefits, although substantial, have been somewhat offset by adverse impacts on fisheries, wetland habitat and navigation. The current development status is summarized below.

Flood Control & Drainage

Project Type	*Number of Projects*	*Benefit Area (ha)*
Full flood control	27	96,000
Partial flood control	33	172,000
Drainage improvement	5	18,100
Surface Water Irrigation		
Large (scale) irrigation	1	6,000
Water retention structure	66	4,200
Lowlift pumps		154,000
Manual lift		286,000
Ground Water Irrigation		
Manually operated shallow tubewells		5,300
Shallow tubewells		126,000
Deep-set shallow tubewells		700
Deep tubewells		80,000

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 and are designed to serve 395,000 hectares. Nearly all were constructed during the past 20 years. The regional planning team found that 80% of the projects had positive impacts.

Ground water is used for irrigation, potable water and industry in the region. Annual available ground water rechargc is estimated at 3.2 billion cubic meters (bcm). At present, about 1.5 bcm is being used annually to irrigate about 2,130 sqkm of land. A further 0.3 bcm is used annually for potable water and industrial supply.

Water transport is essential to the region. Thirteen thana centres depend solely on waterway communication and many of the rural market places have grown up along waterways. There are

about 1,400 km of classified navigation routes which are used by passengers or freight boats. Changes are taking place in the river network and sedimentation has reduced the navigability of some of the main rivers and embankments and control structures have also obstructed navigation routes. Sometimes this leads to public cutting of embankments.

Development Issues: The primary mode of water management for agriculture in the region is the construction of submersible embankments around the haors. In general, these are high enough to contain the early flash floods but low enough to be overtopped during the main monsoon. This long-established practice has conferred considerable benefits on the region and is the only means available to mitigate the effects of floods on agriculture. A conclusion of the regional study is that, although these embankments have problems and inadequacies, there is no reason to abandon their construction.

A basic problem facing the water resource planners is that the river system is unstable over much of the region. The vast quantity of sediment that enters the system every year can lead to rapid shifts in river courses, silting up of channels, depletion of natural waterbodies and maintenance problems at existing projects. Silted up rivers lose flood capacity and their embankments no longer provide early-season protection. Crops can be destroyed by floods and the land can be damaged by sand deposition. Changes in river course lead to destruction of embankments and damage to towns and villages.

The conflict between fishing and farming also presents a challenge for the planners. Embankments and structures can impede movements of fish and disrupt their breeding habits. Also the lowlift pumping depletes the beels which are the most productive sources of fish.

Planners also have to recognize that the region's wetlands support large natural plant communities which are extensively exploited by the local people for food, fodder, fuel, building material and medicine. The wetlands support an internationally significant population of migratory waterfowl (nearly 400,000 birds were counted during the January 1993 migration peak). Populations of many other terrestrial and semiaquatic wildlife species are also found. Stocks of both waterfowl and other wildlife are declining generally. Hunting and habitat destruction are the main threats.

There are also many social issues that have a bearing on regional planning. In the past, planners and designers of water management works had often not consulted those who would be, or might be, affected by a project. Therefore, the regional plan involved a special effort to investigate the social setting for development and much effort went into interviews and seminars.

Planning Approach: Unlike the other four regional studies, FAP-6 did not delineate planning units for the northeast region. But geographic boundaries were defined to ensure that the entire region was addressed. These boundaries were defined, on a preliminary basis, as physiographic units. These were examined in some detail to define the major water management problems that existed within each one and general boundaries were established which grouped areas with similar problems. Subsequently, these were mapped in conformity with what were considered

"appropriate" hydrological boundaries from the standpoint of physical as well as analytical and impact considerations. FAP-6 basin boundaries did not necessarily conform to the planning areas identified by the Master Planning Organization (MPO). While FAP-6 was concerned with identifying and studying all manner of water resources projects, MPO was focusing more extensively on dry season surface water resource estimates.

Northeast regional study used a strategic planning process in which the problem was defined in terms of internal and external environments. The internal environment here is the water system and the external environment consists of regional systems other than water, plus relevant national and international systems. In addition, the strategic planning method stressed action, in particular action focused on key points of intervention.

An interpretative description of the region was first prepared, to provide a profile of the region in terms of what is most important - from a development perspective - to understand, rather than for comprehensiveness of enumeration. The information base for this was the NERP specialist studies which included review of the existing secondary data and documentation, meeting with key informants, plus primary field-based research at NERP field stations and case study sites.

Major driving forces likely to be significant in shaping the region's future development were identified. Some driving forces are internal to the regional water system; some are external; still others are national or international in scope. This analysis relies on forecast data on regional, national and international trends, content analysis of key media, interviews with influential and informed persons, review of futurist media and modelling.

The regional analysis began with the formulation of two mission statements, one for regional development and one for regional water management planning. These provided guidance during the regional analysis, which looked at strengths, weaknesses, opportunities and threats in the regional development system and the regional water system. Strengths and weaknesses were derived from the issues previously identified, covering the areas of perception and profile of issues (including private and public commitment to addressing issues), policy frameworks, institutional form and process, financial resources, natural resources, human resources, present trends and other aspects as required. Opportunities and threats, again of the regional development system and the regional water system, were analyzed. These were derived from the driving forces and include competitors, environmental forces, international trading and business environments, international commodity markets, trends in future development aid flows, the region's likely role in Bangladesh and internationally and other aspects as required.

The regional water management strategy starts with objectives for overall regional development and the regional water management plan. These were tentatively formulated as a first step in developing the strategy to provide guidance; once the strategy was finalized, these were revised to reflect the likely achievements and impacts. The strategy was prepared as a set of interventions cross-referenced by strategic thrusts (key action).

The strategy is based on three key tenets: a mix of structural and non-structural measures is required since there are limits to which nature can be controlled; a development-oriented stance is sought since it promises higher benefits than a defensive stance; and, recognizing that most people of the region are poor, the strategy should impact a large number of people.

(3) Strategy

Eight strategic thrusts considered in the regional study are presented below:

Protect Urban Centres and Infrastructure from Flood and Improve the Urban Environment - It is expected that most of the region's economic output by 2015 will be produced in urban centres and that these centres will contain about nine million people (34% of the region's population). This shift in economic and demographic structures within the region should be facilitated by:

- Encouraging improved urban landuse planning and setting of future development on higher ground to reduce flood risks;
- Promoting urban flood preparedness;
- Providing full flood protection or raising existing embankments where technically feasible and where there are large numbers of people and significant economic output, combining this with erosion control and afforestation to emphasize multiple use of embankments;
- Using river diversions to re-route flood water away from urban centres;
- Implementing erosion protection for Bhairab Bazar;
- Developing waste water systems using appropriate technologies; and
- Enforcing regulations pertaining to industrial pollution.

The expected benefits would include protected and drained land for secondary and tertiary sector uses. The urban environment would become more attractive with better amenities such as domestic water supply and improved security from natural hazards. This would result in healthier and longer-living urban populations. It would promote urban industries dependent on clean water such as electronic, biotechnology, beverage and food industries.

Intensive Agriculture for Urban Consumption - Intensive agriculture for urban consumption will be promoted by providing flood protection and drainage to seasonally flooded areas adjacent to large urban markets. This is of particular relevance to the area around Dhaka since by 2015 it is expected to contain approximately 20 to 25 million people and an intensive agricultural belt extending from Dhaka to the north of Narsinghdi. This thrust will result in more productive high value agriculture and improved nutrition in urban centres leading to more balanced diets.

Enhanced Production Systems on Seasonally Flooded Areas - Continued increase in rice

production is desirable. Improvements in monsoon season rice production will facilitate shifts in dry season production on seasonally flooded land to more intensive higher value agricultural crops. Increased agricultural productivity would result from more intensive use of irrigated land and increases in irrigated area. Both private and public investment in agriculture is desirable and the primary focus should be on the seasonally flooded eastern and western areas and the intensive agriculture belt around Dhaka since these have the highest growth potential.

Effective implementation of this strategic thrust is expected to provide increased standards of living for farm householes since they will be involved in more productive agriculture. This will further result in crop diversification in the dry season leading to more balanced diets, improved nutrition and in alleviation of the severe poverty in the far northwestern portion of the region. It should result in management of ground and surface water resources on a sustainable basis and higher agricultural productivity, consistent with sustainable management of highland ecosystems.

Integrated Development of Deeply Flooded Areas - There are at present as many as 4.8 million people (likely to increase to 6.1 million by 2015) dependent on the deeply flooded haor areas in the region for their livelihood. The haor agricultural system is coming under increasing pressure due mainly to a combination of increased population and reduced drainage effectiveness. The former results in increased demand for food and other basic needs while the latter constraints production. The current economic system offers very limited potential in terms of poverty alleviation unless changes occur. These changes are reflected in the following:

- to increase fisheries productivity;
- to identify and adopt improved farming systems and increased production of livestock, farmable reptiles, amphibian species and wetland plants;
- to improve drainage by re-excavating channels and effective dredging of the Kushiyara and the Baulai; and
- protection from early pre-monsoon floods to ensure harvests.

The main benefits would relate to increased value of agricultural, forestry and fisheries production. This would foster increased monetization of local economies leading to higher standards of living for haor residents.

Biodiversity Enhancement and Sustainable Management - Freshwater wetland biodiversity of Bangladesh, once characteristic of much of the country, is concentrated now in the region. Efforts to preserve this important aspect of the nation's natural heritage should, therefore, focus on this region. Bangladesh's commitment to wetland conservation and improved management was expressed by its accession in 1992 to the Ramsar Convention, the main international agreement addressing wetland conservation and improved management.

The benefits flowing to local people from preserving natural systems - fish, fuel, building material,

marketable products, employment, earnings - would increase and the long-term management of biodiversity and surface water quality would be strengthened.

Improve Liveability of Rural Settlements - Even in 2015, the majority of the region's residents (approximately 66%) will live in rural settlements. It is not and will not be possible to protect extended areas of settlement from flooding. Village homesteads provide for essential needs such as sanitation, flood storage, privacy, work, fuel, food and drinking water. Homesteads are high productivity areas and many of these functions are the responsibility of women and in some cases of direct benefit to them. In areas where flooding occurs, in the approximately 30% of the region's land area subject to deep flooding and the 40% subject to seasonal flooding in a typical year, homesteads are especially important for production and human welfare. Many homesteads in the deeply flooded areas are experiencing increasing flood and wave erosion as swamp forest and other wetland vegetation, which act as wave energy dissipators, have gradually disappeared. The homesteads represent a high proportion of assets of poorer families and accelerated erosion can be a source of severe stress. A strong rationale exists for a strategy thrust to improve the standard and quality of life in rural settlements. To this end, the following mix of measures would be implemented as appropriate:

- raising homestead platforms;
- extending the areal extent of homestead platforms;
- protecting homesteads against erosion;
- undertaking afforestation at the settlement scale;
- increasing accessibility to safe potable water; and
- improving drainage and sanitation at the village scale.

Implementation of this thrust will result in better protection of human property and improvement in living conditions, particularly during flood periods. Women will be particularly benefited. Also protected will be areas for human resource development activities, rural industry and commerce, rice storage and drying, homestead gardens, livestock and leisure activities. It would further lead to improvements in water quality in and around settlements. Flood response will improve since there would be protected base areas for storage of emergency commodities.

Improve Water Transport in the Region - This thrust involves the following elements:

- incorporation of water transportation needs in the design of all water management projects;
- selective channel improvement, often utilizing dredging, to improve navigation;

- a navigational aids programme for better marked channels;
- a programme to improve facilities for docking, loading and unloading, boat construction and repair, water transport and industrial sites; and
- a programme supportive of local countryboat operators to upgrade their boats, usually through motorization, to increase their efficiency and capacity.

This thrust would result in increased efficiency in the shipment of bulk construction materials from the alluvial fans in the north of the region to markets in Dhaka and other key centres of Bangladesh. The livelihood of a large number of people who work in this sector would be protected. Benefits from mechanization would include lower tariffs, higher wages and increased speed of transportation but total employment may not increase significantly.

Institutional Strengthening and Development - Evaluation and assessment of water sector programmes by a variety of agencies have indicated that past water sector planning and management tended to be too centralized, a top down approach dominated by the GOB personnel and had not adequately involved local people in project development, implementation or operation. Many water projects and programmes have considerable potential but are not operating or are performing considerably below potential. The govemment has indicated a desire to make the developmental process more decentralized and participatory in nature. The following would support this intent:

- promote increased public participation in the design, construction, operation, maintenance and rehabilitation of water sector projects thereby improving rural planning to avoid investments at cross-purposes (such as rural roads obstructing drainage);
- increase the range and depth of expertise in govemment water sector agencies;
- improve systems for monitoring the quantity of ground water reserves and surface water;
- improve operations and maintenance of the existing projects;
- develop methods for more appropriate flood waming; and
- create a regional institution for environmental management, research and education.

Implementation of this thrust is expected to result in improved technical quality of projects. There would also be increased support by local people which should lead to increased effectiveness and a reduction in damage to projects.

(4) Regional Plan

The northeast regional water management plan proposed 45 initiatives - the term used to include projects, programmes, actions and policy. The proposed initiatives fall into two categories: flood

control drainage and non-flood control drainage.

Non-flood control drainage initiatives were identified following a process which began with the preparation of sectoral specialist studies. The list of initiatives was refined further during subsequent steps in the planning process. This included the development of an interpretive description of the region, identification of driving forces, regional analysis and, most important, strategy formulation.

The flood control drainage initiatives generally followed a similar approach to that described in the previous paragraph but, in addition, required the identification of geographical boundaries to ensure that water management concerns were addressed throughout the region. The analysis of initiatives was undertaken in sequence leading from upstream to downstream to ensure that the downstream impacts of water management interventions were not overlooked. The list of initiatives was then finalized in conformity with the strategy.

The recommendation of projects is based on the general prioritization of strategic thrusts and on considerations related to rational sequencing of initiatives. (For example, upstream to downstream for flood control, downstream for flood control, downstream to upstream for drainage interventions). The results of the multi-criteria analysis were not used to determine phasing, because the proper basis for phasing relates to the considerations noted above, not to the slight difference in indicators such as the Economic Rate of Return.

For the purpose of establishing a tentative scheduling of projects, the initiatives have been grouped into the following four categories:

Non-structural initiatives of a remedial nature (Group N). Generally, these are initiatives for which implementation is overdue and is independent of other internal or external actions being carried out, and for which processing has some urgency.

Structural initiatives that are independent of other structural plan initiatives of external development (Group SI). Implementation of these initiatives will not be affected by other plan initiatives or upstream development. These include:

- drainage improvement schemes having a large impact on the region and on subsequent initiatives;
- initiatives not substantially affected by Tipaimukh dam;
- projects in the upper catchments that are isolated from other recommended initiatives; and
- projects requiring immediate action to avoid further deterioration of existing infrastructure.

Structural initiatives that are internally dependent (Group SID). Structural projects that are

highly dependent on other plan initiatives and that cannot be implemented in isolation. These need to consider the impacts of other initiatives during feasibility analysis, planning and design.

Structural initiatives that are externally dependent (Group SED). These initiatives will be strongly affected by future developments outside the region which are largely beyond the control of the Government of Bangladesh (such as Tipaimukh dam in India). Ideally, these initiatives should incorporate the expected impacts from Tipaimukh dam into their planning, design and schedule for implementation. However, given the present level of uncertainty associated with Tipaimukh, this can only be done in a very preliminary fashion. Therefore, in the implementation schedule for the initiatives this group of projects has been shown as commencing in the fourth year of the plan to allow additional time for resolution of the Tipaimukh dam issue.

(5) Project Assessment

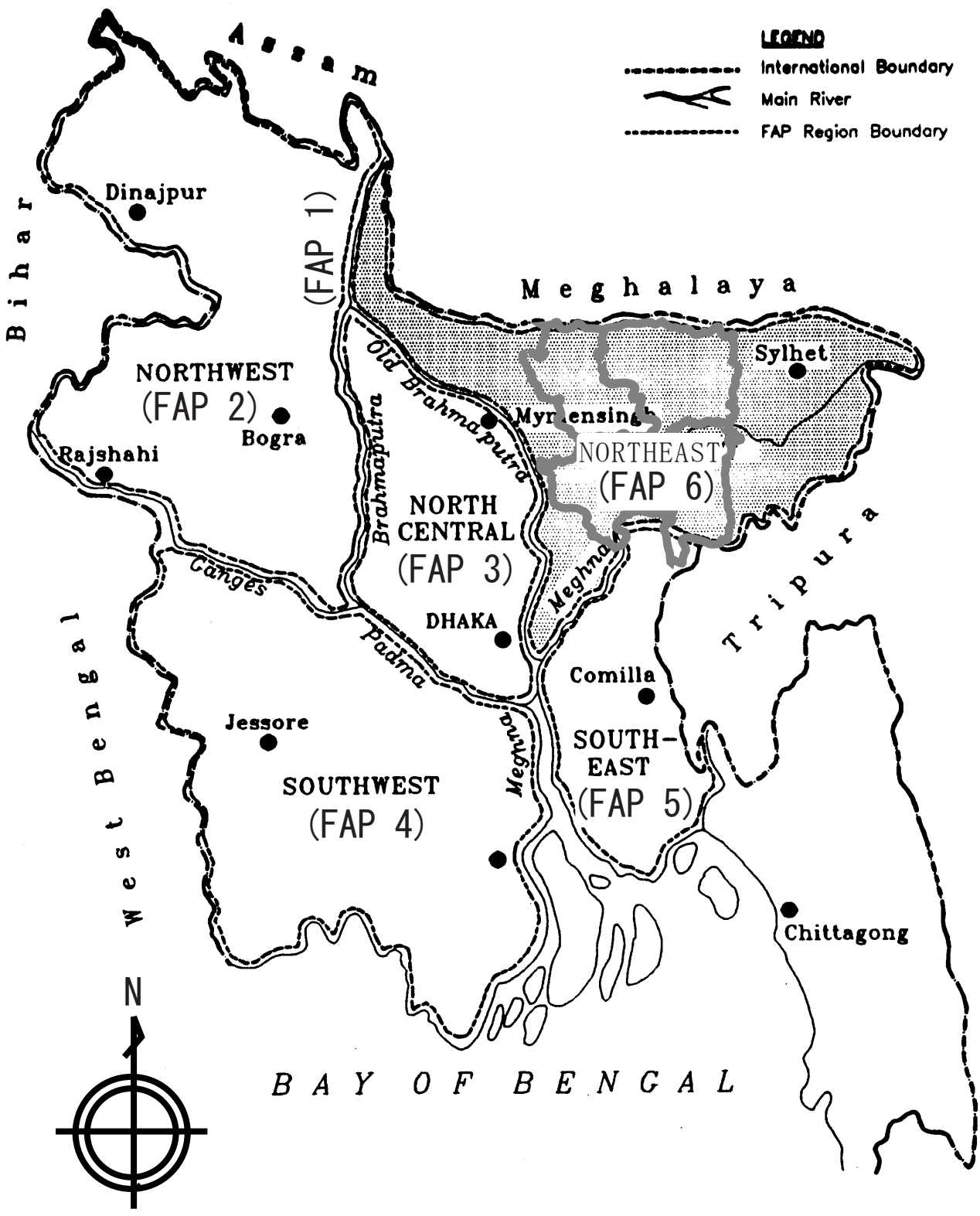
Following Guidelines for Project Assessment (GPA) and the Environmental Impact Assessment (EIA), economic, social and environmental assessments of the proposed projects in the North-East Region were carried out at pre-feasibility level, where impacts could not be quantified or valued, qualitative assessments were made of the project outcomes or impacts. The summary of these results in a framework of multicriteria analysis is presented in the Summary Report. The summary of the results of socio economic and environmental impact analysis containing changes in agricultural production, fishery, employment, resettlement, regional biodiversity, road transportation, navigation, socio-economic equity, gender equity, public concerns, etc., is shown in the Summary Report.

Table A1.4-1: Summary Table of FAP

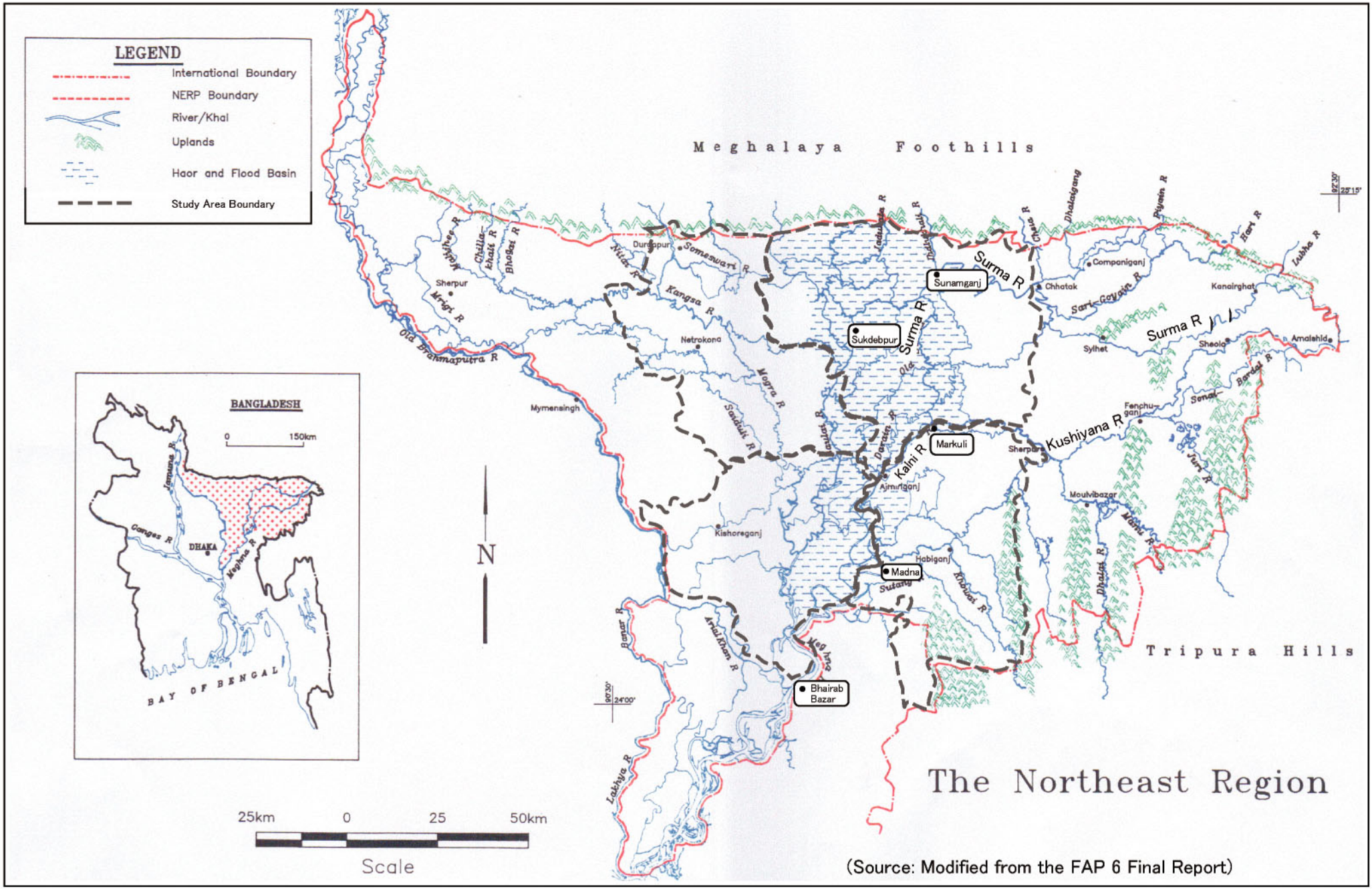
(Unit in Amount: million US$)

No	Component	Amount	Doner	Start	End	Study	Project	Remarks
	Main Components							
1	River Training Study of Brahmaputra River	3.36	IDA	Feb-91	Dec-94	Completed	-	
2	North West Regional Study	4.60	UK. Japan	Jan-91	Jan-93	Completed	-	
3	North Central Reginal Study	3.56	EU. France	Mar-91	Jun-92	Completed	-	
3.1	Jamalpur Priority Project /Study	2.85	France. EU	Aug-91	Dec-92	Completed	Completed	Jun 1996
4	South West Area Water Resources Management Study	3.84	ADB. UNDP	Oct-91	Apr-93	Completed	-	Gorai Pilot Dredging Project
5	South East Regional study	2.20	UNDP	Dec-90	Aug-93	Completed	-	
5B	Meghna Estuary study (MES I &II)	10.55	Natherlands, Denmark,WB	Nov-95	Dec-01	Ongoing	Dec 2001	Kalni-Kushiyare River Training Project by Canada
6	North East Regional study	14.60	Canada	Aug-91	Dec-01	Completed	Dec 2001	Embankment RehabilitationProject Phase I-Completed; Phase II-Donor withdrew, Project continues till June 2004 by local support.
7	Cyclone Protection Project	1.00	EU. France	Feb-90	May-92	Completed	-	
8A	Greater Dhaka Protection Project	3.00	Japan	Oct-90	May-93	Completed	-	
8B	Dhaka Integrated Flood Protection Project	0.61	ADB.Finland	Jan-91	Oct-92	Completed	Completed	Dhaka Integrated Town Protection under BWDB
9A	Secondary Towns Integrated Flood Protection Project	0.61	ADB	May-91	Jul-92	Completed	-	
9B	Meghna River Bank Protection Short Term Study	1.16	IDA	Nov-90	Jul-92	Completed	-	
10	Flood Forecasting and Warning Project	8.71	UNDP. Japan.ADB	Jan-91	Nov-92	Completed	-	
11	Disaster Preparedness Programme	1.10	UNDP	Apr-92	Dec-93	Completed	-	
	Supporting Studies							
12	RCD/I Agricultural study	1.60	UK. Japan	Jan-91	Feb-92	Completed	-	
13	Operation & Maintenance study	0.60	UK. Japan	Jan-91	Aug-91	Completed	-	
14	Flood Response study	0.92	USA	Mar-91	Aug-92	Completed	-	Tookover to EGIS
15	Land Acquisition and Resettlement study	0.40	Sweden	Jan-91	Jan-92	Completed	-	
16	Environmental study	4.04	USA	Nov-90	Apr-95	Completed	-	Tookover to EGIS
17	Fisheries Study & Pilot Project (Phase I)	3.40	UK	Dec-91	Jun-94	Completed	-	
18	Topographic Mapping	6.71	Finland, France, Swizerland, Germany	Sep-90	Apr-95	Completed	-	
19	Geographic Information System	4.36	USA	Apr-91	Jun-96	Completed	-	Tookover to EGIS
20	Compartmentalization Pilot Project	20.12	NI. Germany	Aug-91	Jun-00	Completed	Jun 2000	Compartalization Pilot Project in Tangail
21/22	Bank Protection and River Traingin/ AFRM Pilot Project	38.56	Germany. France	Dec-91	Dec-01	Completed	Dec 2001	Bank Protection Project-Physically completed, Report compilation
23	Flood Proofing Pilot Project	0.30	USA	Nov-90	Dec-91	Completed	-	Tookover to EGIS & CARE
24	River Survey Programme	8.75	EU	Jun-92	Oct-99	Completed	Completed	Oct 1999
25	Flood Modelling and Management	4.39	Denmark. France	Oct-90	Dec-93	Completed	-	Tookover to SWMC
26	Institutiomnal Development Programme	3.60	UNDP. France	Feb-90	Feb-95	Completed	-	
27	Macro-Economic Study (Special Study)	0.41	France. EU	Jun-91	Jun-95	Completed	-	Special Study

Source: WARPO, Principal Scientific Officer, As of July 1, 2001



Map A1.4-1: Location Map of FAP Regions



(Source: Modified from the FAP 6 Final Report)

Map A1.4-2: The Northeast Region under FAP-6