BANGLADESH
ACTION PLAN FOR FLOOD CONTROL

FAP 24

RIVER SURVEY PROGRAMME

TERMS OF REFERENCE
(TOR)

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

Dhaka, November, 1990

2-12-1990

TOR FOR RIVER SURVEY PROGRAMME (FAP 24)

1. BACKGROUND

1.1 The disastrous 1987 floods in Bangladesh raised considerable international interest in helping the country to find a long term solution to its flood problem. A number of studies were undertaken and, in June 1989, the Government of Bangladesh requested the World Bank to coordinate the preparation of a five-year Action Plan for Flood Control in Bangladesh. The role of the bank in coordinating international efforts to assist Bangladesh in flood control was endorsed in the Communique of the G7 economic summit meeting held in Paris in July 1989. The Action Plan was discussed and endorsed by a meeting of donors held in London in December, 1989.

1.2 The Action Plan consists of project-oriented studies in all the country's main regions, supporting activities to promote improved project design and execution, and execution, and non-structural measures. For each plan component, one or more donors have expressed interest in financing first phase activities, comprising surveys, studies or pilot projects. The various actions are to be implemented by these donors in close cooperation with the Government of Bangladesh and under the co-ordination of the World Bank, as described in the Action Plan. The Government of Bangladesh has established the Flood Plan Co-ordination Organization to co-ordinate Action Plan projects in Bangladesh.

1.3 The River Survey Programme is one of the supporting activities. It will constitute the first phase of a longer term effort aimed at expanding and strengthening the collection of hydrological and morphological data and further developing understanding of the behavior of the main rivers in Bangladesh. The main objectives of the project are to collect reliable all season data on the hydrology and morphology of the country's main river systems, undertake special studies regarding the behavior of the river system, provide specialised on-the-job training to Bangladesh professionals, and provide benchmarks against which to assess changes in the river morphology and hydrology.

1.4 Although hydrological, morphological and hydrographic data are routinely collected by concerned Bangladeshi organizations (the Bangladesh Water Development Board- BWDB; and also the Bangladesh Inland Water Transport Authority-BIWTA), the limitations of existing boats and survey equipment mean that some essential data needed for the planning of Action Plan

projects are either insufficiently accurate or are not collected. The River Survey Programme would carry out necessary surveys using modern equipment and technology, undertake special studies of the behavior of the river system and provide specialised training in river survey techniques to Government staff.

1.5 The Commission of the European Communities has indicated its interest in financing the project and the Flood Plan Coordination Organization (FPCO) is to be the Implementing Agency. An EEC Reconnaissance Mission visited Bangladesh in April, 1990 to carryout a preliminary assessment of data need to be collected under FAP 24. The Project would be carried out over four years in two phases: Phase I Preliminary Phase (Year 1, starting in early 1991) and Phase II Survey and study Phase (Years 2-4).

2. THE PROJECT AREA

2.1 The River Survey Programme will cover locations on selected main rivers of the country: the Brahmaputra/Jamuna, Ganges, the Meghna and Padma, plus the main distributaries of these rivers: the Old Brahmaputra, the Dhaleswari, the Gorai and the Arial Khan.

2.2 The Brahmaputra/Jamuna, Ganges, Padma, Meghna and Old Brahmaputra rivers form the common boundaries of the five regional planning studies being undertaken under the Action Plan(See Fig. 1).

For the purpose of morphological study selected reaches of the rivers will be considered. For collection of hydrological and morphological data important locations, including some locations where on-going data collection is going on, will be selected.

3. SCOPE OF WORK

3.1 The objectives of the project are :

- to collect reliable all season hydrological, morphological and hydrographic data at key locations on the country's main river systems with emphasis given to collection of data during the monsoon season introducing improved or new technology where appropriate;

- to undertake special studies of the behavior of the river systems based on the new data that will be collected, existing data and through supplementary surveys;

- to strengthen BWDB by providing on-the-job training to professional staff from BWDB, and where applicable BIWTA and staff of associated, Local Consultants in the fields of river surveys and studies so that they can continue the data collection programme in the longterm.

- to upgrade the institutional capability in Bangladesh for river hydrological and morphological data collection and study programme.

3.2 The results of the surveys and studies will be used : (a) as an input to the regional water resource planning studies, feasibility studies and other projects being undertaken under the Flood Action Plan, (b) as a benchmark against which to assess changes in river hydrology and morphology resulting from the construction of embankments, river training, bank protection and other project works under the Action Plan.

3.3 The Project will require the use of especially equipped vessels capable of undertaking river surveys in the flood season; modern equipment and technology for hydrological and hydrographical surveys; the establishment of a number of gauging stations for measuring water levels, where these do not exist; and, where necessary, the improvement of existing gauging stations. By using up-to-date equipment it will be possible, accurately to collect key data (e.g. peak river discharges during flood stage). Survey data will be stored on an 'easy-access' computerized data base. BWDB and, where applicable, BIWTA staff and the staff of associated local consultants would be trained in the use of the new equipment and in the new techniques.

3.4 The Project would comprise four components:

Component- 1 : Hydrological and Morphological Data Collection (including compilation, processing and retrieval)

This part of the project will involve river surveys, stage, discharge and sediment measurement etc., using modern equipment. Details of the hydrological and morphological data collection programme will be finalized in Phase I, taking into consideration the study programme. Proposals for improvements in data compilation, processing, storage and retrieval systems now in use in Bangladesh will also be made. The Consultants will also liaise closely with the Master Plan Organization, which is responsible for maintaining a national data data base on water resources and with the River Research Institute.

Component - 2 : River Behavior Studies :

This programme of river studies will be undertake to investigate key characteristics of behavior of the river systems. The river studies will address aspects of the main river systems which will not be covered under the various regional studies. The studies will use the data from the river surveys, existing data and some supplementary surveys. Study topics will be finalised during the Phase-I and the study programme will have strong bearing on the details of the hydrological and morphological data collection programme, (described in component 1). An International workshop at Dhaka on "Morphological characteristics of Alluvial river and Their Behaviour with special reference to Bangladesh Rivers" will be organized at the end of Phase-I inorder to provide useful input in finalizing the study programme.

Component - 3 : Training:

Specialised on the job training in river survey techniques and related areas would be provided to staff of the concerned government agencies (BWDB, BIWTA) as well as to staff of engaged local consultants'. This would mostly take the form of on-the-job training in the use of modern equipment and technology. Necessary additional equipments will be procured for use in Bangladesh under this programme. It is expected that most of the equipments will be made available to the institutions responsible for continuing the survey programme on completion of the project. The overall aim of the training programme will be to upgrade the institutional capability of the concerned Government agencies.

Components 1 to 3 will be undertaken by European Consultants, which will provide a team of specialists in, inter alia river hydrology, morphology and hydrography. The Consultants will subcontract local consultants to assist and work with them in close consultation with BWDB and where appropriate with BIWTA.

Component - 4: Project Management :

The executing agency for the project will be FPCO. However, for data collection programmes the Bangladesh Water Development Board (which is responsible for hydrological data collection in the country) will provide counter-part personnel and they will be responsible for storing and retrieval of all data collected. A European Project Advisor (PA) will be appointed to assist FPCO and BWDB in the management and supervision of the programme of river surveys, studies and training and to advice BWDB on data processing, storage and

retrieval. The Project Advisor will review the proposed river survey and data collection programme as well as the topics for river studies submitted by the consultants and make appropriate recommendations to FPCO. In addition he will advice FPCO on any Institutional Development Programme for the concerned Govt. agencies. The P.A. will also evaluate the training programme proposed by the consultants. He will co-ordinate in organising an international workshop or "Alluvial River Morphology and their Behaviour" with special reference to Bangladesh rivers" to be organized at the end of Phase-I.

4. TERMS OF REFERENCE PART-A : TOR OF THE CONSULTANT.

4.1 General :

The project will be carried out in two phases as shown in Figure 2. Phase I (Year 1) will comprise a review of available data, checking of gauges, finalisation of study topics, mobilization of equipment, first flood season measurements and detailed planning of the main programme, including institution strengthening and training and some initial training activities. Phase 2 (Year 2-4) will involve comprehensive hydrological and hydrographical surveys, special studies and training.

4.2 Phase-I : (Preliminary Phase)

a. Surveys:

1. Check the R.L. of the benchmarks of existing gauges on the following:

   - the Brahmaputra, Ganges, Padma, upper Meghna - all gauges.

   - Old Brahmaputra at Jamalpur and Mymensingh, Dhaleswari at Tilly, Gorai at Kushtia and Arial Khan at Madaripur.

   The benchmarks are to be connected to the same datum by means of second-order levelling. The location of the benchmarks that could be used for the necessary surveys are indicated on the attached map Annex 1.

2. Review the methods used by BWDB and BIWTA to carry out stage, discharge and sediment measurements in Bangladesh with special attention given to Bahadurabad, Hardinge Bridge, Bhairab Bazar and Baruria. The review will also include cross-section measurements. In consultation with BWDB, improvements will be proposed, as appropriate, in terms of equipment, methods, locations and frequency.

3. Mobilize and make operational by June 1991 fully equipped and staffed survey vessel(s) for Phase I. The vessel(s) and instruments should be of proven performance in Bangladesh, or in comparable conditions elsewhere.

4. Carry out discharge, sediment and cross section measurements in the Jamuna river at a stretch near Bahadurabad in the period July to October at locations to be indicated by FPCO. In view of the exceptional conditions prevailing in the Brahmaputra (depth may be more than 25m, velocities may exceed 3 m/s, sediment concentrations can be very high), the Consultant may propose trials with different types of equipment and technology.

5. Assess the results of the surveys and studies carried out and, in consultation with the Project Advisor to prepare a programme of surveys to be carried out during the next phase for the approval of FPCO including :

- discharge, sediment and cross-section measurement round the year including flood stages;

- hydrographic surveys:a programme for future observation and monitoring of morphological changes will be established, using river surveys and satellite imageries. In view rapid morphological changes in the rivers during the flood season (e.g., deep scouring and filling, rapid movement of and waves); significant changes only become visible after floods and therefore it is proposed that surveys are carried out immediately after and before each major flood wave and, if considered necessary, during flood stages.

- specification of the vessels, equipment and staff required: the inputs should be appropriate for carrying out discharge and sediment measurements at higher river stages than has so far been possible (e.g., through the use of faster and more stable vessels); should have easier and more accurate position-fixing by local SRR systems or satellite-based Global Positioning Systems; techniques for flow and sediment measurement; and computer based systems for rapid processing and plotting of observations.

- proposals for improvements in data compilation processing, storage and retrieval systems.

b. Studies :

6. Collect, analyse and adjust as necessary, in consultation with FPCO and the PA, historical water levels and discharges of selected stations and present them both in tabular form and as frequency curves. Using these records prepare rating curves extended for extreme flood conditions and profiles of the water surface at different discharges for the main rivers at different times of the year.

7. Assess, analyses and report on available data on river morphology (BWDB cross sections, air photos, satellite imageries, BIWTA surveys etc) of the Brahmaputra, Ganges, Padma, Old Brahmaputra, Dhaleswari, and the upper reaches of the Meghna, Gorai and Arial Khan, which is to be used for the definition of the program under Phase 2. This study will make a preliminary assessment of the morphological characteristics of these rivers, their shifting characteristics and expected response in qualitative terms as different components of the FAP are implemented.

8. Review the results of the surveys and studies carried out so far, and prepare a proposal for studies to be carried out during the next phase.

c. Training:

In conjunction with FPCO and BWDB prepare an outline programm for training BWDB and, where applicable, BIWTA staff and staff of associated local consultants. Initial training of all local and counter part staff will be carried out on Phase I. Initial recommendations for upgrading of technology and equipment will be made.

4.3 Phase 2: Survey and Study Phase

On the basis of a Planning Report completed at the end of Phase 1, FPCO and EC, in consultation with the Consultant and PA will define the programme of activities for the Phase-2. Appropriate time schedules and inputs will be agreed and the contract with the consultant will be modified as needed. However, the following description is given to provide an indication of the services required:

a. Surveys

1. In coordination with BWDB, carry out discharge, sediment and cross-section measurements round the year (i.e. covering both the flood and dry seasons) at the following stations

- Brahmaputra ... Bahadurabad
  Sirajganj
  Aricha
- Ganges ... Hardinge Bridge
- Padma ... Baruria; Mawa.
- Old Brahmaputra ... Mymensingh
- Dhaleswari ... Tilly
- Gorai ... Kushtia (Gorai Rly Bridge)
- Arial Khan ... (Offtake)
- Carry out overland discharge measurement during the flood season at all appropriate locations to arrive at accurate peak discharge at the above stations. Review, correct and extend, or prepare new stage discharge relationships for the above stations.

2. Carry out, additional cross-sections in the wet season (and also in dry season, if necessary) of the following rivers:

- Brahmaputra, 8 sites
- Ganges, 6 sites
- Padma 4 sites
- Old Brahmaputra, Dhaleswari, Gorai and Arial Khan 4 sites each
- Any Other sites considered necessary.

3. In consultation with BWDB and also with BIWTA carry out hydrographic surveys before and after the floods at the following sites:

- Brahmaputra
  - Offtake of Old Brahmaputra=100 sq. km.
  - Offtake of Dhaleshwari=100 sq km.
  - Outlet of Hurasagar= 100 sq km
  - Confluence with Ganges 300 sq. km.
- Ganges
  - Offtake of Gorai=100 sq. km.
  - Upperstretch of Gorai=100 sq. km.
- Padma

  Offtake of Arial Khan/Dubaldia=50 sq. km.

The areas are provisional and indicative only.

4. Recommendations for upgrading the data compilation, storage and retrieval systems will be prepared.

b. Studies

1. Undertake a programme of studies to investigate key characteristics of the behavior of the river system. The river studies would address aspects of the main river system that are essential for the planning of projects under the Flood Action Plan. The first of these will be identified during the Preliminary Phase of the project; others will be identified during the Surveys and studies phase. The studies will be undertaken in response both to the demands of ongoing FAP studies and to the possible effects of planned Action Plan projects on river regimes.

2. The following will give an indication of the possible studies that the Consultants may be requested to undertake:

- Further refinement of the rating curves and estimation of peak flood flows at different flooding conditions.

- Further refinement of the profiles of the water surfaces at different discharges for the main river at different times of the year as will as at different stages of implementation of various components of FAP.

- quantitative assessment and evaluation of river response with respect to implementation of various FAP projects.

- behavior at the confluence of the Ganges and the Brahmaputra and the effect on the outlet of the Hurasagar.

- the characteriesties of overland flow during flood stages.

- resistance and bed forms at various times of the year.

c. Training

Prepare and carry out programmes for training BWDB and, where applicable, staff of other Bangladeshi Organization, including the staff of associated local consultants and contractors in the use of modern equipment, instruments, techniques and technology so that they are able (a) to carry on with the surveys after completion of the project and (b) to upgrade the routine survey programmes being undertaken by those

organizations. This would mostly take the form of on-the-job training, but would be supplemented, by some training seminars and workshops.

4.4 Reports

The Consultant shall prepare and submit the following reports:

Phase I :

1. An Inception Report (end Month 1) giving a Work plan for Year 1 of the Project.

2. An Interim Report (end Month 6) summarising the results of the surveys and studies completed and detailed workplan for the next 6 months (Month 6).

3. A Planning Report ie. Phase I Final Report (Month 12) summarising the results of the hydrological, morphological and hydrographic surveys undertaken in Year 1, giving an assessment of the effectiveness of the equipment and methods used, and proposing a detailed Work Plan for Year 2, with an outline Work Proramme for Years 3 and 4. The report at the end of Phase 1 will also present proposals for a format for annual reporting on the hydrology and morphology of the main rivers. The aim of such report would be to provide each year all data of interest on water levels, discharges, change in morphology, notable events (scour and filling at critical points). In addition to providing a continuous record, it would serve as a reference for planners and designers.

Phase II:

4. Interim Reports (Months 24 and 36), summarising the results of the hydrological, morphological and hydrographical surveys, giving an assessment of the effectiveness of the equipment and methods used and a proposed work programme for the coming year.

5. Study Reports, as appropriate, giving results of studies performed, as well as proposals for other relevant studies.

6. A Final Report (Month 48), presenting the result of the last year of surveys, summarising the overall results and lessons of the project. The Final Report will include a hydrological review giving adjusted long-year statistical properties on water levels and discharges.

PART B: PROJECT ADVISOR

4.5. TOR of Project Advisor: The Terms of Reference for the Project Advisory who will appointed to assist FPCO in the management and supervision of the main Surveys, Studies and Training component of the Project would be:

a. To assist FPCO in supervising the Consultant: this would involve, inter alia, reviewing proposed work programmes, with the Consultant; assessing the quality of survey results, studies and training; reviewing the overall progress of the work.

b. To advise FPCO on the selection of studies to be carried out by the Consultant: In order to do so, the PA will hold discussions with the teams undertaking other Action Plan studies and pilot projects in order to assess their requirements for river survey data and special studies.

c. To advise FPCO on possible institutional development needs for an extended programme and intensified surveys and studies of the river system of the country, (in close consultation with the team undertaking FAP 26 - the Institutional Development Study).

d. To Coordinate in organising of an international workshop at Dhaka on "Morphological Characteriesties of alluvial rivers and their behaviour with special reference to Bangladesh rivers" at the end of Phase I which will review the fundings of Phase I studies. Participation will include researchers from Bangladesh and overseas as well as invite professional and technical contribution in pertinent topics.

2. The PA will work full time in the first year at the end of which; FPCO and EEC will prepare his TOR and requirements for the years 2,3 & 4 (which is expected to be on intermittent basis).

4.6. Reports of Project Advisor:

The PA would produce quarterly reports on progress, highlighting any specific technical issues. The PA would also produce special review reports at key stages of the project, and a Final Report in month 48.

5. DURATION AND TIME SCHEDULE

The Project would start in March 1991 and would last for four years (1991-1995). An outline programme for the project is shown in Figure 2.

6. STAFFING

6.1 PART A : River Surveys, Studies and Training

The Consultant undertaking Part A of the Project will be responsible for the staffing of the project.

a. Surveys.

It is left to the Consultant, to determine the staff (expatriate and local) for the teams that will perform the river surveys. It is expected that a local firm could do the topographical surveys needed for checking the gauges. The management of the surveys is expected to require the following:

Description	Man - months	
	Foreign	Local
Sr. Hydrographer	48	96

b. Studies.

For the studies the following professional staff is estimated to be needed:

1 Preliminary Phase

Description	Man - months	
	Foreign	Local
Sr. River Engineer	12	24
Hydrologist	6	12
	18	36

2. Survey and study phase (the following estimate is indicative only at this stage).

Description	Man - Months	
	Foreign	Local
Sr.River Engineer	36	72
River Engineer	36	72
River morphologist/ sediment Spl.	18	36
Hydraulic research Engineer	10	20
	100	200

c. Training

The Consultant would have to show his experience in this field and the staff he intends to employ, but he is not required at this stage to give an estimate of the number of manmonths involved.

6.2 PART B: Project Advisor (PA)

The PA will be staffed by an expatriate river specialist: Necessary support staff would also be provided from the fund.

7. RESPONSIBILITIES OF THE GOVERNMENT

7.1 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.

  Provided that:

  (a) The Consultant and his expatriate personnel shall follow the usual customs procedure of the Government in importing property into Bangladesh; and

  (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.

7.2 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;

7.3 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.

8. RESPONSIBILITIES OF THE CONSULTANT

8.1 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.

8.2 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.

8.3 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.

8.4 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.

8.5 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.

8.6 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.

8.7 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.

8.8 **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.

8.9 **Cooperation**

The Consultant shall cooperate fully with the Government in performance of the services for which the Government shall provide the data facilities as set forth in contract.

9. COST ESTIMATE

The Consultants will propose unit rates for various activities (as far as possible) which would allow adjustments in work volume in future dates.

9.1 Phase I - 1 year

Expatriate Professional Staff. 30 mm x ECU 12,000	360,000
Local professional Staff 60 mm x ECU 1,700	102,000
Local Supporting Staff 90 mm x ECU 800	72,000
Levelling of gauges	90,000
Per diem, travel expenses, office, vehicles etc.	100,000
Survey Team, vessel, equipment, etc.	350,000
Contingencies	56,000
ECU	1,130,000

9.2 Phase II - 3 years (2nd to 4th years)

Expatriate professional staff 136 mm x ECU 12,000		1,632,000
Local professional staff 272 mm x ECU 1,700		462,000
Local Supporting Staff 400 mm x ECU 800		320,000
Perdiem, travel expenses, office, vehicles		550,000
Survey teams, vessels, equipment etc, (4 units)		4,200,000
Contingencies		366,000
	ECU	7,530,000

9.3 Provisional sums

Special equipment and instruments		1,000,000
SPOT imageries		450,000
Seminars,Workshops		132,000
	ECU	1,582,000

9.4 Project Advisor (PA)

Expatriate Advisor (12 months full time) 12 mm x ECU 18,000		216,000
Expatriate Advisor (Phase II, Partime) Indicative includes possible inputs from other short term specialists. 3 x 6 mm x ECU 18,000		324,000
Computers, vehicles etc.(L.S.) Local Transports, office furniture. Support Staff & Office, Stationeries		150,000
	ECU	690,000
Contingency		34,500
Total Project Cost ECU	ECU	10,966,500

JOB DESCRIPTIONS (FAP - 24)

1. Sr. Hydrographer: -

He will have basic Degree of Civil Engineering with Post-Graduate Degree in Water Resources/Hydraulic Engineering with experience around 20 years in river survey work including the knowledge of handling modern equipments in large rivers specially during flood seasons. He should have knowledge of analysing satellite images and SPOTs. He will be responsible for all surveys, prepare the programme and time schedules and the deployment of vessels, equipment and staff. He will supervise the survey operations and prepare reporting on the results. He will also make effective arrangements on the job training and establish working relations with BWDB and BIWTA.

2. Hydrographer:

He will have basic degree and Civil Engineering with Post-Graduate Diploma/Degree in Water Resources/Hydraulic Engineering with experience around 15 years in river survey works using modern equipments in large rivers. He will be in charge of the survey vessel and perform the necessary measurements and observations and deliver the results to the base office. In doing so he will extend maximum on the job training to staff seconded by BWDB or BIWTA.

3. Sr. River Engineer:

He should have a Master Degree in Hydraulic Engineering with experience around 20 years in professional field. He should be capable enough to supervise the engineers and technicians collecting river data and prepare maps and other information. He is supposed to be the Team Leader for the project and as such be fully responsible for all operations of the consultants. He will establish effective relationships with FPCO, PAU, BWDB, RRI and BIWTA. During the Preliminary Phase he will carry out the specified studies on river morphology and prepare proposals for a programme of river studies for Phase-2.

4. Hydrologist:

He should have a basic degree of Civil Engineering/ Water Resources Engineering with Post-Graduate degree in Hydrology/ Water Resources Engineering. He should have of professional experience around 15 years in the related field and collecting and interpreting data for Hydrological and Morphological study in large Water Development and Flood Protection Projects. The