BANGLADESH
ACTION PLAN FOR FLOOD CONTROL

FAP 8A

GREATER
DHAKA TOWN PROTECTION PROJECT

(STUDY IN DHAKA METROPOLITAN AREA)

TERMS OF REFERENCE

FLOOD PLAN COORDINATION ORGANIZATION
MINISTRY OF IRRIGATION, WATER DEVELOPMENT
AND FLOOD CONTROL

Dhaka, June 1990

1. BACKGROUND

1.1 In 1987 and 1988, Bangladesh experienced two of the most severe floods on record. These floods created awareness both at home and abroad and called for finding a solution to such environmental disaster. Soon after the floods, various studies were conducted by different agencies, countries and Government of Bangladesh and several action plans were proposed. The World Bank co-ordinated the studies and framed Flood Action Plan (FAP) with 26 components as an initial stage in the development of long term comprehensive system of flood control and drainage works. The Dhaka Town Protection has been included as one of the components of the FAP.

1.2 As a follow up action of the December conference the Government of Japan and the Asian Development Bank (ADB) agreed in the Dhaka conference in January 1990 to undertake the study on the Dhaka Town Protection (FAP No. 8) and it was agreed that a long term comprehensive master plan for Dhaka Town Protectin should be formulated in order to optimize flood control investment and to improve urban environmental quality.

1.3 Through follow-up discussions in March 1990, ADB agreed to undertake the study on the Dhaka City Integrated Flood Protection Project which is identified as phase I of the Dhaka Town Protection (FAP No. 8).

The objective of the above study is to prepare an action oriented master plan for urban environmental improvements together with a feasibility study for high priority integrated investment to benefit the city of Dhaka. Immediate investment needs for flood control and drainage comprising flood embankment, pump house re-excavation and restoration of Khals and Canals and four lane highway along the embankment for the Dhaka Metropolitan Area (260 km2). In May, 1990, it was confirmed by both the Japanese Mission and GOB that Japan will conduct the Master Plan Study on Flood Control and Storm Water Drainage of the Dhaka Metropolitan Area (850 km2) under Dhaka Town Protection Project (FAP No.8), taking into consideration the Dhaka City Integrated Flood Protection Project.

2. THE REGIONS

2.1 The greater Dhaka is surrounded by rivers, Tongi khal on the north, Balu and Sitalakhya rivers on the east and Turag and the Buriganga on the western side. At the southern most end Buriganga meets Dhaleswari. The combined flow meets

Sitalakhya and then FLOWS southward to join Meghna. The water levels in the rivers surrounding greater Dhaka are affected not only by discharges from the Brahmaputra and local rainfall, but at times also by the combined effect of the Padma and the Meghna through the backwater from Dhaleswari and Sitalakhya. Dhaka city is located on the southern edge of the Madhupur Jungle terrace. The central part of the city is adequately high but extensive flood plains within Grater Dhaka normally ramain inundated at varying depth for approximately four months a year during the monsoon season.The study are will cover Dhaka Metropolitan are (Approx. 850 km2) consisting of Greater Dhaka area (approx. 260 km2), Tongi, Savar, Keraniganj and Narayanganj (See Figure-1).

2.2. A dominant feature of the Greater Dhaka area is the limited availability of flood-free land. The central part of Dhaka city is developed on the hilly land with an elevation of 6.0 to 8.0 m above mean sea level (GTS). The fringe areas are, however, located in the flood plains of the Buriganga and Balu rivers with a level of 2.0m to 6.0m GIS (See Figure-2). The fringe low-lying areas are flooded 2.0m to 4.0m during several months every year by overflowing of the surrounding rivers. Even the central part of Dhaka city is affected during major floods. During the past four (4) decades, the flood stage of the Buriganga river at Mill Barack (located near Old Dhaka) exceeded 6.0 m GTS six (6) times, damaging the central part of Dhaka city as well. The Greater Dhaka area was hit by the catastrophic floods during the period of August-September, 1988. The Buriganga river at Mill Barrak recorded the highest flood stage of 7.08 m GTS in its history on September 4, 1988. The flood frequency is estimated to be 100 years. The floods submerged almost all of the Dhaka Metropolitan area, leaving only 58 km2 of the high-elevated land of Dhaka city unsubmerged (See Fig.3). Major flooding of Dhaka city continued for 18 days from 30th August to 16th September. Dhaka area is also affected by internal floods due to heavy local rainfall in addition to the above mentioned external flooding caused by the surrounding rivers. Heavy monsoon rains cause water logging in many places within the city creating manifold problems for the citizens. External floods occur due to lack of flood protection facilities. Internal floods are mainly caused by insufficient drainage facilities; encroachment of buildings and bottlenecks from road and railway crossing are some of the major causes.

2.3 The Government of Bangladesh has embarked on the construction of the polders ecompassing the Greater Dhaka area with an approximately 260 km2. The principal alignment of the polders has been established. However, no detailed

study of the internal drainage system has been made except for the existing urbanized area of 137 km2. The polder construction will accelerate urban developments of the floods plains of the Balu, Turag and Buriganga rivers with an area of approximately 120 km2. Such urban developments will further increase the requirement of pump drainage. Disorderly urban developments of the flood plains may cause unexpected ,flood problems on the new development areas and may further aggravate the drainage conditions of the inner existing urban areas. Provision of proper flood protection and drainage system is essential for satisfactory urban development of the flood plains. This calls for the need of a Master Plan for Flood Control and Drainage for the entire Dhaka Metropolitan Area. In the meantime the construction of flood embankments for the Greater Dhaka area will continu. While these will protect the area against the external threat of floods, the risk of flooding through rainfall within the area will contine. It is therefore imperative that as early as possible pumping stations are installed to evacuate excess water. The related feasibility studies will be taken up as soon as possible.

2.3 Previous Studies and Projects

2.3.1 For flood protection and drainage of Dhaka city and its surrounding areas, several studies have been undertaken and several plans have been proposed by DPHE, BWDB and other agencies until 1987. However,most of the proposals have not been officially accepted mainly due to financial constrains. Only the expansion of drainage net works has been implemented on an ad-hoc basis with the objective to remove water logging of specific areas within Dhaka city. Major studies among them are described below.

(1) Master plan and Feasibility Report for Storm Drainage and Flood Control for the City of Dhaka. DPHE. 1968. The proposed master plan includes construction of embankments encompassing Dhaka city with an area of 75 km2, pump stations and other intermal drainage facilities.

(2) Dhaka City Drainage and Flood Control Project, BWDB, 1973. The master plan covers Dhaka City and its surrounding areas with an area of approximately 260 km2 and proposed constructin of polders along the Balu river. Tongi khal, Turag and Buringanga rivers, pump stations and other internal drainage facilities.

(3) Dhaka Metropolitan Area Integrated Urban Development Project, Planning Commission, ADB, UNDP, 1981. The study recommended the urban development strategy directing the expansion toward the northern high areas rather than toward the eastern and western flood plains which require large scale flood protection and drainage works. The strategy, however, was not officially accepted. No detailed flood protection and drainage plan was proposed.

(4) In October 1987, JICA prepared a flood protection and drainage plan for the urbanized area of Dhaka city covering 137 km2 in collaboration with DPHE. The proposed plan includes construction of embankments to protect the eastern low-lying areas, pump stations, and other internal drainage facilities of khal improvement and drainage pipe.

(5) In the wake of the devastating flood in 1988, the Government of Bangladesh constituted a committee for "Flood Control and Drainage of Grater Dhaka" to prepare a flood control and drainage plan of Greater Dhaka and its surrounding areas.

In March 1989, the report for Flood Control and Drainage of Greater Dhaka prepared by the Committee was officially approved by the Government of Bangladesh. The proposed plans with phasing of activities are summarized as follows (See Figure 4).

Stage I:

- embankments from Tongi Railways Bridge to Shirnir Tek-Satmasjid Road along Turag river;
- road raising and flood wall along Buriganga river from Friendship Bridge Via DND Project;
- embankment around Dhaka International Airport;
- clearing of khals in the city;
- repair and restoration of the sewarage system; and
- temporary flood control structure.

Stage II

- road/embankment from Demra to Tongi Bridge; and
- installation of five pumping stations.
- re-excavation and restoration of 12 canals.

(6) In January 1990, JICA revised its previous plan to be in consistency with the plan of the above commitee and the other relevant ongoing projects in collaboration with DWASA. The revised plan includes pump stations, khal improvements and drainage pipes only (See Figure-5).

(7) A Master Plan to be carried out by Japan International cooperation Agency (JICA) under bilateral agreement between Bangladesh and Japan is now proposed covering an area of approx 850 km2, including the Greater Dhaka (260 km2), Tongi, Savar, Keraniganj, and Narayanganj under Flood Action Plan (See Figure 1).

3. SCOPE OF WORK

Objectives of the Study

The objectives of the study are set forth as given below :

(1) Formulation of a Master Plan on a comprehensive flood control and storm Water Drainage for Dhaka Metropolitan Area (850 km2).

A Master Plan will include comprehensive structural and nonstructural measures such as :

i) Flood protection works including embankment, flood walls, road raising etc. with control gates.

ii) Storm Water Drainage Systems for existing urbanized areas including drainage channels, drainage pipes, drainage pumps, etc.

iii) Storm Water Drainage Systems for future urban development areas including trunk drainage channels, drainage pumps, flood retarding ponds, flood plain management etc. The proposed drainage systems will provide guidelines for efficient future urban developments of the flood plains.

It should provide guide-lines for flood plain management and for urban developments, from drainage point of view.

(2) Execution of a Feasibility study on a flood control and storm water drainage for the priority area identified in the Master Plan.

In carrying out the above studies, close liaison and coordination is to be maintained with the Dhaka Integrated Flood Protection Project (FAP No.8) and other relevant components of Flood Action Plan, such as FAP Nos. 1,2,3,1,10 and 25. Embanking rivers and developing the protect area will tend to affect flood levels.

4. TERMS OF REFERENCE

In order to achieve the objective of the study the consultants shall perform all necessary field investigation and related tehcnical, economical and social studies including the following works :

(1) To collect, collate and update the available data and information as described below:

- topographic map, aerial photograph and related drawings
- soil, geological and geographical data.
- population, land use and regional development plans.
- existing road network
- hydrological and hydraulic conditions.
- existing flood control and stormwater drainage facilities.
- past floods and flood damages.
- related institutions, and
- other related data and information

(2) To review the relevant previous studies reports and plans including ongoing projects.

(3) To carry out the following field surveys and investigation:

- field reconnaissance;
- supplemental topographic survey for preparation of accurate base map;
- longitudinal and cross sectional survey for drainage channels and rivers;

- supplemental geo-technical survey for proposed major flood control and drainage facilities;

- flood and flood damage survey, and

- water quality test.

(4) To conduct a review of existing urban development plan and projection of population distribution and land use pattern/distribution, in order to assess the future flood control and stormwater drainage requirement.

(5) To prepare a Master Plan on a comprehensive flood control and stormwater drainage in the Dhaka Metropolitan area. For this purpose the following studies and analysis shall be conducted.

- assessment of the present conditions for the existing flood control and stormwater drainage works.

- target year, design rainfall and flood water level,

- hydraulic simulation with mathematical modelling using Mike 11 of SWMC for the 850 sq. km area with a view to formulate and optimise planning and design aspects at the Master Plan and its priority projects considering various options for flood control and drainage,

- alternative studies for external flood protection and internal drainage improvement plans, and recommendation of optimum plan in consideration to capital cost, operation/maintenance, environmental and financial aspect, and

- preparation of the phased implementation programme and identification of priority schemes.

(6) To conduct a Feasibility study for the identified priority projects which shall incorporate, but not limited to, the following aspects:

- the necessary supplementary data collection, field surveys and analysis;

- alternative project concepts and selection of the optimum ones considering technical, economic and operational aspects;

- preliminary designs of the proposed facilities, with due attention to appropriate technology and taking into account prevailing conditions in Bangladesh;

- time schedules for subsequent detailed design, tendering and construction, with estimated dates for putting the proposed facilities into service;

- approximate land acquisition plans.

- cost estimates for construction, operation and maintenance of the proposed projects.

- economic and financial evaluation of the proposed projects, including their social and environmental impacts.

- proposals for institutional arrangements for operation and maintenance.

(7) Technology transfer shall be effected through the actual participation of the counterpart personnel assigned by the Government of Bangladesh to assist the experts of the study Team in the field study (on the - job training), and through overseas training.

5. REPORTING

In the course of the study, the following reports shall be prepared and submitted:

(1) Preliminary Review Report, to be submitted at the end of the Preliminary Review Phase.

It shall present a compilation and analysis of all collected relevant data, on the basis of which a precise description of the required Master Plan Study and of detailed related TOR will be presented.

It will include a proposal for the development of the project area that will form the basis for the desired master plan. The Client will offer his decision on this proposal within 1 month after submission of the Report; agreed development plan will be the basis of the Master Plan to be prepared by the Consultants.

(2) Interim Report shall asses and review the data collected and propose options for Master Planning Priority projects will be identified on a preliminary basis and proposed for feasibility study in the next phase.

Interim Report, to be submitted 6 months after the commencement of the Master Plan Study.

(3) Master Plan Report shall review all options assessed and propose the preferred Master Plan for flood control and drainage for the Dhaka Metropolitan Area. The report shall make firm recommendation for the priority project(s) to be taken up for the subsequent feasibility study. Final proposals for detailed Terms of Reference for the feasibility study will be added. Master Plan Report to be submitted at the end of the Master Plan Study.

(4) Draft Final Report, to be submitted 7 (seven) months after the commencement of Feasibility Study.

It will confirm viability of priority projects.

(5) Final Report, to be submitted within 1 (one) month after receipt of the comments from the Government of Bangladesh on the Draft Final Report.

6. STUDY DURATION AND SCHEDULES

6.1 The entire study will be conducted within 19 months, and be structured and conducted in such a way that the results of each become available not later than indicated in Fig. 6.

There are 3 study phases:

- Preliminary Review - to start not later that 2.5 months after signing of the bilateral agreement.
- Master Plan Study - to start not later that 5.5 months after signing of the bilateral agreement.
- Feasibility Study. - to start not later that 13.5 months after signing of the bilateral agreement.

6.2 Implementation Arrangement

The Flood Plan Coordination Organization, FPCO set up by GOB to guide all activities under the FAP, will also coordinate this study, and act as counterpart organization. The existing high-powered policy-related Steering Committee for Dhaka Flood Protection, would continue during the implementation of the study and would provide policy guidance.

7. STAFFING AND OTHER STUDY INPUTS

7.1 The study will be carried out by a team of Expatriate consultant duly supported by local consultants. GOB will extend nccessary support by providing staff input. Proposed input are

- Expatriate Consultants

1. Team Leader	19
2. Hydrologist/Hydraulic Enginee/Modeller	10
3. Flood Prevention Planning Engineer	18
4. Drainage Planning Engineer I	18
5. Drainage Planning Engineer II	7
6. Hydraulic River Structural Engineer	6
7. Drainage Facility Engineer	5
8. Urban Planner	4
9. Land Use Analyst	5
10. Environmentalist	5
11. Construction Planner/Cost Estimator	5
12. Topographic Survey Expert	4
13. Flood Damage Survey Expart	3
14. Mapping Specialist	1
15. Socio-Economist	4
	114

- Local Consultants:

1. Engineer (Hydraulics/Hydrology Modelling)	10
2. Flood Prevention Planning Engineer	18
3. Drainage Planning Engineer	15
4. River Structural/Drainage Facility/ Construction Planner	15
5. Urban Planner/Land Use analysts	10
6. Environmental/Flood Damage/ Survey Expart/Socio-economist	12

7. Topographic Survey Expart/Mapping Especialist 10

90

- Counterpart Personnel:(GOB)

  1. Project Director (Full time)

  2. Engineers from BWDB, DMC, RHD, DWASA, RAJUK, DOE and others. (Part time)

- Supporting Local Staff: (To be supported by JICA)

  1. Eng. Support, Surveyor

  2. Typist

  3. Driver

  4. Others.

7.2 Other Inputs

Equipment, materials, facilities, etc. (Primary information is given in Appendix)

8. RESPONSIBILITIES OF THE GOVERNMENT

8.1 Freedom from Taxation and duties:

The government/Executing Agency shall bear the cost of any taxes,duties, fees,. levies and other impositions under the laws and regulations in effect in Bangladesh ion the Consultant and expatriate personnel in respect of:

- any payments made to the consultants or their panel other than Bangladesh nationals, in connection with the carrying out of the services;

- any materials, equipment and supplies brought into Bangladesh for the purpose of carrying out the services and which after having been brought to the country will be subsequently withdrawn therefrom:

- any equipment imported for the purpose of carrying out the services and paid out from the funds provided by the Government and which is treated as property of the Government.

(b) If the Consultant or any of the expatriate personnel does not withdraw, but disposes of any property in Bangladesh upon which custom duties and taxes have been exempted, the Consultant shall bear such custom duties and taxes in conformity with the regulations of the Government.

8.2 Other Privileges and Exemptions

The Government shall:

- provide the expatriate personnel with work permits and such other documents as shall be necessary to enable them to perform the services including privileges specified in the Government of the People's Republic of Bangladesh notification no /RO 88-L-85/906/CUS dated the 13th February,1985 and /RO 89-/85/907/CUS dated the 13th February,1985 (circular of 1988 is to be incorporated)

- arrange for the personnel and his authorized dependents to be provided promptly with all necessary entry and exit visas, residence permits, work permits, exchange permit and travel documents required for their stay, in Bangladesh;

- facilitate clearance through customs of any property required for the services and of the personal effects of the expatriate personnel and the prompt issue to the Consultants expatriate personnel of Custom Pass Books.

- issue to officials, agents and representatives of the Government all such instructions as may be necessary or appropriate for the prompt and effective implementation of the services;

- exempt the consultants and the personnels for the services from any requirement to register or obtain any permit to practice the profession of Engineer or Architect or to establish himself higher individually or as a corporate entity according to the laws of Bangladesh;

- arrange for duties and taxes on the imported equipment, vehicles and other materials relating to the project which will be retained in Bangladesh to be paid by the implementing agency in Bangladesh;

8.3 Services, Facilities and Equipment

- The Government shall provide assistance to collect pertinent data, maps and information available for the performance of the Services under this Contract.

- The Govt. shall, if available, provide accommodation in the Govt. Rest House at usual rate.

- Indemnify, save and hold harmless the Consultant and its personnel from and against all claims, demands or suits, that may be made or brought against the Consultant and its personnel arising directly from the performance of the services provided that, such claims, demands or suits are not the result of negligence or willful acts of the Consultant and its personnel.

9. RESPONSIBILITIES OF THE CONSULTANT

9.1 Responsibility of Consultant

Consultant shall carry out the services as detailed in "Scope and Terms of Reference" in the best interest of the Government for the successful realization of the program with all reasonable care, skill and diligence with sound engineering, administrative and financial practices and shall be responsible to Executive Agency (FPCO) for the discharge of responsibilities.

The Consultant shall during the execution of the services appoint and designate a Team Leader to represent the Consultant in Bangladesh in all matters relating to the services.

The Consultant shall be responsible for the professional and technical competence of its employee and the personnel's behavior and shall use its best efforts to select and employ for work in Bangladesh only those persons who in its judgment will be the best and most likely to perform satisfactorily the terms of their employment.

The Consultant shall keep accurate and systematic records and accounts in respect of the services in such form and detail as is customary in the profession and shall be sufficient to accurately establish the costs and expenditures incurred for the services.

Except with the prior approval of the Government/Executive Agency the Consultant shall not any time communicate to any persons or entity not connected with the services any confidential information, disclose to them for the purpose of the services or disclosed by them in the course of their services, nor shall the Consultant or the Consultant's personnel make public any information relating to the services.

The Consultant shall be responsible in respect of life, health, accident, travel and other insurance which may be necessary for the Consultant's personnel for the purpose of the services.

All existing rules and regulations of the Govt. of Bangladesh related to the classification, custody and issue of restricted map, aerial photograph and other related data shall be maintained.

9.2 Information

The Consultant shall furnish the Executing Agency with such information relating to the services and the Project as the Executing Agency may from time to time reasonably request.

9.3 Assignments, Subcontractors:

Except with the prior written approval of the Government the Consultant shall not assign or transfer the contract or any part thereof nor engage any independent Consultant or sub-contractors to perform any part of the services other than nominated personnel listed in the contract.

The approval of the Executing Agency to the assignment of any part of the Contract or to the engagement by the Consultant of independent Consultants or sub-contractors to perform any part of the services shall not relieve the Consultant of any of his obligations under this contract.

9.4 Prohibition on Conflicting Activity

No member of the personnel assigned to this Project shall engage, directly or indirectly either in his name or through the Consultant any other business or professional activities in Bangladesh during the performance of his duties or assignment under this contract.

9.5 Laws and Regulations of Bangladesh

This Contract shall be and is deemed to be a Bangladesh contract and shall accordingly be governed by and construed according to the laws for the time being in force in Bangladesh.

The Consultant shall respect and abide by all applicable laws and regulations in Bangladesh and shall use his best efforts to ensure that the Consultant's personnel and their dependents while in Bangladesh and local employees of the Consultant shall respect and abide by all laws and regulations of Bangladesh.

9.6 Ownership of Drawings, Data and Reports

All reports and relevant data such as maps, drawings, plans, statistics and supporting records or materials compiled or prepared in the course of Services shall be the absolute property of the Government. The Consultant agrees to deliver all these materials to the Executive Agency upon completion or termination of this Agreement.

9.7 Reports and Communication

All reports, communications, recommendations and general correspondence from the Consultant to the Executing Agency under the Agreement shall be in English language. One hundred copies of each report are to be submitted.

9.8 Notice of Delay

In the event when the Consultant delay in obtaining the required services of facilities set forth in this contract for the conduct of the services, or the occurrence of the event or condition that might delay or prevent completion of the services in accordance with the time schedule, the Consultant shall promptly notify the Government of such delay indicating what steps are being taken or suggested by the Consultant to meet the situation any may request an appropriate extension of time for completion of the services.

9.9 All the clauses and Provisions from 8.1-9.8 will be guided by the Protocal "Scope of Work" to be signed between GOB and Japan Govt. under bilateral agreement

10. COST ESTIMATES

The study will cost an estimated total cost of 3.00 million US $ comprising the following preliminary breakup on major items:

1. Expatriate Consultants	114 m/m
2. Local Consultants	90 m/m
3. Transport and Equipments	1 Car,1 Speed boat 4 Jeep,1 Microbus
4. Foreign Training	4 person

Detail of the cost shown in Appendix.

Description	Nos.		Unit Price Y or Tk	Unit Price US$	Total US$
Foreign Consultant	114.0	M/M	Y 3,000,000	20,000//	2,280,000
Local Consultant	90.0	M/m	Tk 80,000	2,286	205,700
Passenger Car	1	Unit	Y 4,000,000	30,000	30,000
4 Wheel Drive	4	Unit	Y 5,000,000	30,000	120,000
Microbus	1	Unit	Y 10,000,000	60,000	60,000
Speed boat	1	Unit	Tk. 450,000	12,850	12,850
Copy Machine	2	Unit	Y 2,000,000	13,000	26,000
Personal Computor	2	Unit	Y 1,500,000	10,000	20,000
Type writer	1	Unit	Y 500,000	3,000	3,000
Fax	1	Unit	Y 200,000	1,300	1,300
Air Conditioner (Rental)	8	Unit	Tk 25,000	714	5,714
Hydrological equip (Rainfall, Water level Current meter, Water quality)			Y 10,000,000	60,000	60,000
Training in Japan (incl.air fare)					
Hydrology/Hydraulic (1 person 2 months)			Y 1,500,00	10,000	10,000
Flood Control (1 person 2 months)			Y 1,500,000	10,000	10,000
Drainage (Planning) (1 person 2 months)			Y 1,500,000	10,000	10,000
Drainage(Facility) (1 person 2 months)			Y 1,500,000	10,000	10,000
Supporting staff (16 person 304 months)			Tk 3,500	100	30,400
Office with furniture & phones			Tk 535,000	15,286	15,286
Office stationary & Reporting			Tk 400,000	11,429	11,429
Operation & maintance of Transport			Tk 200,000	5,714	5,714
					2,92,7393

* * * Y = 0.2263 Tk. US$ = 35 Tk. Y = 0.00646 US$

// Rate includes air fare, per diem other expences, etc.

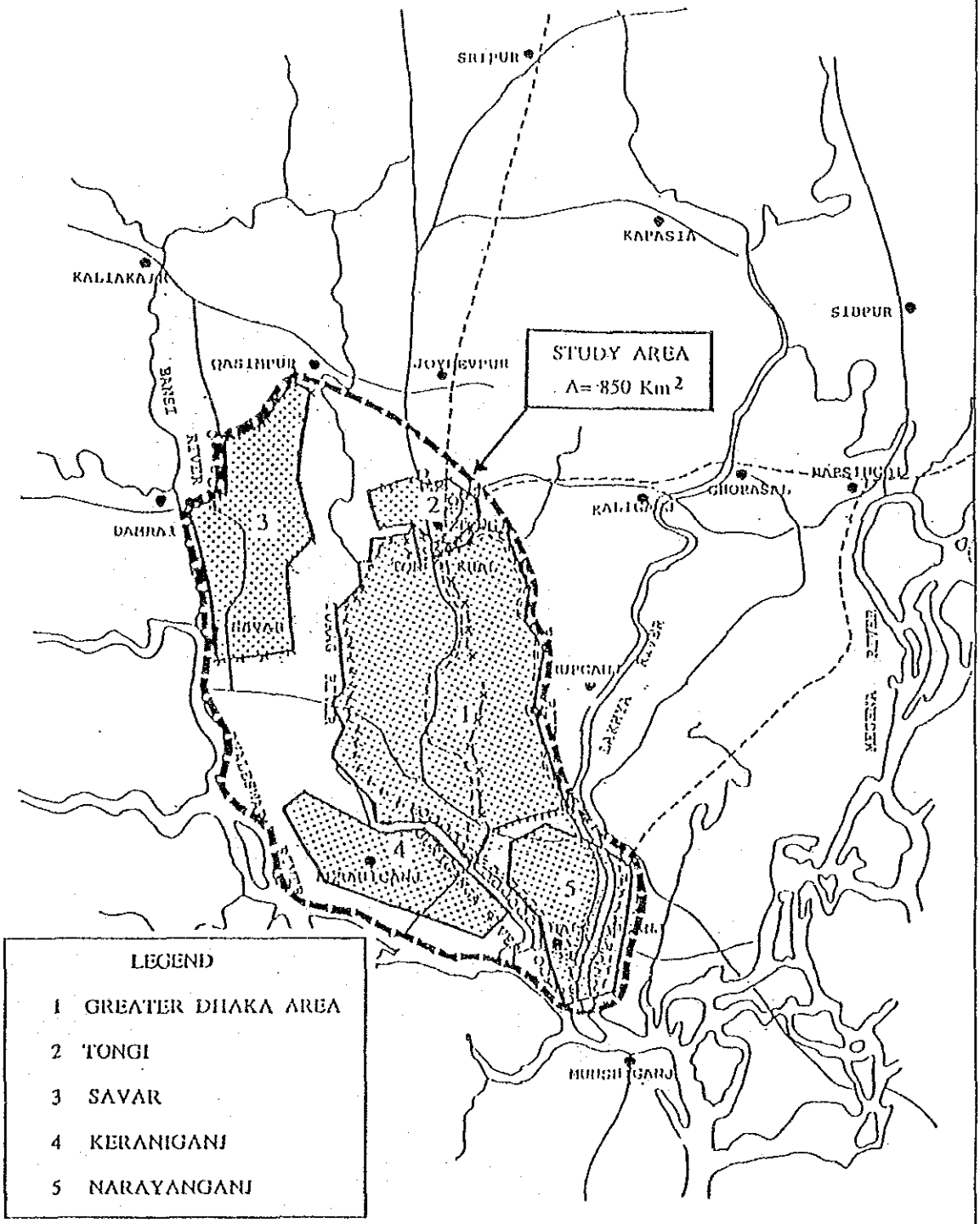


FIG. 1 STUDY AREA

FLOOD CONTROL AND DRAINAGE PROJECT IN DHAKA METROPOLITAN AREA

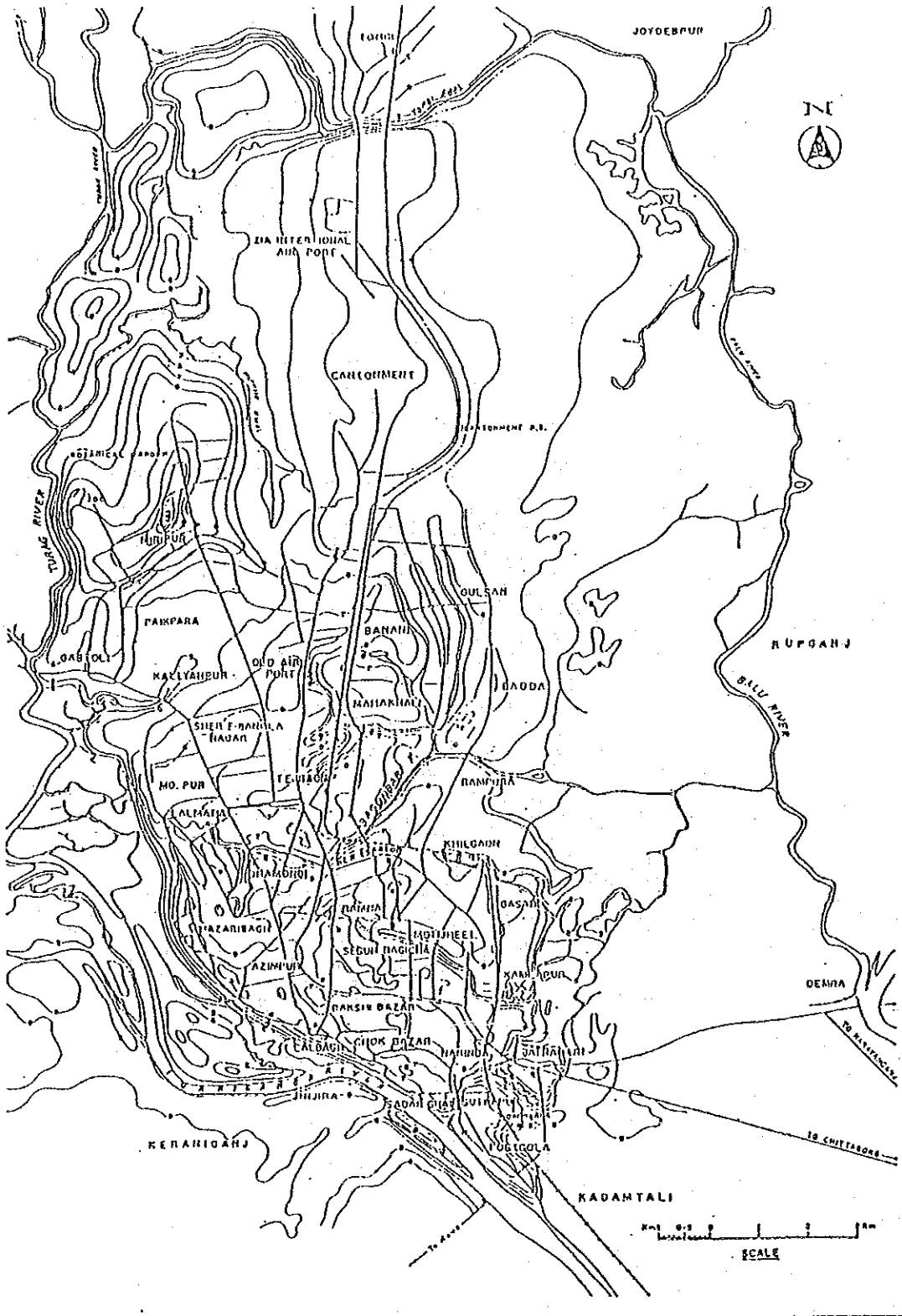


FIG. 2 TOPOGRAPHY OF GREATER DHAKA AREA

FLOOD CONTROL AND DRAINAGE PROJECT IN DHAKA METROPOLITAN AREA

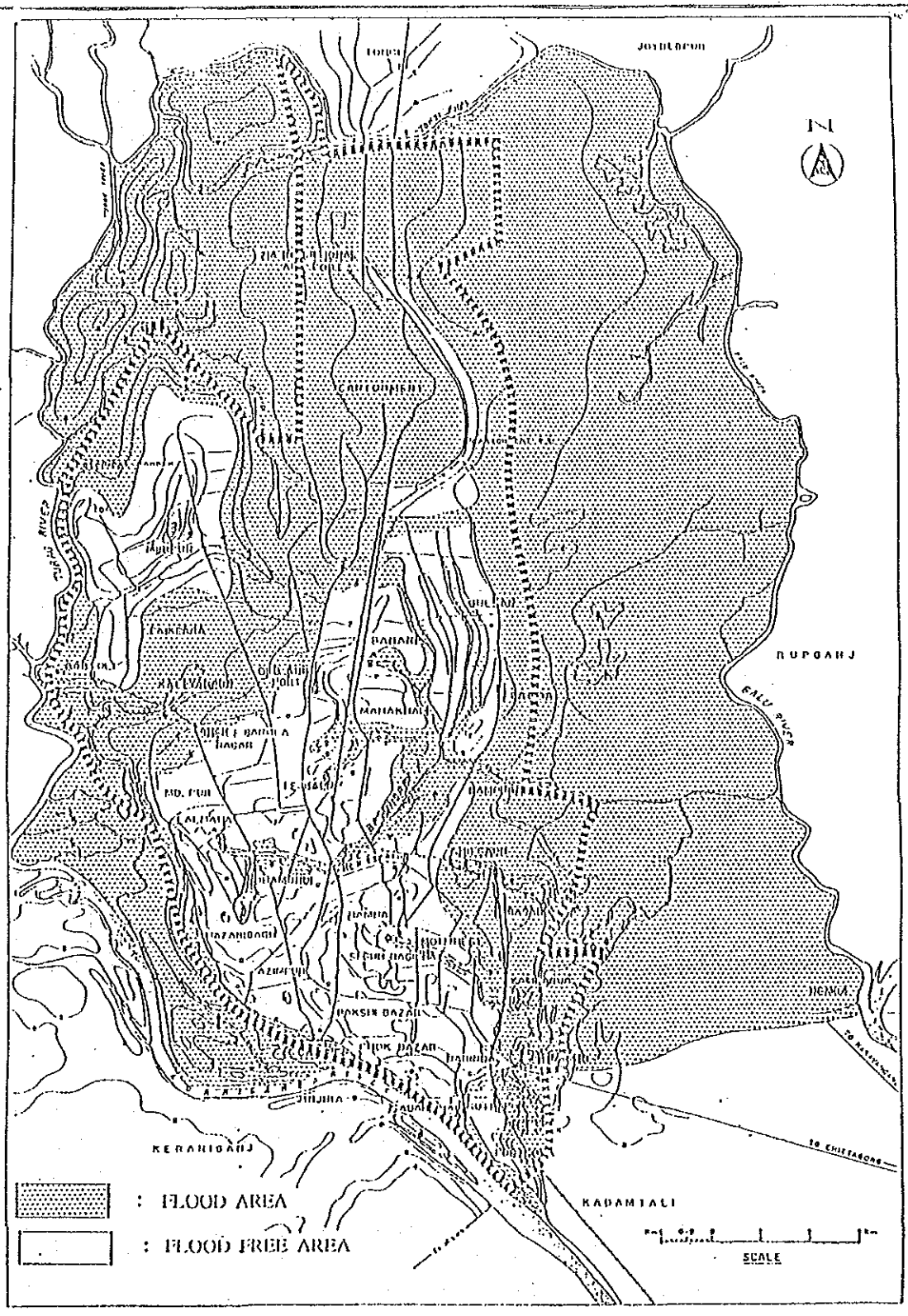
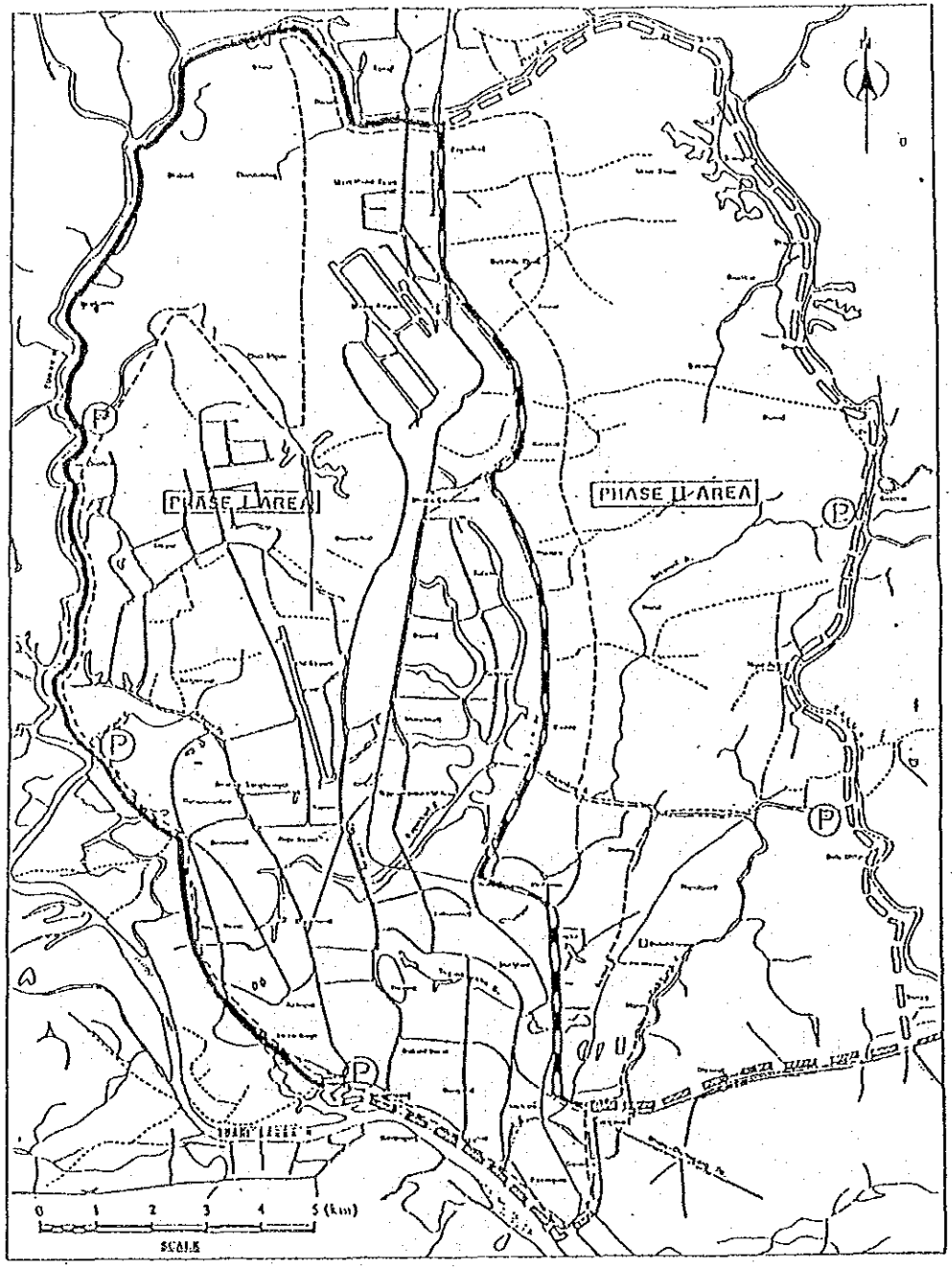


FIG. 3 : 1988 FLOOD AREA OF GREATER DHAKA AREA

FLOOD CONTROL AND DRAINAGE PROJECT IN DHAKA METROPOLITAN AREA



LEGEND

- Embankment (Phase I)
- Flood Protection Wall (Phase I)
- Temporary Flood Protection Boundary with Interim Works (Phase I)
- Embankment (Phase II)
- Pumping Station (Phase II)
- Boundary of JICA Study Area

Source : Report on Flood Control and Drainage of Greater Dhaka by Committee in Jan.1989

FIG. 4 GREATER DHAKA FLOOD CONTROL AND DRAINAGE SCHEME PROPOSED BY COMMITTEE

FLOOD CONTROL AND DRAINAGE PROJECT IN DHAKA METROPOLITAN AREA

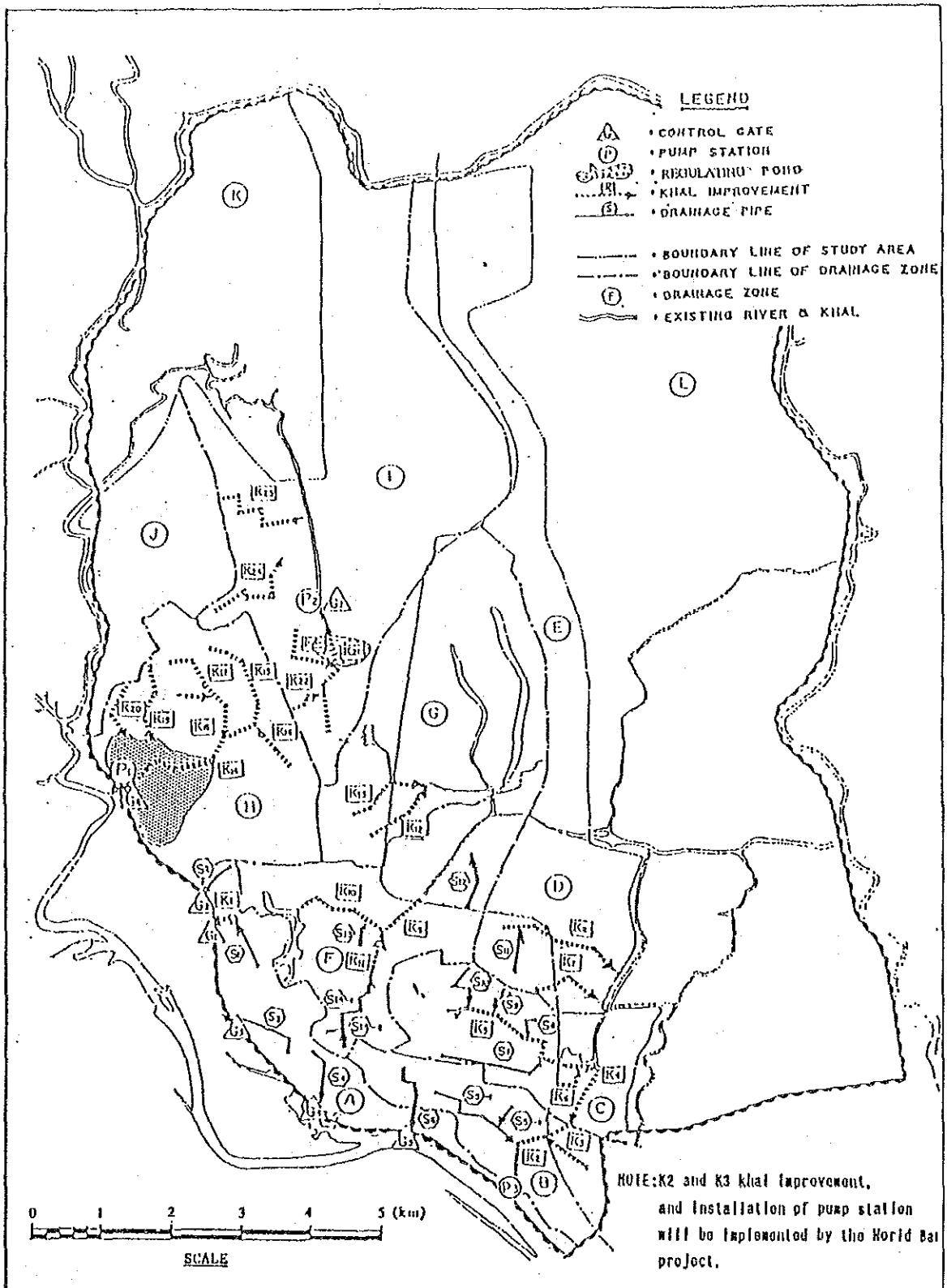


FIG. 5 STORMWATER DRAINAGE FACILITIES PROPOSED BY JICA

FLOOD CONTROL AND DRAINAGE PROJECT IN DHAKA METROPOLITAN AREA

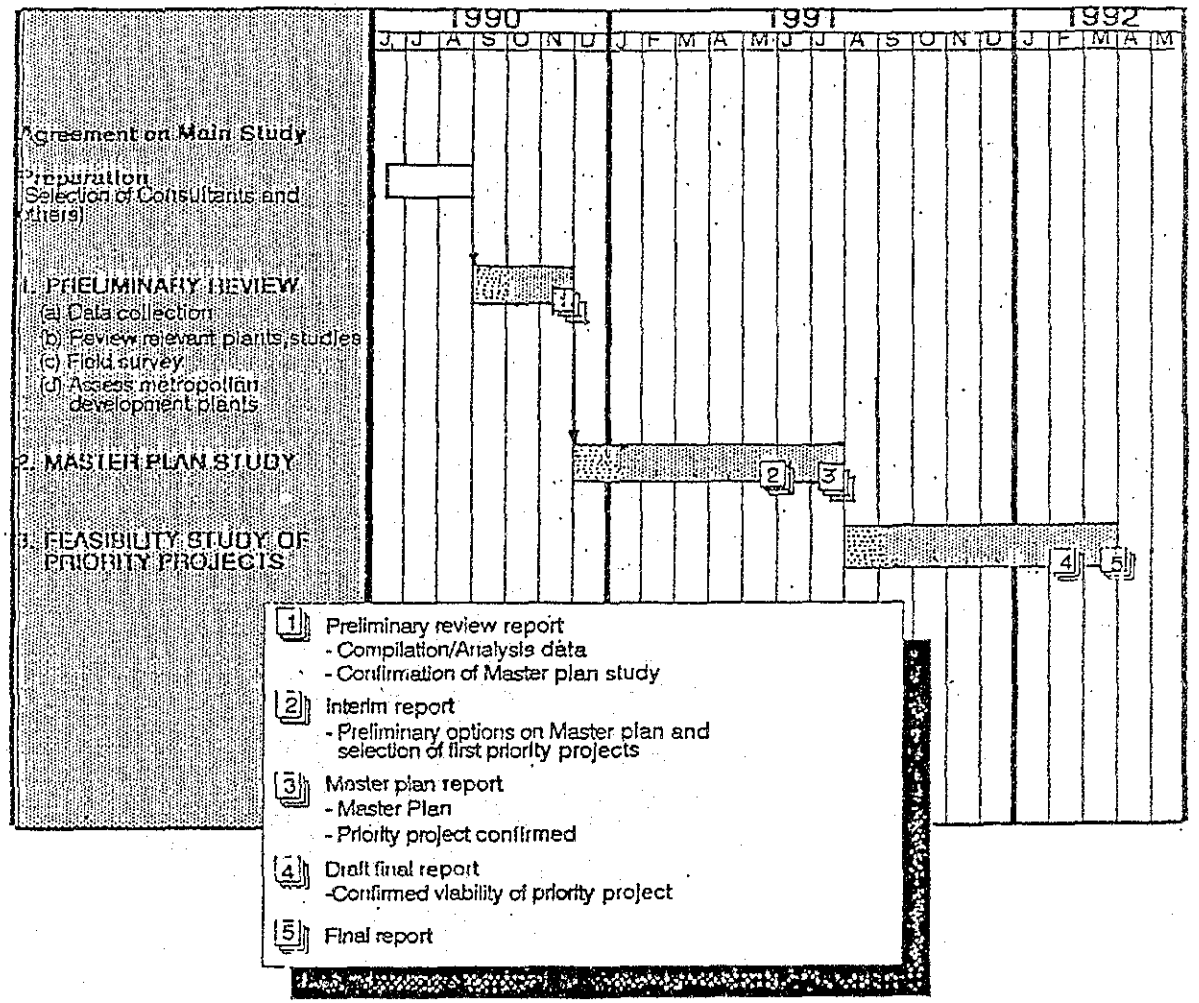


Figure 6 Tentative work Schedule of Dhaka Town protection Phase II

TECHNICAL ASSISTANCE

TO THE

PEOPLE'S REPUBLIC OF BANGLADESH

FOR PREPARATION OF THE

DHAKA INTEGRATED FLOOD PROTECTION PROJECT

May 1990

CURRENCY EQUIVALENTS
(As of 31 May 1990)

Currency Unit	= Taka (Tk.)
$ 1.00	= Tk. 33.80
Tk. 1.00	= $ 0.029

In this Report, a rate of $1.00 = Tk. 34.0 has been used, which was the rate prevailing during the preparation of the technical assistance.

ABBREVIATIONS

BWDB	-	Bangladesh Water Development Board
DMC	-	Dhaka Municipal Corporation
DWASA	-	Dhaka Water Supply and Sewerage Authority
DOE	-	Department of Environment (of the Ministry of Environment and Forests)
FAP	-	Flood Action Plan
FPCO	-	Flood Plan Coordination Organization
JICA	-	Japanese International Cooperation Agency
LGD	-	Local Government Division (of the Ministry of Local Government, Rural Development and Cooperatives)
LGEB	-	Local Government Engineering Bureau (of LGD)
MIWDFC	-	Ministry of Irrigation, Water Development and Flood Control
RAJUK	-	Capital Development Authority

NOTES

(i) The fiscal year of the Government ends on 30 June.
(ii) In this Report $ refers to US dollars.

I. INTRODUCTION

1. Following the devastating floods of 1987 and 1988 in Bangladesh -- two of the most severe in the country on record -- a Flood Action Plan (FAP) was formulated under coordination of the World Bank and later confirmed at the conference of donors held in London in December 1989. At this conference, the Bank expressed its willingness to provide assistance related to mitigating floods in Bangladesh, including urban flooding. The Government of Bangladesh, thereafter, requested Bank technical assistance to help prepare an integrated flood protection project for Dhaka, a component included in the FAP. A Fact-Finding Mission visited Bangladesh from 24 March to 7 April 1990. The Mission had discussions with Government officials, confirmed the need and scope of a project preparatory technical assistance, and reached agreement on the consultants' terms of reference and the implementation arrangements. The technical assistance first appeared in ADB Business Opportunities in April 1990.

II. BACKGROUND

A. Flooding Problems in Bangladesh

2. With major river systems and some 40 per cent of its inland area under waterways, Bangladesh has a history of flooding, exacerbated by heavy rainfalls during the monsoon period of June to September. The first systematic study of the country's flooding problem was carried out with UNDP assistance over thirty years ago. This was followed by a Master Plan in 1964 which proposed a large number of projects for flood control, drainage and irrigation. Subsequently, some major embankments were built along parts of the main rivers, but no national level major flood control measures were taken. The disastrous floods of 1987 and 1988 -- which caused damage estimated at $ 0.5 billion and $1.3 billion respectively in monetary terms, apart from extensive loss of human life, highlighted the enormity and urgency of the problem and aroused much international concern. Several studies were undertaken in 1988 and 1989 with assistance from UNDP, USAID, Japan and France to develop a comprehensive flood policy and program. At the Government's request, and based upon inputs from the above studies, the World Bank coordinated the preparation of the FAP.

3. The FAP has been formulated as an action plan for the next five years as the first step in the Government's long term flood control program. A set of "Eleven Guiding Principles" provides a broad framework for a plan of physical works together with measures to improve preparedness and management of floods. Prominent among the aspects considered are: (i) the planning and design issues (including location and adjustment of embankments), (ii) social aspects (including closer involvement of the beneficiaries and local authorities in the planning, design and management of projects, and better efforts to educate the public), (iii) environmental issues (including preservation and enhancement of favorable environmental impacts), (iv) matters related to staged development, and (v) implementation

issues, particularly those relating to enhancing implementation capability and coordination. The FAP has identified a total of 26 activities, including 11 components -- Dhaka Town Protection being one of them-- and 15 supporting activities. A national Flood Council and a Flood Plan Coordination Organization (FPCO) were established in September 1989. Implementation of the FAP is the responsibility of a Technical Committee with multiagency representation as well as an expert panel (local and foreign), in the fields of engineering, agriculture, economics, social sciences and environmental sciences. Various donors are assisting in the implementation of the FAP. It is planned that the Bank would be involved with the South West Region Water Management Study and Secondary Towns Integrated Flood Protection, in addition to Dhaka Integrated Flood Protection; the latter is the first proposal needing immediate consideration due to the nature of the problem.

4. While Bangladesh remains primarily a rural country, its urban population has been growing at a very high rate during the last two decades and now constitutes over twenty percent of the total population of about 110 million. Urban flooding problems have become acute because of high densities and inadequate drainage facilities in towns. Since large investments relating to the housing stock, infrastructure and industrial, commercial and other buildings are concentrated in the urban areas, flood damages in such areas have been extensive. In recognition of this, all the donor-assisted studies carried out during 1988 and 1989 agreed on the high priority for protective works for urban centers.

B. Flooding Problems in Dhaka, Previous Studies and Donor Activities

5. Dhaka city is located on the southern edge of the Madhupur Jungle Terrace and is surrounded by rivers on all four sides [see Map page (i)]. The Greater Dhaka area encompassed by these rivers covers about 260 sq km. The central parts of the city are high enough to remain generally free from flooding, but fringe areas are extensively inundated by 2-4 meters for several months each year by overflows of the surrounding rivers. Major floods, however, such as those in 1987 and 1988, affect even the central parts of the city. Heavy rainfall, high surrounding water levels and an inadequate and unsatisfactorily maintained drainage system all contribute to flooding in the city. Heavy rainfall particularly aggravates flooding when it is late in the monsoon period and adds to the overflow of the rivers. Damage to city infrastructure is usually severe. During the floods of 1988, about 400 km of roads in Dhaka were damaged and about 60 per cent of the 1900 km internal road system was submerged. The flood damage in Dhaka was estimated at between $ 15 million and $ 30 million.

6. For the flood protection and drainage of Dhaka city and its surrounding areas, several studies were undertaken in the past, but not thoroughly enough, due to resource constraints. The first full-scale study was prepared by UNDP in 1968. It proposed a master plan covering an area of about 75 sq km area and involving construction of an embankment around the city, pump stations and other drainage facilities. In 1970, another study followed, which was revised and updated after Bangladesh become independent in 1971, involving polders covering about 250 sq km, together with infrastructure improvements. In January 1989, a Government-appointed

committee prepared a flood control and drainage plan for Greater Dhaka and its surrounding areas which was officially approved in March 1989. The proposed plan involves: (i) construction of embankments and flood protection walls along the Tongi Khal, Turag and Buriganga rivers, Dhaka-Narayanganj roads and Balu river to protect the Greater Dhaka area of around 260 sq km; (ii) installation of five pumping stations to drain internal water; and (iii) re-excavation and restoration of 12 canals. In view of the urgency of the flood protection works, and pending assistance from donors, the Government has undertaken some emergency works 1/ from its own resources which are expected to be completed by June 1990. These works are being undertaken by several agencies such as the Bangladesh Water Development Board (BWDB), the Dhaka Municipal Corporation (DMC) and the Dhaka Water Supply and Sewerage Authority (DWASA). Environmental impact of the investments is being studied by the Department of Environment (DOE) of the Ministry of Environment and Forests, assisted by consultants financed under a Bank technical assistance project. 2/

7. While direct flood protection programs for Dhaka have been undertaken in the past by the Government from its own resources, several international agencies have been assisting the Government in programs relating to environmental improvements. The Bank has assisted in the preparation of an integrated metropolitan development plan for Dhaka during 1979-1981 3/ and an ongoing urban infrastructure improvement project in 1989, 4/ involving improvement of municipal facilities in the Mirpur suburb of Dhaka. The World Bank has assisted in three projects for water supply and an urban project, having components in Dhaka involving improvement of slums, solid waste and drainage improvements in the inner city area. The Japanese International Cooperation Agency (JICA) prepared a drainage plan for the western half of the Dhaka metropolitan area in October 1987. This was updated in February 1990, and priority drainage investments ($15 million) in two of the ten drainage zones are planned for implementation during 1990-1992. JICA is also to prepare a master plan for drainage and flood protection for the larger regional metropolitan area of 850 sq km, which includes about six towns in the vicinity of Dhaka. UNDP, besides collaborating with the Bank in the 1981 planning study, has also financed feasibility studies that led to urban investments in Dhaka by the World Bank and the Bank. Two further studies are being developed: one with the Planning Commission for the study of traffic and transportation problems of Dhaka and the second with the Capital Development Authority (RAJUK) for updating of the master planning study.

1/ These include embankments (30 km), flood-walls (34 km), pipe sluices (5), road-raising (9 km), flood protection of the international airport and repair and restoration of sewerage works in the city.

2/ TA No. 1104-BAN: National Environmental Monitoring and Pollution Control, for $750,000 financed by JSF, approved on 12 January 1989.

3/ TA No. 282-BAN: Study of Integrated Urban Development of Dacca Metropolitan Area, for $288,870 financed jointly with UNDP, approved on 6 March 1979.

4/ Loan No. 942-BAN: Dhaka Urban Infrastructure Improvement Project, for $24.2 million, approved on 12 January 1989.

C. Need for Technical Assistance

8. The various studies related to flood protection that were carried out in the past remained largely at master planning, or at project identification/pre-feasibility level of detail. Where elements were carried out, they were done by the various agencies, generally on an ad hoc basis without proper coordination. These piecemeal efforts have been generally ineffective and, in fact, have in some cases, inadvertently compounded environmental and health hazards. Inadequate drainage has resulted in polluted waters remaining stagnant in low-lying lands (and often densely populated slum areas) for long periods of time. Uncoordinated collection and disposal of solid waste has contributed to localized flooding through clogging of drains. Similarly, inadequate and ineffective excreta management has led to high levels of exposure to water borne pathogens during floods. A clear, urgent need has thus emerged to integrate flood protection works for the Dhaka metropolitan area, encompassing about 260 sq km, with other infrastructure and environment improvement measures to maximize impact. Such a project is to be developed and implemented in coordination with other donors, particularly with JICA in the context of its proposed Master Plan for drainage and flood protection for the larger regional metropolitan area of 850 sq km. The project would also take account of the North-Central Regional Study, planned under financing from the European Community and France. The Government of Bangladesh, recognizing this need and being unable to meet it, has requested technical assistance from the Bank.

III. THE TECHNICAL ASSISTANCE

A. Objective

9. The objective of the technical assistance is to prepare a feasibility study of a flood protection project for Dhaka within the framework of an integrated plan for the area. Since environmental concerns involving slums and squatter settlements, solid waste management and sanitation, particularly for low-lying and flood prone areas, are closely linked with direct programs for flood protection and storm water drainage, the need for integration is obvious. This integration is planned to be carried out under an overall environmental management framework within which the investments will be identified. The formulation of the investment proposal will be carefully coordinated with the activities of all other donors and particularly with the master planning study being developed with JICA assistance (see para 7).

B. Investment Potential

10. The Project package likely to emerge from the technical assistance is estimated to require an investment of $60 million to $70 million.

C. Scope and Work Program

11. In formulating the investment proposals, high priority is planned to be given to the needs for flood protection and drainage that have emerged

through previous studies and proposals of the Committee for Flood Control and Drainage of Greater Dhaka. The investment components are expected to include embankments, pump stations, sluices, improvement of internal drainage and drainage canals, improvement of slums and squatter areas, sanitation/sewerage and solid waste management, together with the needed additional studies, institutional development and implementation assistance.

12. The scope of the technical assistance will cover the following:

(i) Collation and review of the completed, ongoing and planned studies/development programs and projects, and an assessment of their short and long term environmental implications; with special emphasis on programs and projects related, but not limited, to flood protection and drainage, land use management, water quality management, solid waste management, sanitation and slum and squatter areas improvement.

(ii) Preparation of a basic plan for integrated flood protection together with a clearly defined Immediate Improvement Action Plan.

(iii) Determination of the specific Project components to meet the priority needs.

(iv) Assessment of the feasibility of the proposed Project including its design and cost estimates, and its evaluation in terms of technical, economic, financial, social and environmental aspects.

(v) Institutional arrangements for Project implementation, operation and management based on a review of options.

13. The Project package will need to ensure that: (i) the components meet the specifically identified priority needs; (ii) the emphasis of the Project components is on ameliorating the existing critical deficiencies related to flood control and drainage; (iii) the Project package achieves an optimum balance between the short term and longer term needs; and (iv) the Project components mutually support and reinforce their impact.

14. Project components will be selected and given priority by applying criteria evolved by the consultants and agreed to between the Government and the Bank, in the context of the components' respective suitability in meeting the sector/Project objectives. The proposed planning and design standards will take into account considerations such as cost effectiveness, cost recovery and affordability. The feasibility work will include establishing cost estimates, broken down into foreign and local costs, implementation schedule and arrangements including the needs for consulting services for any further studies and those required for Project implementation. Specific recommendations will be made for improving inter-agency coordination and for operation and maintenance of the facilities.

15. Justification for all Project components will be assessed in financial and socioeconomic terms. More specifically, the analysis will include internal rate of return assessments, the extent of cost recovery and

affordability of the facilities to the involved agencies and the beneficiaries where appropriate. The study will also include an assessment of the extent to which the Project directly benefits the urban poor, and of its environmental impact. The proposals for cost recovery to be considered will cover, among other things, mechanisms for the public sector to capture part of the increase in value of the urban land protected from floods, including land banking, land readjustment, and land development/land transfer tax, together with the needed legislation.

16. The study will be prepared over a period of about nine months with scheduled completion by the end of May 1991. It will require a total input of 49 man-months (21 man-months international, 28 man-months local), provided by a team of international consultants (who will be encouraged to associate with local consultants), with expertise in flood control planning and engineering, hydraulics and roads engineering, environmental management, municipal engineering/planning, financial/socioeconomic analysis and institutional development (see Appendix 1). These consulting inputs will be supplemented by 45 man-months of sub-professional inputs from technical/support staff 1/ and 84 man-months of counterpart staff (see Appendix 2). The consultants will be selected in accordance with the Bank's Guidelines on the Use of Consultants.

D. Cost Estimates and Financing Arrangements

17. The total cost of the technical assistance is estimated at $670,000, consisting of $440,000 in foreign exchange cost and $230,000 equivalent in local currency cost (see Appendix 3). The Bank will finance $250,000 of the foreign exchange cost as a grant from the Technical Assistance Special Fund. The Government of Finland will finance $190,000 of the foreign exchange cost and $160,000 equivalent of the local currency costs, with the Bank acting as administrator under the existing cooperation arrangement between the Bank and the Government of Finland. The Government will meet the remaining local currency cost of $70,000 equivalent by providing local counterpart staff, supporting staff, office space, equipment, furniture, supplies and project vehicle maintenance. It will also provide communication and reproduction facilities required by the consultants. The Government has been informed that approval of this Technical Assistance does not necessarily commit the Bank to finance an ensuing project.

E. Implementation Arrangements

18. The executing agency for the technical assistance will be the Ministry of Irrigation, Water Development and Flood Control (MIWDFC), with the Bangladesh Water Development Board (BWDB) acting as the implementing agency. A Project Director to be designated by the BWDB will be responsible for the technical assistance, and will liaise with the consultants to facilitate their activities and provide guidance. MIWDFC will arrange all inter-agency coordination and coordination with donors to facilitate the

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1/ These would be provided by the local consulting firm providing the domestic professional inputs.

implementation of the study. The existing high-powered, policy-related, Steering Committee for Dhaka Flood Protection, presently chaired by the Advisor to the President on Flood Control, will continue during the implementation of the technical assistance and will provide policy guidance. In addition, prior to the start of the consultancy, the Government will establish a Project Technical Committee, chaired by the Secretary, MIWDFC and consisting of senior officials of all agencies concerned. The Project Technical Committee will provide guidance to the consultants, including periodic reviews of their reports. It will also prepare working papers on policy-related matters for the Steering Committee. Guidance and overall monitoring of the study will be provided by the Bank and the Government, among other things, through joint reviews of the consultants' reports and working papers. Four tripartite reviews are specifically envisaged following submission of the inception report, the two mid-term reports and the draft final report by the consultants.

IV. THE PRESIDENT'S DECISION

19. It is considered that the technical assistance to the Government of the People's Republic of Bangladesh in an amount not exceeding the equivalent of $600,000 is necessary to prepare the Dhaka Integrated Flood Protection Project. This technical assistance will be jointly financed on a grant basis by the Bank ($250,000), and the Government of Finland ($350,000) and is to be administered by the Bank under the existing cooperation arrangement between the Government of Finland and the Bank. The proposal for the Bank to administer the assistance is considered appropriate. The President, acting under the authority delegated to him by the Board, has approved (i) the technical assistance in the amount to be financed by the Bank and (ii) the Bank acting as administrator of the technical assistance to be financed by the Government of Finland, and hereby reports his action to the Board. This technical assistance will be made available initially as a grant, but will be subject to the reimbursement arrangements set forth in the Board paper on Technical Assistance Operations (Doc. R51-77, dated 20 May 1977) in the event that the technical assistance results in investment financing from external aid sources other than the Bank.

TERMS OF REFERENCE

1. The scope of work under the technical assistance has two broad areas: (i) the preparation of a basic plan for integrated flood protection; and (ii) the development of feasibility for proposed investments. These are outlined below.

I. BASIC PLAN FOR INTEGRATED FLOOD PROTECTION

2. The main focus of the Plan will be flood protection and drainage. Other elements will include the collection and disposal of wastes including excreta and effluent water within flood-prone areas in Dhaka, in particular the low-lying slum areas. The following environmental problems in DMA will be reviewed from the point of minimizing adverse effects of such environmental problems during floods.

1. Land Use Management

(i) Assessment of the existing land use planning in DMA 1/ and policies being implemented/enforced in DMA (including conversion of agricultural lands to industrial and urban uses) and including policies relating to management of squatters;

(ii) recommendations for alternative land use design/strategies for optimum land utilization in DMA; and

(iii) evaluation of the adequacy and usefulness of any existing land use standards to regulate land use activities.

2. Flood Protection and Drainage

(i) Review of the JICA-sponsored study for an updated flood protection/drainage plan for Dhaka (together with master planning study which is to be carried out in parallel with the Bank study) and make recommendations in the context of overall urban environmental management plan; and

(ii) review work done by Government agencies in preparation of priority flood control and drainage components of critical nature.

3. Water Quality Management/Sewerage and Excreta Management

(i) Assessment of the adverse effects/impacts of existing point and non-point sources of water pollution based on an inventory to be prepared from existing available information/reports including

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1/ Reference will be made to the land use studies under donor-assisted projects.

those available from DOE on water quality monitoring of Dhaka waterways and on industrial waste management in the DMA, and including the feasibility study for the World Bank's Fourth Dhaka Water Supply and Sewerage Project; and

(ii) assessment of the adequacy of existing environmental control systems (drainage/sewerage/excreta management facilities) including treatment plants for sanitary and industrial wastes and other facilities for water pollution control.

4. Water Supply

(i) Review the existing situation on water supply planning and project implementation, considering both surface and ground water sources, and delineation of any gaps for additional improvements; and

(ii) preparation of recommended investment projects, if any, for filling critical gaps, especially with respect to provision of water to the urban poor in the context of integrated flood protection.

5. Solid Waste Management

(i) Evaluation/review of existing reports on solid waste management in DMA; and

(ii) evaluation of the contribution of solid wastes to the overall water pollution problem of DMA waterways.

6. Slum and Squatter Areas Improvement

(i) Assessment of the impact of squatter settlements on environmental quality, including projections of the expected magnitude of the problems;

(ii) evaluation of slum/squatter programs/projects in DMA, particularly proposals prepared by the National Council for the urban poor, with special reference to environmental aspects; and

(iii) recommendations for slum and squatter areas improvement measures for inclusion in the Integrated Plan, with emphasis on environmental health aspects (including hazards to the overall community, stemming from high-disease rates in the squatter areas).

7. Hazards and Toxic Wastes Management

(i) Identification, classification and evaluation of the sources of toxic and hazards chemical wastes in the study area (based on information to be made available by DOE);

(ii) assessment of the adverse effects of toxic and hazardous wastes; and

(iii) recommendations for alternative methods for waste treatment/recovery and identification of methods for toxic and hazards wastes collection, transport and disposal.

8. Institutional and Policy Aspects

(i) Review of environmental considerations in the planning and decision making activities of the various GOB agencies involved in DMA flood control, infrastructure and land use planning which significantly affect environment, including review of specific attention given to environmental aspects in existing/ongoing studies; and

(ii) review and assessment of present arrangements for institutionalizing integration of environmental factors in planning/decision making in the DMA area and measures for its strengthening.

9. Investment Program

Appropriate prioritization of the investment program in the above various sectors on an area-wide basis within the context of the integrated Plan and the "Immediate Action Plan" for maximizing impact.

3. The output will be an integrated flood protection program for DMA (the Integrated Plan) together with an Immediate Action Plan as follows:

(i) the main problems and issues of integrated flood protection in connection with developments in the defined Study Area;

(ii) evaluation of programs, projects and policies related to integrated flood protection of the Study Area; and

(iii) formulation of an integrated flood protection program (together with an Immediate Action Plan) to establish/upgrade/improve schemes for flood/erosion control, drainage, excreta and effluent water within the flood-prone areas, in particular the low-lying slum areas, and related environmental aspects from the point of minimizing adverse effects of such environmental problems during floods.

4. The formulation of the basic plan for integrated flood protection is expected to be completed within the first three months of the start of the consultants work.

II. FEASIBILITY STUDY

5. The major work of the consultants will be the preparation of a feasibility study for immediately-needed investments that relate to flood protection embankments, provision of a ring road, and improvement to drainage, sanitation, slum areas and solid waste management. In view of the greater urgency for flood protection and drainage, a large part of the

investment proposals is expected to relate to these two components, which would be complemented by other components. The consultants will examine various options for cost recovery (including capturing, by the public sector, part of the increases in property values) and arrangements for operations and maintenance. Considerable prefeasibility/feasibility work for several elements has already been carried out by the Government agencies involved, together with detailed design in some cases. This will be fully made use of. The consultants will also selectively help in detailed designing, which will remain mainly a responsibility of the implementing agencies. The intention is that prior to the engagement of the implementation consultants, the detailed design of some components will be completed so that construction of the components can commence at the earliest moment.

6. The consultants will also review the design options and standards -- particularly those related to flood protection embankments --- of the works currently being undertaken by the Government from its own resources to ensure the integrity of the engineering design. Similarly, the consultants will take into account the recommendations and conclusions of the JICA master planning study for flood control and drainage, as well as the pilot investment projects in the two priority zones of Dhaka under JICA financing, in formulating the investment program for flood control and drainage.

7. The study is planned to be carried out in close coordination with the activities of other donors. The scope of the proposed study will include the following :

1. General

(i) collation and review of the studies carried out earlier, relevant to the proposed Project, particularly the flood protection, drainage and environment planning studies and identification of strategic projects and programs for the Project;

(ii) identification of data gaps and carrying out of infrastructure surveys, as required, to supplement the information available from earlier studies;

(iii) assessment and determination of the existing and planned physical growth, and identification of the critical development needs, with due regard to the initial identification of needs already carried out;

(iv) preparation of broad outlines for strategic flood protection planning for development in the short and medium term (The Integrated Plan) together with the terms of reference for detailed studies, along with cost estimates;

(v) development of a program of environmental management and monitoring;

(vi) review and advice on the planning and design standards adopted by the Government;

(vii) evaluation of the adequacy of existing administrative, manpower, and institutional mechanisms for planning, programming, and implementation of environmental programs for maximizing impact; and

(viii) formulation of the overall scope of the Project components to meet the priority needs;

2. Feasibility and Implementation

(i) assessment of the feasibility of the proposed Project for an investment decision, including design and cost estimates, and evaluation in terms of social, economic, financial, technical and environmental aspects;

(ii) assistance in the detailed engineering design and other preparatory action for flood control and drainage components;

(iii) identification and review of options for institutional and financial arrangements for implementation, operation and management of project components and the Project as a whole, and recommendations for the most appropriate arrangement for the Project;

(iv) assessment of the planning and management capabilities of concerned Government agencies and specific recommendations for support in these respects; and

(v) assessment of the need for expert advisory (consultancy), services during implementation of the Project and preparation of the terms of reference for such services.

8. Priority integrated flood protection needs will be identified, taking into account the Government's policy approaches, natural (physical) and resource constraints, and economic and environmental considerations. The following considerations will particularly be given attention in formulating the investment proposals:

(i) the Project components should meet the specifically identified priority needs, with due regard to the current implementation status of sectoral investments;

(ii) the emphasis of the Project components should be on ameliorating the existing critical deficiencies in integrated flood protection;

(iii) the Project package should achieve an optimum balance between the short term needs and the resources; and

(iv) the proposed package should ensure integrity of the Project, with components which mutually reinforce their impact, and with components which facilitate institutional support and cost recovery aspects.

9. The collection, collation and updating of the available data will include: (i) topographic maps, aerial photographs and related drawings; (ii) soil, ecological and geographical data; (iii) population, land use and regional development plans; (iv) existing road network; (v) hydrological and hydraulic conditions; (vi) existing flood control and stormwater drainage facilities; (vii) past floods and flood damages; (viii) related institutions, and (ix) other related data and information.

10. The field surveys will include: (i) field reconnaissance; (ii) supplemental topographical surveys for preparation of accurate base maps; (iii) longitudinal and cross-sectional surveys for drainage channels and rivers; (iv) supplemental geo-technical surveys for proposed major flood control and drainage facilities; (v) flood and flood drainage surveys; and (vi) water quality tests.

11. It is envisaged that the project package would have an overall cost in the range of $60-70 million. About $50 million of this investment is envisaged to be for embankments (including roads) and drainage components. The justification and adequacy of the amount will be subject to further guidance during the course of the study.

C. Project Design, Cost and Implementation

12. The consultants' key tasks in this regard will include the following:

(i) examine possible beneficiaries participation in project formulation, implementation and operations and maitenance;

(ii) examine and recommend planning and design standards (service levels), for the proposed Project components, bearing in mind considerations of cost effectiveness, cost recovery and affordability;

(iii) prepare outline engineering design of the flood protection and drainage components and preliminary outline engineering design for the other proposed Project components;

(iv) propose an implementation schedule for detailed engineering, tendering and construction of Project components;

(v) prepare, adopting suitable cost parameters, cost estimates for the Project which should include costs for expert advisory (consulting) services required for implementation of the Project and also for institutional support, studies and training programs and service charges on loan financing; and should be broken down into direct and indirect foreign exchange costs and local currency costs for each cost component, and supplemented by physical and price contingencies at rates agreed upon by the Government and the Bank;

(vi) propose procurement modes and packages based on cost-effective bid packages;

(vii) assist BWDB/DWASA in detailed engineering design, detailed specifications, preparation of tenders and other preparatory activities for flood protection and drainage;

(viii) review and analyze the existing administrative and financing systems relevant to the Project and propose appropriate changes necessary for the implementation and management of the Project;

(ix) assess the existing implementation arrangements in respect of financial, technical and managerial capabilities and recommend appropriate measures to facilitate Project implementation, including staffing and training of staff of Project implementation units, supervision of construction works, monitoring and reporting of programs and provision of consulting services during implementation, if necessary;

(x) propose appropriate financial and managerial arrangements for proper operation and maintenance of all Project facilities and estimate the costs and manpower requirements thereof; and

(xi) propose cost recovery mechanisms (including necessary institutional arrangements) through taxes, user charges and innovative land management techniques (e.g. advance land acquisition, land readjustment) for O&M as well as recovery of initial investment.

D. Financial and Socio-Economic Analysis of Project Components

13. The justification for all Projects components will be assessed in financial and socioeconomic terms, utilizing similar analytical evaluation studies for comparable components where data/time limitations preclude direct measures/assessments. Appropriate consideration should be given towards estimating the possible flood damages in with and without Project situations. First, the design flood discharges at various return periods should be estimated (either by the consultants or from existing reports); these should be consistent with other FAP studies, particularly the North-central Regional study under European Community/French assistance. Thereafter, the flood depth and duration under varying future level use/drainage conditions should be established. In estimating the project benefits business losses avoided during flooding period should be estimated and applied to the social cost benefit analysis in terms of avoided income losses. Among other things, the analysis will include:

(i) financial justification in terms of financial internal rate of return, extent of cost-recovery (direct and indirect) and/or affordability of facilities by the beneficiaries, providing, where appropriate, income distributional data and revenue and expenditure cash flows;

(ii) economic justification in terms of economic internal rate of return for all major project components, with economic benefits estimated in terms of changes in property values, damages avoided or the value of developed land as the case may be; and external costs

and/or benefits identified and quantified where possible;

(iii) identification and estimation of the social benefit of the Project in terms of number of beneficiaries, their income levels and occupations where possible; and

(iv) assessment of the major and direct environmental impacts of the Project, including potential adverse environmental implications, if any, as well as ways to mitigate such effects.

E. Institutional Support

14. The requirements of the Project for skills in engineering, planning, project management and other essential disciplines should be estimated and, based on existing availability, recommendations made for additional recruitment/upgrading of skills and expertise.

15. The institutional strengths and weakness of the executing/ implementing agencies should be assessed and recommendations made to strengthen the institutional capabilities through organizational changes, new implementation arrangements, staff recruitment and training and utilization of local and international consultants for specialized requirements.

F. Reports

16. The consultant will prepare and submit the following reports which will be reviewed in tripartite meetings among the Government, the Bank and the Consultants:

(a) Inception Report: An Inception Report will be submitted within one month after the start of the study, outlining the detailed work plan with a clear indication of information review and difficulties foreseen, if any.

(b) First Interim Report: An Interim Report will be submitted within three months after the start of the study, comprising the Integrated Plan and proposals for priority investment components together with preliminary analysis, detailed feasibility for which is proposed.

(c) Second Interim Report: The Second Interim Report will be submitted five months after the start of study comprising feasibility details for flood protection and drainage components.

(d) Draft Final Report: A Draft Final Report will be submitted eight months after the start of the study presenting (a) engineering design of selected components for flood control and drainage and (b) detailed findings for feasibility of other proposed investments.

(e) Final Report: A Final Report will be submitted nine months after the start of the study, incorporating comments made by GOB and the Bank.

G. Implementation Arrangements

17. The Ministry of Irrigation, Water Development and Flood Control (MIWDFC) will be the Executing Agency for the TA with BWDB acting as the implementing agency. MIWDFC will arrange all inter-agency coordination to facilitate the implementation of the study. The existing high-powered policy-related Steering Committee 1/ for Dhaka Flood Protection, chaired by the Advisor to the President on Flood Control will continue during the implementation of the TA and will provide policy guidance. In addition, prior to the start of consultant work, the Government will establish a Project Technical Committee, 2/ chaired by MIWDFC Secretary and consisting of senior officials of all agencies concerned. The Project Technical Committee will provide guidance to the consultants and review their work periodically. It will also prepare working papers for consideration of policy-related matters by the Steering Committee. Guidance and overall monitoring of the study will be provided by the Bank and the Government, among others, through joint reviews of the consultants' reports (and working papers, if any). Four tripartite reviews are specifically envisaged following submission of inception, the two mid-term and draft final reports by the consultants.

1/ Consisting of State Minister for Irrigation, Chairman BWDB, Chairman DWASA, Chairman RAJUK, Director DOE, Director UDD, Secretary MOW, Secretary Ministry of Land, Member, Planning Commission, Secretary MIWDFC and Joint Secretary MIWDFC (Member-Secretary).

2/ The Project Technical Committee will be involved only in the project-related work; it will coordinate its inputs with the overall Technical Committee of FAP, overseeing overall implementation.

ESTIMATE OF STAFF REQUIREMENTS

I. Staff to be engaged under the technical assistance		Man-Months
(a) International Consultancy Expertise		
(i)	Flood Control (Planning/Engineering)	9
(ii)	Hydraulics Engineering	3
(iii)	Environmental Management	3
(iv)	Municipal Engineering/Planning	3
(v)	Financial Analysis/Economics/ Institutional Development	3
		21
(b) Domestic Consultancy Expertise		
(i)	Flood Control (Planning/Engineering)	9
(ii)	Hydraulics Engineering	6
(iii)	Municipal/Environmental Engineering/Planning	9
(iv)	Financial Analysis/Institutinal Development	4
		28
(c) Technical/Supporting Staff		
(i)	Engineering Support/Surveying	15
(ii)	Drafting	10
(iii)	Administrative Support/Clerical/Typing	20
		45
II. Counterpart Staff to be provided by the Government		
(i)	Project Director Full time Engineer from BWDB)	9
(ii)	Engineering Support from related agencies (such as BWDB, DMC abd DWASA)	75
		84

COST ESTIMATES

		Amount ($)
A.	Bank/Other Donor Financing	
1.	Foreign Exchange Costs	
	Remuneration of international consultants 1/	263,000
	Per diem of international consultants 2/	79,000
	International travel 3/	28,000
	Engineering/computing equipment & software	10,000
	Government participation in Negotiations	2,000
	Communications and reports	9,000
	Contingencies for foreign exchange costs	49,000
	Sub-total	440,000
2.	Local Costs	
	Local Consultants 4/	70,000
	Technical and supporting staff 5/	23,000
	Preparation and printing of reports and information documents	10,000
	Local transportation	10,000
	Photocopying and related expenses	5,000
	Communications	5,000
	Field office and facilities	17,000
	Contingencies for local exchange costs	20,000
	Sub-total	160,000
	Total Bank/other Donor financing	600,000
B.	Government Financing	
	Remuneration of counterparts	45,000
	Operation and maintenance including fuel	10,000
	Office accommodation, supplies, equipment	15,000
	Total Government Financing	70,000
	Total (I + II)	670,000

1/ 21 man-months @ $12,500 per month.
2/ Of the 21 man-months, 20 man-months (600 man-days) are assured in Dhaka @ $131 per day.
3/ 8 trips @ $3,500 per trip.
4/ 28 man-months @ $2,500 per month.
5/ 45 man-months at an average of $500 per month.

附属資料4. 収集資料リスト

地域		調査団名又は専門家氏名		調査の種類又は指導科目		作成部課	
国名		配属機関名		現地調査期間又は派遣期間	年 月 日～年 月 日	担当者氏名	

番号	資料の名称	形態	版型	ページ数	オリジナルコピーの別	部数	収集先名称又は発行機関
	COUNTRY REPORT : BANGLADESH		A 4	30	コピー	1	
	PROJECT PERFORMANCE AUDIT		A 4	20	コピー	1	OPERATION EVA−
	REPORT,. BANGLADESH, DRAINAGE						LUATION DEPT.
	AND FLOOD CONTROL PROJECT						
	BANGLADESH ACTION PLAN		A 4	20	コピー	1	ASIA REGI ON
	FOR FLOOD CONTROL						COUNTRY DEPT. I,
							THE WORLD BANK
	DAHKA CITY DRAINAGA AND		A 4	10	コピー	1	SIR WILLIAM
	FLOOD CONTROL PROJECT,						HALCROW & PARTNERS
	PROJECT BRIEF						LTD., BANGLADESH
							WATER DEVELOPMENT
							BOARD
	バングラデシュにおける1987年及び1988年の洪水災害		B 5	42	オリジナル	1	京都大学防災研究所
	（村本嘉雄）						年報第32号A別冊
	INITIAL ENVIRONMENTAL		A 4	50	コピー	1	PEPT. OF ENVIRONMENT,
	EXAMINATI ON FOR DHAKA ,FLOOD						MINISTRY OF ENVIRON-
	PROTECTION PROJECT (DFPP)						MENT & FORESTS

番号	資料の名称	形態	版型	ページ数	オリジナル/コピーの別	部数	収集先名称又は発行機関
	ENVIRONMENTAL GUIDELINES FOR SELECTED		A 4	50	オリジナル	1	ADB
	INDUSTRIAL AND POWER DEVELOPMENT PROJECTS						
	ENVIRONMENTAL GUIDELINES FOR SELECTED		A 4	50	オリジナル	1	ADB
	AGRICULTURAL AND NATURAL RESOURCES						
	DEVELOPMENT PROJECTS						
	ENVIRONMENTAL GUIDELINES FOR SELECTED		A 4	50	オリジナル	1	ADB
	INFRASTRUCTURE PROJECTS						
	GUIDELINES FOR INTEGRATED REGIONAL		A 4	50	コピー	1	ADB
	ECONOMIC-CUM-ENVIRONMENT DEVELOPMENT						
	PLANNING, A REVIEW OF REGIONAL ENVIRONMENTAL						
	DEVELOPMENT PLANNING STUDIES IN ASIA,						
	ENVIRONMENT. PAPER №3, VOLUME I						
	GUDELINES FOR INTEGRATED REGIONAL		A 4	100	コピー	1	ADB
	ECONOMIC-CUM-EVVIRONMENT DEVELOPMENT						
	PLANNING, A REVIEW OF REGIONAL ENVIRONMENTAL						
	DEVELOPMENT PLANNING STUDIES IN ASIA,						
	ENVIRONMENT PAPER. №3, VOLUME II, CASE STUDIES						

番号	資料の名称	形態	版型	ページ数	オリジナルコピーの別	部数	収集先名称又は発行機関
	PAPERS ON THE SECOND MEETING		A 4	300	コピー	1	FLOOD PLAN COORDINA-
	OF THE TECHNICAL COMMITTEE						TION ORGANIZATION,
	TO BE HELD ON 16 TH JUNE , 1990						MINISTRY OF IRRIGATION,
							WATER DEVELOPMENT
							AND FLOOD CONTROL
	BIBLOGRAPHY ON ACTION PLAN		A 4	100	コピー	1	MASTER PLAN
	FOR FLOOD CONTROL OF BANGLADESH						ORGANIZATION
	METROPOLITAN DEVELOPMENT PLAN		A 4	200	コピー	1	HABITAT
	PREPARATION AND MANAGEMENT,						
	DHAKA AND CHITTAGONG, (STRUCTURE						
	PLANS, MASTER PLANS AND						
	DETAILED AREA PLANS) ,						
	VOL, I. PROJECT DOCUMENT						
	AND TERMS OF REFERENCE						
	TECHNICAL ASSISTANCE PROJECT		A 4	25	コピー	1	FLOOD PLAN CO-ORDI-
	PROPOSAL (TAPP) ON DHAKA CITY						NATION,MINISTRY OF
	INTEGRATED FLOOD PROTECTION PROJECT						IRRIGATION WATER
	(FLOOD ACTION PLAN No. 8 B) Phase I						DEVELOPMENT & FLOOD
							CONTROL,BANGLADESH

附属資料5. 面談者リスト

1. Ministry of Finauce
   1) Mr. Md. Nasim — Deputy Director, External Resources Division

2. Departmeut of Environment
   1) Mr. S. H. M. Abul Bashar — Director
   2) Mr. Anwarul Islam — Deputy Director
   3) Mr. Reazuddin — Deputy Diretor
   4) Mr. Shamin Ahsan — Chief of Laboratory. (Scuior Chewist)

3. Flood Plam Coordinatron Organization (FPCO)
   1) Mr. Md. Nurul Huda — Chairman, Local Panel of Experts
   2) Mr. A. M. M. Nurul Huq — Chief Engineer
   3) Mr. K. B. M. Shafiuddin — Superintending Engineer
   4) Mr. Emaduddin Ahmad — Executive Engineer
   5) Mr. Md. Ashfaui Azama — Executive Engineer
   6) Mr. M. A. Khaleque — Executive Engineer

4. Survey of Bangladesh
   1) Col. Md. Mahbubul Karim psc — Surveyor General

5. Rajuk (都市開発公社)
   1) Mr. M. M. Rahmatullah — Chairman
   2) Mr. Md. M. Delwar Hossain — Chief Engineer
   3) Mr. Zakir Hossain — Dhaka Town Planner
   4) Mr. Emdadul Islam — Executve Engineer

6. Dhaka Metropoliton Corporation (DMC)
   1) Mr. Shafiul Islam — Additional Chief Engineer

7. Dhaka Water Supply and Sewerage Authority (DWASA)
   1) Mr. A. Quader Chondhury — Superintending Engineer

8. LGEB
   1) Mr. R. Nurul Hasan — Superintending Engineer
   2) Mr. Md. Morsed Alam — Senior Water Resourses Specialist

9. Bangladesh Water Development Board (BWDB)
   1) Mr. Md. Afazuddin Chief Engineer, North-East Zone
   2) Mr. Syed Shahadat Hossain Director, Surface Water Hydrology-I

10. UNDP. Dhaka office

1) Ms. Flavia Pansieri	Assistaut Resideut Represontative
2) Mr. K. A. Hafiz	Programme officer
3) Mr. Saito	

11. Panel of Expert for FPCO
   1) Mr. J. I. M. Dempster
   2) Mr. W. Van Allen

12. ODA mission

1) Mr. John Lo Hoy	Economic Advisor South East Asia Development Division ODA (Bangkok, Thailand)
2) Ms. Linda Brown	Agricultural Advisor ODA (Dhaka)
3) Mr. B. M. Bennell	ODA Consultant Team Leader for NW Regional Study.
4) Mr. Paul Balogun	Consultant Team (Agricultural Economist)
5) Dr. N. Walmsley	Consultant Team (Hydrologist)

13. Asian Development Bank (ADB)

1) Mr. Asad A. Shah	Seuior Urban Infrastructure Dept. Manila.