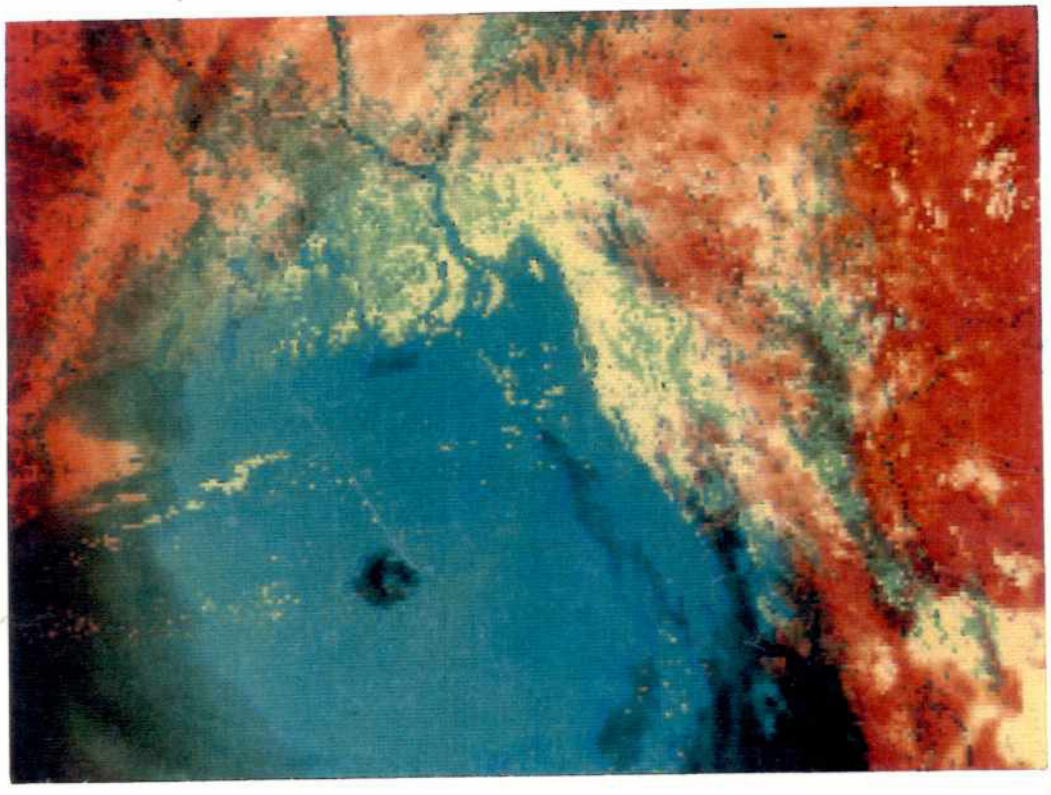
United Nations Development Programme
Ministry of Relief and Rehabilitation
Government of the Peoples Republic of Bangladesh

FAP 11

Assistance to Ministry of Relief in Coordination of Cyclone Rehabilitation



Consultancy Services
Technical Proposal
December 1991

Mott MacDonald International Ltd
in association with
Asian Disaster Preparedness Center

United Nations Development Programme
Ministry of Relief and Rehabilitation
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Mott MacDonald

Our ref: 70568A

Project No: BGD/91/021

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Mr Daan Everts
Director
United Nations Development Programme/
Office for Project Services
220 East 42nd Street
New York NY 10017
USA

2 December 1991

Dear Sir

ASSISTANCE TO MINISTRY OF RELIEF IN COORDINATION OF CYCLONE REHABILITATION

We have pleasure in submitting our proposal for consulting services for the above study, in response to your letter of invitation of 6 November 1991 and the Terms of Reference, General Conditions of Contract, and UNCITRA Arbitration Rules attached thereto.

Mott MacDonald have been associated with urban and rural development projects and disaster related projects in Bangladesh, over a period of more than 25 years. On most of our projects in Bangladesh, we have worked with leading local consultancy practices in the Country and with many of the national ministries and other government agencies.

The Mott MacDonald Group with a staff resource of 3,300, provides a complete range of technical and management consultancy services. The Group has extensive experience in disaster related projects ranging from assistance with emergency relief for refugees to the design and implementation of projects for the alleviation of and protection from natural disasters. In Bangladesh we are currently working on the JICA Funded Dhaka Flood Protection Master Plan and on three of the regional studies associated with the Flood Action Plan.

To strengthen the team in the specialist field of disaster management and its relation to compilation of appropriate databases we have invited the Asian Disaster Preparedness Center to associate with us for this assignment and their letter of agreement to associate is attached. Their specialist knowledge and training capability in disaster management will provide the team with an unrivalled expertise for this assignment.

Our proposal is in two parts. Volume 1 - Technical Proposal, presents our understanding of the present situation, the proposed methodology and approach, programme and staffing schedules, CVs of nominated staff and project summary sheets. Volume 2 - Financial Proposal, gives details of our estimate of costs, including the Summary of Costs on Form A.

We hope you will find that our proposal shows a good understanding of the methodology and that the approach proposed by us is appropriate to meet both the immediate and longer term objectives.

We look forward to participating in this important assignment, which we consider is vital for the development of an overall disaster defence strategy.

Yours faithfully
for Mott MacDonald International Ltd

Masood Khan
Director

Enc

Facsimile Transmission

Asian Disaster Preparedness Center
Asian Institute of Technology
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REF: ADPC-912293

25 November 1991

FAX: (44-223) 461 007

Mr. Masood Khan
Mott MacDonald
Demeter House, Station Road
Cambridge CD1 2RS, U.K.

Dear Mr Khan,

UNDP Project Proposal BGD/91/021
Assistance to Ministry of Relief in Coordination of Cyclone Rehabilitation

I am writing to confirm the ADPC's willingness to associate with Mott MacDonald in a joint project proposal.

I believe that the combination our respective expertises will provide a very strong team capable of delivering an excellent service to UNDP and the Government of Bangladesh.

Yours sincerely,

Brian Ward

B.A.O. Ward
Director

BW:kg
cc: Mr. Masood Khan in Singapore (Fax: (65) 291-9255)

Please note our new fax numbers

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CHAPTER 1

THE CONSULTANTS

1.1 Consultancy Group

The Study would be undertaken by Mott MacDonald International Ltd in association with Asian Disaster Preparedness Center of the Asian Institute of Technology, with assistance from local consultants/institutions.

We understand that the relationship between the selected local consultant, or local organisation, and the successful bidder would be defined during discussions with the Government of Bangladesh at the contract award stage.

We have also noted the requirement for the provision of additional specialist experts and we have included in our proposal typical examples of the type of expert that we would propose to utilise during the Study.

1.1.1 Mott MacDonald International Ltd

The Mott MacDonald Group was formed on 1 January 1989 by the merging of the Mott, Hay & Anderson (MHA) Holdings Group of companies, with Sir M MacDonald & Partners.

The Group, with a total staff resource of over 3 000, is now the second largest consulting engineering group in the UK and the leader in terms of overseas operations.

The Group has several regional companies within its corporate structure - Mott MacDonald International Limited, based in Cambridge, co-ordinates all international operations outside Europe.

The amalgamation of the two firms draws on their complementary expertise: MacDonald has long been regarded as a leader in the field of water-related projects while MHA, established in 1902, contributes its strength in transportation schemes. MacDonald was founded in 1922 and has a long and distinguished association with irrigation and agricultural development schemes, hydraulic engineering and water resources projects. In recent years, both firms have diversified into thriving multidisciplinary consultancies offering the complete range of engineering services as well as environmental, institutional, agricultural and the full range of associated services.

The Group is committed to reinforcing the quality, diversity and strength of consulting services, maintaining and enhancing the reputations established by MacDonald and MHA, and will continue to provide services of high calibre on time and within budget. The Group undertakes the full range of consulting services from initial planning, through design and construction supervision, to operation and management of completed schemes and training of clients' staff. The Group's assignments extend from the largest multidisciplinary projects to small appointments where personal service and assurance are the key requirements.

The Mott MacDonald Group has a comprehensive network of computer facilities providing a flexible, powerful, interactive environment for both engineering and administrative staff. The network extends throughout the UK using leased private circuits to carry both data and voice traffic. Overseas and site offices are able to access the system using modems and using either the Integrated Digital Services Network or public telephone lines. The network includes a variety of mini-computers with machines from Digital, Hewlett Packard and Prime together with workstations from Sun and Digital. Users access the network from their personal workstations, which are based on a range of IBM compatible microcomputers. Computer training is emphasised in development of engineers, technicians and administrative staff within the Group.

Mott MacDonald's policy is to develop software that is portable among different computer systems; mini, workstation or stand-alone micro. Thus software is written in compliance with recognised and widely used standards, such as ANSI Fortran 77. This policy of portability is considered when selecting commercial software. The Group's Computer Department is, therefore, able to support overseas and regional offices using software solutions that have been used and developed throughout the Group.

The application of computers is central to the Group's work strategy. Mott MacDonald has developed a complete range of software in the fields of water supply, wastewater disposal, water resources, groundwater modelling, hydrology, irrigation and drainage, structures and building services. The computer system is widely used for project planning, computer-aided draughting, accounting, administration and word processing.

In addition to its main offices in Croydon and Cambridge, the Group has regional offices at 20 locations in the UK and is represented internationally in over 50 countries.

1.1.2 Asian Disaster Preparedness Center

The Asian Disaster Preparedness Center (ADPC) was established in January 1986 to assist countries of the Asia/Pacific region to formulate their policies and strengthen their capabilities in all aspects of disaster management. ADPC is part of the Asian Institute of Technology (AIT), Bangkok, Thailand.

The ADPC offers the following services:

Consultancies and Planning Services

Consultancies are undertaken on request in such areas as vulnerability analyses, disaster menagement structures, and the evaluation of disaster-related operations. Support can be provided in the preparation and simulation of contingency plans related to specific disaster situations.

Appropriate Technology and Awareness Presentations

In addition to promoting public awareness programmes, the ADPC encourages 'organisation awareness' amongst policy decision-makers to emphasize the principles of disaster management, the cost-effectiveness of prevention and preparedness, and the importance of integrating the disaster factor into development planning. Presentations to appropriate target groups are given upon request anywhere in the region.

Training

The ADPC is engaged in three types of training:

(i) Disaster Management

This course provides a multidisciplinary overview of the field of disaster management and is intended to improve the understanding and skills of mid- to senior-level personnel with responsibility for some aspect of emergency preparedness or response.

(ii) Specialised Short Courses

These specialised short coures are organised to address specific emergency related topics, or on request, for agencies or departments involved in specialised emergency-related tasks.

(iii) **Support to National Training Programmes**

On request, the ADPC provides support to training programmes in countries throughout the Asian and Pacific region.

Information

The ADPC maintains a specialised collection of books, periodicals, articles and audio-visual materials, and a database to provide information on disasters for policy-makers, participants of ADPC training courses, disaster management practioners, researchers, and others. Additionally, the ADPC maintains a link with the United Nations Information Emergency Network (UNIENET), giving it access to disaster-related reports and publications worldwide.

Studies and Technical Programmes

Technical research studies focus on:

- Documentation and evaluation of disasters;
- Hazard-resistant design and construction;
- Risk and vulnerability analyses; and
- Environmental impact assessment.

Disaster management invoves the systematic observation and analysis of measures relating to disaster prevention, mitigation, preparedness, emergency response, rehabilitation and reconstruction.

ADPC training activities include a six-week disaster management course held twice yearly, and specialised short courses on improving cyclone warning response and mitigation, hazards mitigation and emergency health care.

ADPC supports national programmes by assisting in general as well as technical training programmes, consultancies and carrying out technical research studies.

Asian Institute of Technology (AIT)

The Institute originated in 1959 to help meet the growing need for advance engineering education in Asia. In November 1967, under its present name of the Asian Institute of Technology (AIT), the Institute became an autonomous international institution empowered to award degrees and diplomas.

The Institute's academic programmes focus on the problems of the region and their engineering, scientific and management solutions. Advanced education in engineering, science, planning and management is provided through a range of activities at levels and intensities from doctoral research to short-term training. AIT offers:

- academic programmes leading to master or doctoral degrees, the diploma or certificates;
- research work by students, faculty or research staff; and
- special programmes, conferences, seminars or short courses.

The doctoral degree programme takes about nine terms (three years), the master degree five terms, and the diploma two or three terms. A certificate programme normally lasts one term.

The Institute's 400-acre campus is 42 kilometres north of Bangkok, Thailand. Here more that 800 students, mostly from Asia, and 200 faculty and international staff, foster advanced technological learning to meet the regional need for more and better trained personnel for key positions in private and public sectors.

The Institute is supported by donor governments, foundations, international agencies, business organisations and individuals, Asian and non-Asian. This support acknowledges AIT's successful international academic endeavor, an endeavor recognised in several international awards, including, in its thirtieth anniversary year, 1989, the Ramon Magsaysay award for international understanding.

1.1.3 Mott MacDonald International - Bangladesh Office

The MacDonald Study Team would be supported by the Group's permanent office in Dhaka where the resident manager is Mr D N Moore. This regional office supports all the firm's activities in Bangladesh and acts as a bridge between our Clients in the country and the Group's headquarters and resources in UK. The office acts as an outlet for the regional operating company, Mott MacDonald Asia, which has specialised in providing Consulting Services specifically tailored to the needs of the countries in the Asia region.

The Dhaka office is able to draw on the resources, local knowledge and records built up over some twenty five years of working in Bangladesh. The office is able to react quickly to Clients' needs but is also able to rapidly draw upon the resources of the UK base by use of telephone, telex, fascimile or courier. The office is also fully equipped with computers, printers and secretarial staff.

The Dhaka office is therefore well placed to support the various activities of the study team for the duration of the services.

1.1.4 Local Consultants

The majority of the firms on the Government of Bangladesh endorsed list of local consultants are well known to us, as are their senior personnel. Our resident Country Manager, Mr D N Moore, has frequent contact with managing directors and senior staff of those companies. We are therefore well aware of the strengths of the local firms and of the depth of local knowledge and expertise that they can contribute to this project. We fully appreciate the benefit of inclusion of a local firm of consultants in a project of this nature.

Our involvement with the listed companies may be summarised as follows:

(a) Development Design Consultants

We are currently working with them on one project and in the past we have successfully completed projects together. We are currently preparing other proposals with Development Design Consultants.

(b) House of Consultants Limited

We are presently working with them on three projects and we are preparing further proposals together with House of Consultants Ltd. We have completed several projects in the past with this firm.

(c) Engineering and Planning Consultants Limited

We are currently working with them on four projects and in the past we have successfully completed projects together. We are currently preparing other proposals together with Engineering and Planning Consultants Ltd.

(d) Desh Upodesh Limited in association with Resource Planning Management Consultants

We are currently working with Desh Upodesh Ltd on three projects and have successfully completed other projects with them. We are also preparing other proposals together with Desh Upodesh Ltd.

(e) Development Planners and Consultants in association with Sheltech Consultants Limited and Centre for Development Research (CDRB)

We are currently preparing proposals together with Development Planners and Consultants and with Sheltech Consultants Ltd and we have employed Centre for Development Research in the past.

Based on our experience of successfully working together with the above local consultants, we note the Government's endorsed list and we would be pleased to associate with any of the local consultants given on that list should we be awarded the Consultancy Services.

1.2 Firms' Experience

1.2.1 Recent Experience of Similar Projects

Specific details of the firms' experience in the various components and fields relating to these consultancy services are given in the following tables of selected projects/activities:

Table 1.1 : Selected Natural Disaster and Mitigation Projects/Refugee Studies Undertaken by Mott MacDonald.

Table 1.2 : Selected Institutional Strengthening and Training Projects Undertaken by Mott MacDonald.

Table 1.3 : Relevant activities of Asian Disaster Preparedness Center.

1.2.2 Experience in Bangladesh

Mott MacDonald International Ltd

Mott MacDonald first worked in Bangladesh in 1967 and has maintained a continuous presence from 1970. Over the years, we have provided more than 50 expatriate staff to work in Bangladesh in addition to employing Bangladeshi nationals. Bangladesh consulting firms are being appointed increasingly as 'lead consultant' and we have worked closely with many of the more experienced national firms (see Section 1.1.4).

Projects have been located in all parts of the country, and major disciplines involved have included:

- flood control;
- urban and rural water supplies;
- urban and rural sanitation;
- rural development including roads and related structures, small-scale water schemes, markets, offices and staff quarters;
- rural planning;
- training of engineers;
- irrigation engineering;
- drainage;
- hydrogeology;
- hydrology;
- ground and surface water modelling;
- groundwater engineering.

The firm has developed particularly close links with the Bangladesh University of Engineering and Technology, the Bangladesh Agricultural Development Corporation and the Local Government Engineering Bureau. Other government agencies with which we have worked include:

Bangladesh Water Development Board
Chittagong Water Supply and Sewerage Authority
Dhaka Water Supply and Sewerage Authority
Master Plan Organisation
Public Works Department.
Flood Plan Co-ordination Organisation

Projects have been funded by many of the leading agencies including:

World Bank
Asian Development Bank
United Nations Development Programme
Overseas Development Administration
Swedish International Development Authority.

Current major Mott MacDonald Projects in Bangladesh which are of particular relevance to the proposed consultancy services include:

(i) Regional Water Resources Development Programmes

Mott MacDonald are currently involved in three of the five regional water resource studies being carried out in Bangladesh. These are the South East, North West and North Central Regional Studies. The studies will identify projects for flood control, drainage and irrigated agricultural development and they will make recommendations on the phasing of the development programmes in a Regional Plan. Flooding due to rivers, local rainfall and cyclones will be examined. Feasibility studies on selected areas will follow the regional studies. Mott MacDonald are carrying out these services in association with local consultants Resources Development Consultants Ltd, House of Consultants Ltd and Desh Upodesh Ltd.

(ii) Bangladesh Flood Action Plan Co-ordination

Mott MacDonald are acting in an advisory capacity to the World Bank on Co-ordination of National Flood Action Plans.

TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Bangladesh				
Bangladesh Flood Action Plan Coordination	World Bank	1994	Assistance and advice in coordination of National Flood Action Plan.	AV
First Urban Development Project	HABITAT	1993	Technical and managerial advice, training and supervision of implementation units of Municipal Authorities to help achieve environmental improvement components of first urban development project.	AV TR
Greater Dhaka Flood Protection	Pacific Consultants International	1992	Formulation of a master plan for the comprehensive flood control and stormwater drainage for Dhaka and Metropolitan area.	FS
Rural Roads and Markets Improvement and Maintenance Project	Ministry of Local Government, Rural Development and Cooperatives	1992	Improvement and maintenance of feeder roads and construction of structures on rural roads. Planning and design of growth centres (markets) and providing support to project including equipment, office and laboratory facilities.	DS CN TR
Flood Preparedness and Agricultural Intensification Programme	IFAD	1991	Review and updating of five sub-projects aimed at flood protection and irrigation facilities for small farmer groups.	FS

* FS Feasibility Study; DS Design; OM Operation and Maintenance; CN Supervision of Construction; TR Training; AV Advisory

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TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Bangladesh (cont)				
Rural Employment Sector Programme	SIDA	1990	Technical assistance programme to improve social and economic conditions of 6 million people.	FS DS CN AV
Flood Policy Study	UNDP	1989	Planning mission to assess flooding problems and control measures for Brahmaputra and Ganges basins.	AV
Rehabilitation of Water Development Projects	UNDTCD	1988	Rehabilitation of twenty-one existing irrigation, drainage and flood control projects, ranging in area from 1 600 ha to 243 000 ha (total 0.5 million ha).	FS DS OM
Intensive Rural Works Programme	SIDA	1986	Scheme to improve social and economic conditions in famine and flood prone areas.	OM AV TR
Egypt				
West Beheira Settlement	Ministry of Irrigation	1984	Rehabilitation of 4 200 ha irrigation scheme including infrastructure in associated villages.	FS DS
England				
Hartlepool Marina Infrastructure Works	Teesside Development Corporation	1993	Alterations to sea defences at marina entrance.	DS
Mablethorpe to Skegness Sea Defences	National Rivers Authority - Anglian Region	1992	Major improvements to 580 m of sea defences to prevent collapse.	FS DS

TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
England (cont)				
Mill Beach Tidal Defences, Essex	National Rivers Authority	1990	Recommendations to improve existing defences which protect 260 ha.	FS
Ethiopia				
Water Supplies for Somali Refugee Camps	OXFAM for UNHCR	1988	Provision of water supplies for two camps with a total population of 200 000 people.	CN AV
Gambia				
Gambia Barrage	Gambia River Development	1979	Identification, costing and outline design of irrigation and flood protection works to accommodate effects of proposed barrage.	FS
Hong Kong				
Sai Kung Marina Extension, New Territories	Hong Kong Marina Ltd	1981	Investigation of stability of existing sea walls and design of extension to marina.	FS DS
India				
Kandi Watershed and Area Development	Department of Agriculture and Forests	1985	Project to tackle flood damage and soil erosion caused by tree-felling and over-grazing.	FS OM
Libya				
Wadi Qattarah Feasibility Study	Secretariat for Agrarian Reform and Land Development	1979	Investigations following failure of two flood protection dams and proposals to divert flood waters.	FS

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TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Mozambique				
Maputo Coastal Protection Works	Ministry of Construction and Water	1988	Rehabilitation of 7.3 km stretch of coastline subject to erosion.	FS DS
Nigeria				
Dadin Kowa Resettlement Project (Phase 1)	Upper Benue River Basin Development Authority	1982	Provision of multidisciplinary management consultancy services for resettlement of 23 000 people to be made homeless by flooding of land to form reservoir.	FS AV
Oman				
Khasab Flood Control Dams	Musandam Development Committee	1986	Three overflow embankment dams, protecting the coastal town of Khasab and controlling a catchment of 300 km^2.	FS DS CN
Mina al Fahal Flood Control: Phase 1	Petroleum Development (Oman) Ltd	1983	Stormwater protection to commercial and office facilities requiring construction of open channels, conduits and river improvements to drain up to 50 m^3/s from three areas.	DS CN
Muhada Flood Control	Regional Development Committee	1982	Assessment of flood damage in town and recommendations for permanent protection, including an increase in capacity of cross-drainage structures.	FS

TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Pakistan				
Sukkur Barrage Gates Rehabilitation	Government of Sindh, Irrigation and Power Department	1992	Rehabilitation of mile-long barrage requiring replacement of 66 gates, and 55 head regulator gate leaves, refurbishment of gate hoist equipment and electrical systems, plus provision of workshops.	FS DS CN AV TR OM
Thar Desert Drought Relief	ODA for Sindh Arid Zone Development Authority	1989	Emergency water supply programme based on four boreholes.	FS CN AV
Karachi Stormwater Drainage Scheme	Karachi Development Authority	1988	Study of surface water drainage for metropolitan area (2 072 km^2) and survey/design of 200 km^2 priority projects.	FS DS OM
Sukkur Barrage Flood Management Review	Government of Sindh, Federal Flood Commission	1987	Study of barrage operation problems including review of design flood, operating rules and influence of reservoir and flood bund development in Indus basin. Recommendations for modifications to barrage.	FS OM
Philippines				
Zamboanga Research Centre Flood Protection Works	Philippine Coconut Authority	1979	Estimation of return period flood peak discharges in San Ramon and Talisayan rivers following torrential floods; design of protection works for design flood of 350 m^3/s.	FS DS

TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Scotland				
Dingwall Flood Protection and Drainage Improvements	Highland Regional Council	1993	Flood protection works including maintenance works on the River Peffery, two stormwater overflows and coastal embankments.	FS DS CN
Singapore				
Jurong Lake Tidegate and Jalan Ahmad Ibrahim Culvert	Drainage Department of Singapore	1990	Reconstruction of culvert and tidegate to accommodate increased storm runoff.	FS DS CN
Somalia				
Flood Damage Assessment Study	Ministry of Agriculture	1981	A study of 350 000 ha area affected by serious flooding; recommendations to reduce damage from future floods.	FS
Refugee Farm Studies	National Refugee Commission	1980	Feasibility of developing irrigated agriculture in two regions settled by refugees from the Ogaden region.	FS
Jowhar Offstream Storage Project	Ministry of Agriculture	1980	Project to alleviate flooding and to augment irrigation supplies during low flow periods by creating 200 million m^3 offstream storage reservoir.	FS DS CN
Sudan				
Port Sudan Suburban Settlement	UNHCR	1984	Provision of 13 000 houses for 7 100 Ethiopian refugees.	DS CN AV

TABLE 1.1

SELECTED NATURAL DISASTER RELIEF AND MITIGATION PROJECTS/ REFUGEE STUDIES UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Sudan (cont)				
Qala en Nahl Water Supply Study	UNHCR	1976	Assessment of water supply facilities serving refugee settlement with a population of 15 500 to establish if the settlement could support a population increase.	FS
Tanzania				
Stiegler's Gorge Power and Flood Control Development	Rufiji Basin Development Authority	1980	Dam to provide flood control for 150 000 ha and to generate hydroelectric power (three stations with a total capacity of 2 100 MW).	FS DS
Yemen				
Flood Damage Reconstruction	EEC	1986	Identification of rehabilitation projects.	AV

TABLE 1.2

SELECTED INSTITUTIONAL STRENGTHENING AND TRAINING PROJECTS UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Bangladesh				
Second Pabna Irrigation and Rural Development Project	Bangladesh Water Development Board	1991	Study for Phase II area to include current Government water resources policies, improved flood protection facilities and addressing institutional deficiencies in O&M of similar systems in Bangladesh.	FS
Rural Employment Sector Programme (Infrastructure Development Project)	Swedish International Development Authority	1990	Continued support to the IRWP project successor, including in-country and overseas training.	TR
IDA Deep Tubewells II	Bangladesh Agricultural Development Corporation and ODA	1988	Advice on implementation, and supervision of agricultural and irrigation extension training programme.	TR
Intensive Rural Works Programme (IRWP)	Swedish International Development Authority	1986	Training of local government staff in the planning, design and construction of small rural development schemes.	TR
Water Balance Studies	Bangladesh Water Development Board	1982	Establishment of water balance unit through training and institutional recommendations.	TR

* FS Feasibility Study; CN Supervision of Construction; DS Design; TR Training; OM Operation and Maintenance; AV Advisory

TABLE 1.2

SELECTED INSTITUTIONAL STRENGTHENING AND TRAINING PROJECTS UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Bangladesh (cont)				
Irrigation Management Study	Bangladesh Agricultural Development Corporation	1982	Training of BADC staff in the organisation of its irrigation division.	TR
China				
Liaoning River Basin Management Study	Liaoning Urban Construction Engineering Consultant Co	1989	On-the-job transfer of technology to project counterparts, as part of water resources study.	TR
Egypt				
Rehabilitation and Improvement of Water Delivery Systems in Old Lands	World Bank	1988	Training of staff at all levels in techniques appropriate to programme of Regional Irrigation Improvement Projects.	TR
England				
Rehabilitation and Management of Irrigation Projects Course	Various	1988	Joint 10 week course in conjunction with Southampton University for senior engineers and managers.	TR
Birmingham University Diploma Course	Birmingham University	1985	Module on flood alleviation for course on 'Water Resources for Developing Countries'.	TR

TABLE 1.2

SELECTED INSTITUTIONAL STRENGTHENING AND TRAINING PROJECTS UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Indonesia				
Establishment of Pollution Monitoring and Control Authorities in North Sumatra and West Kalimantan	Ministry of Agriculture	1991	Recommendations for the establishment of efficient and effective pollution monitoring and control management in the two provinces including: management information systems; operational manuals; financing plans; training programme and implementation planning.	FS AV
Transmigration Advisory Group Transmigration V	Ministry of Transmigration	1990	Training and skills transfer for major resettlement programme.	TR
Project Preparation for Manpower Development Project - II	Ministry of Public Works	1989	Preparation of five year project to upgrade manpower capabilities of Ministry of Public Works.	AV TR
Training Programme for Development of Project Management Capabilities	Ministry of Public Works	1988	Improving implementation and disbursement capabilities at the project level by developing project management skills through a modular training programme.	TR
Review and Upgrading of Training Programmes	Ministry of Public Works	1987	Review and development of courses for support bureaux of MPW (manpower planning, finance, law, computing, plant, planning and aid administration).	TR
Transmigration Planning Advisory Group	Ministry of Transmigration	1986	Advisory services, training and supervision of all aspects of regional planning and rural development.	AV TR

TABLE 1.2

SELECTED INSTITUTIONAL STRENGTHENING AND TRAINING PROJECTS UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Indonesia (cont)				
Ministry of Public Works, Manpower Planning and Training	Ministry of Public Works	1986	Project to improve effectiveness and efficiency of Ministry's staff training in order to strengthen its capacity to execute work programmes	AV TR
Nepal				
Establishing Design Criteria and Manuals	World Bank Department of Irrigation, Hydrology and Meteorology	1990	Project to improve the planning and design capabilities of DIHM as part of an institution building exercise.	AV TR OM
Pakistan				
Training Programme for Sukkur Barrage Engineers	British Council	1986	Courses to prepare engineers to supervise rehabilitation of barrage gates and to broaden their technical and managerial experience.	TR
Philippines				
Central Cordillera Agricultural Programme	Department of Agriculture	1994	Provision of long-term technical assistance team to assist with programme implementation. Components include: development of stable upland farming, roads and irrigation rehabilitation, agricultural research and extension, provision of credit, watershed management and training.	AV TR

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TABLE 1.2

SELECTED INSTITUTIONAL STRENGTHENING AND TRAINING PROJECTS UNDERTAKEN BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Philippines (cont)				
Palawan Integrated Area Development Project Hydrometric Network Program	Government of the Philippines	1985	On-the-job training in installation and management of hydrometric network and in use of computer-based data management system for planning water resources.	TR
Somalia				
Hydrometry Project	Government of Somalia	1986	Installation of hydrometric and computer equipment to enable optimum planning of water resources development. Training of local personnel.	TR
Sri Lanka				
Water Supply Sector Project	National Water Supply and Drainage Board	1992	Preparation of manuals, on-the-job training and overseas courses related to rehabilitation and improved O&M for 50 water supply schemes.	TR

TABLE 1.3

Relevant Activities of Asian Disaster Preparedness Center

Category of activity	Title	Details
Technical Programmes	Seismic Hazards Mitigation	Intensive training courses for a total of 64 engineers in seismic design and construction of structures including dams and bridges.
Social Sciences Research Seminar	Seminar on Socio-economic Aspects of Disaster in the Asia - Pacific Region, at AIT	With Disaster Research Center at the University of Delaware. Conceptualised disaster as a Social Process. Identified research topics. Structural and non-structural mitigation, preparedness versus national development goals.
Missions	Bangladesh, 1987	Consultancy on Flood Preparations (Everett Ressler)
	Bangladesh 1988	Emergency consultation on floods in Bangladesh (Everett Ressler)
	Bangladesh 1988	Participation in AIT/Bangladesh University of Engineering and Technology Seminar on Floods in Bangladesh, Dhaka (Brian Ward)
	Bangladesh 1989	Disaster Management Workshop, University of Dhaka (Brian Ward)
	Philippines, 1989	Second National Disaster Management Workshop (Brian Ward/Everett Ressler)
	Sri Lanka, 1986	Promotion of disaster management (S Govinage)
	Orlando, USA, 1987	Conference on hurricanes (S Gupta)
Post-disaster Evaluation Reports (to strengthen disaster response capability)	Typhoon Sisang, Philippines, 1987	Typhoon Sisang left 1 200 dead and destroyed large percentages of low-income group housing. Short-term and long-term measures to avoid such devastation in the future were put forward.
	Core Shelter Project	Following the disaster of Typhon Sisang, ADPC assisted government engineers in design and construction of shelters capable of withstanding strong winds. Some 12 000 such shelters have been built).
	Drought in India, 1987	Affected some 285 million people. However there was little migration out of affected areas or widespread sale of land or cattle. ADPC reported on the effective mechanisms to deal with drought. A well co-ordinated, community based response with improved forecasting and comprehensive national strategy was found.
	Nepal Earthquake, 1988	With a reading of 6.7 on Richter scale, 722 died and 12 242 injured, some 66 000 homes were destroyed. Damage was assessed and rehabilitation and reconstruction programmes were planned by ADPC with advice on use of appropriate construction.

TABLE 1.3 (cont)

Category of activity	Title	Details
Training - General Programmes at AIT	Disaster Management Course	A six-week course offered twice a year at AIT. Provides a multi-disciplinary approach with disaster simulation for personnel with responsibility for disaster preparedness and response. To date there have been 12 courses with 293 participants from 30 countries, including 19 participants from Bangladesh. Practical skills training is emphasised.
	Improving Cyclone Warning Response	Courses include impact of cyclones, community awareness, warning systems and hazard/vulnerability analyses. 18 participants.
	Refugee Camp Management (UNHCR)	Emergency management workshop. 43 participants from 13 countries.
	Emergency Assistance Programmes (UNICEF)	A second emergency management workshop with University of Wisconsin.
Training-General Programmes in Selected Countries	Storm Preparedness in Vietnam	The training courses in Vietnam for Ministry of Water Resources and Bureau for Flood and Storm Prevention. Storm Preparedness and Prevention. 129 officers have benefited.
	Workshop on Disaster Preparedness and Response, Colombo, Sri Lanka	43 participants. For Ministry of Social Services and Ministry of Rehabilitation.
	Disaster Management Workshop, Philippines	For Department of Social Welfare and Development. Initially 29 participants on a 2-week course, participants from Government and NGOs. Worked with Disaster Management Centre at Oxford Polytechnic.

(iii) **Flood Policy Study**

Mott MacDonald provided specialist consultants, including the Team Leader, on a mission for UNDP to propose a plan of action to address flood problems in the Ganges and Brahmaputra river basins. The mission considered causes and return periods of floods, short-term preparedness measures - flood warning and forcasting, medium- and long-term measures for flood control including regional and international co-operation and action. The mission advised on a comprehensive flood strategy and commented on the local flood policy study.

Projects undertaken in Bangladesh by Mott MacDonald are given in Table 1.4 and selected projects are shown on Figure 1.1.

Asian Disaster Preparedness Center (ADPC)

ADPC have been involved in a number of missions to Bangladesh including:

20 to 25 September 1987 : Consultancy on Flood Preparations (Everett Ressler).

7 to 17 September 1988 : Emergency Consultation on Floods (Everett Ressler).

3 to 5 November 1988 : Participation in AIT/Bangladesh University of Engineering and Technology Seminar on Floods, Dhaka (Brian Ward).

20 to 22 August 1989 : Disaster Management Workshop, University of Dhaka, liaison visit to UNDP.

Mr E Ressler was Program Co-ordinator at ADPC from 1986 to 1989. Mr B Ward is the current Director of ADPC.

1.2.3 General Company Capability Statements

Mott MacDonald International Ltd

The study, use and control of the world's water resources are major features of Mott MacDonald's work. Over some 70 years we have studied water resources in regions ranging from arid desert to wet tropics and planned their development for hydropower, irrigation, agriculture, and municipal and industrial supplies.

Our staff have worked in over 70 countries on projects ranging from large barrages and dams through all types and sizes of irrigation and drainage systems, agricultural and rural development, to land reclamation, flood alleviation, urban drainage and coastal protection. Institutional strengthening, training and associated infrastructure are frequently involved in the services which we carry out.

Fields of Experience

To meet the demands of this study it is essential that the Consultants have a good base of knowledge relating to the background and previous experience of similar projects in Bangladesh and elsewhere in the world. The extensive overseas experience of Mott MacDonald International gives a sound base from which to undertake this demanding task.

The expertise of the Consultant for carrying out this study is considerable. More details follow, under the following headings:

(a) Flood Alleviation and Mitigation
(b) Maritime Engineering and Coastal Protection
(c) Hydraulic Engineering
(d) Strategy Formulation
(e) Institutional Development/Building
(f) Institution Management
(g) Management nformation Systems (MIS)
(h) Management Consultancy
(i) Developing Management Skills
(j) Human Resources Development/Training
(k) Agriculture and Rural Development
(l) Urban Infrastructure
(m) Water Resources, Irrigation and Drainage
(n) Investment Planning.

Project summary sheets for the work carried out by the Consultants during the last ten years which best illustrate their qualifications are given in Appendix II and a summary of experience for these selected projects is given in Figure 1.2.

(a) Flood Alleviation and Mitigation

The Group has more than 50 years experience of works for which the threat of flooding is a significant factor, affecting their planning, design, construction and operation. Thus our expert staff have not only been responsible for the design of engineering works to alleviate flooding, but have also been involved in associated work including flood plain planning control, flood damage assessment, rehabilitation proposals, and emergency response planning.

Figure 1.1

Recent Mott MacDonald Projects undertaken in Bangladesh

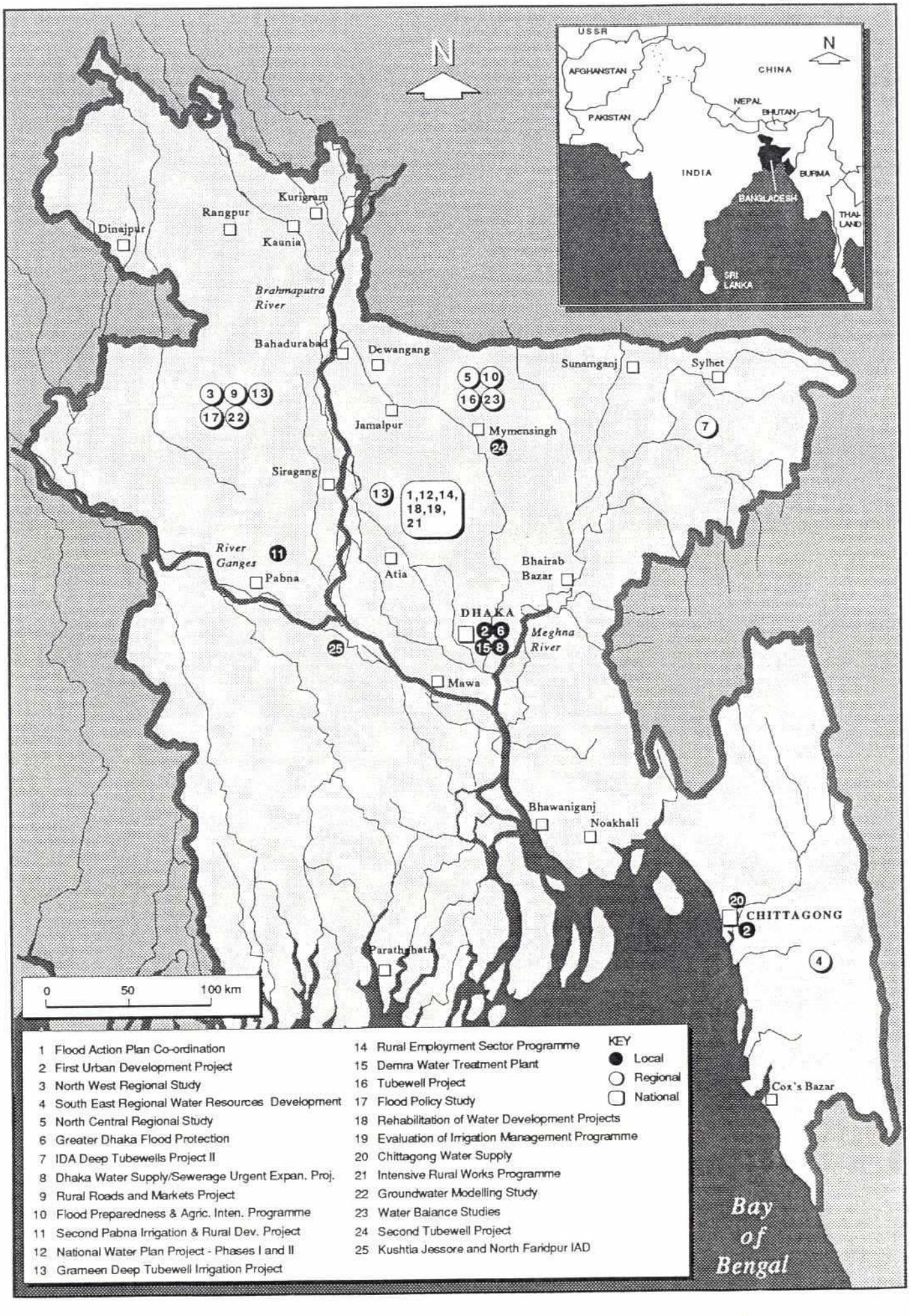

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Bangladesh Flood Action Plan Coordination	World Bank	1994	Assistance and advice in coordination of National Flood Action Plan.	AV
First Urban Development Project	HABITAT	1993	Technical and managerial advice, training and supervision of implementation units of Municipal Authorities to help achieve environmental improvement components of first urban development project.	AV TR
North West Regional Study	Flood Plan Co-ordination Organisation, Govt of Bangladesh	1993	Study of flooding and drainage problems, feasibility study of preferred options and preparation of regional plan for flood control and drainage.	FS
South East Region Water Resources Development	World Bank (IBRD)	1993	Preparation of a development plan involving flood control, drainage and irrigation for an area of 9 000 km^2. The study will proceed to a feasibility study of 100 000 ha.	FS
North Central Regional Study	Government of Bangladesh	1992	Preparation of a Water Development Plan for an area of 12 000 km^2 including pre-feasibility studies for priority projects to be implemented during the first five year plan. Flood protection and drainage are major components.	FS

* FS Feasibility Study; DS Design; OM Operation and Maintenance; CN Supervision of Construction; TR Training; AV Advisory

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Greater Dhaka Flood Protection	Pacific Consultants International	1992	Formulation of a master plan for the comprehensive flood control and stormwater drainage for Dhaka and Metropolitan area.	FS
IDA Deep Tubewells Project II	Bangladesh Agricultural Development Corporation ODA	1992	Installation of 4 000 deep tubewells (50 m to 110 m deep) to supply irrigation water. Training of personnel in well siting, irrigation techniques and maintenance.	FS DS AV OM
Dhaka Water Supply and Sewerage Urgent Expansion Project	Dhaka Water Supply and Sewerage Authority	1992	Emergency works to upgrade Dhaka's water supply and sewerage system as part of long term development plan to 2010.	DS CN
Rural Roads and Markets Improvement and Maintenance Project	Ministry of Local Government, Rural Development and Cooperatives	1992	Improvement and maintenance of feeder roads and construction of structures on rural roads. Planning and design of growth centres (markets) and providing support to project including equipment, office and laboratory facilities.	DS CN TR
Flood Preparedness and Agricultural Intensification Programme	IFAD	1991	Review and updating of five sub-projects aimed at flood protection and irrigation facilities for small farmer groups.	FS
Second Pabna Irrigation and Rural Development Project	Bangladesh Water Development Board	1991	Study for Phase II area to include current Government water resources policies, improved flood protection facilities and addressing institutional deficiencies in O&M of similar systems in Bangladesh.	FS

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
National Water Plan Project - Phase II	World Bank	1991	Project aimed at enhancing Government's capability to plan water resources.	AV
Grameen Deep Tubewell Irrigation Project	UNDP (through OPS)	1991	Review of the commercial viability of the Grameen Bank to operate deep tubewells for irrigation and preparation of a UNCDF project to support this operation for five years.	FS
Rural Employment Sector Programme	SIDA	1990	Technical assistance programme to improve social and economic conditions of 6 million people.	FS DS CN AV
Demra Water Treatment Plant	Dhaka Water Supply and Sewerage Authority	1990	New water supply and sewerage works including 450 M l/d water treatment plant.	FS DS
Tubewell Project	ADB	1990	Study of irrigation development using groundwater.	FS
Flood Policy Study	UNDP	1989	Planning mission to assess flooding problems and control measures for Brahmaputra and Ganges basins.	AV
Rehabilitation of Water Development Projects	UNDTCD	1988	Rehabilitation of twenty-one existing irrigation, drainage and flood control projects, ranging in area from 1 600 ha to 243 000 ha (total 0.5 million ha).	FS DS OM
Evaluation of Irrigation Management Programme	FAO	1988	Evaluation of programme comprising some 600 schemes.	AV

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Chittagong Water Supply	Government of Bangladesh Chittagong Water Supply and Sewerage Authority	1988	Augmentation of water supply from 57 000 m^3/d to 168 000 m^3/d by groundwater abstraction. Scheme includes 90 000 m^3/d pump station and treatment plant at Mohara.	DS CN
National Water Plan	World Bank for Ministry of Irrigation, Water Development & Flood Control	1987	Water resources assessment and long term plan for ground and surface water including modelling and planning in relation to irrigation.	TR AV
Intensive Rural Works Programme	SIDA	1986	Scheme to improve social and economic conditions in famine and flood prone areas.	OM AV TR
Tea Rehabilitation Project: Labour Welfare Component	Bangladesh Tea Board	1984	Study of water supply facilities at 63 tea estates; recommendations for improvements.	FS
Chalna Water Supply	Chalna Port Authorities	1982	Groundwater investigations for potable water supply.	FS
Groundwater Modelling Study	Bangladesh Agricultural Development Corporation	1982	Development of four computer models to plan and monitor tubewells.	FS AV
Water Balance Studies	UNDP	1982	Detailed water resources investigation over 70 000 km^2 to provide national planning tool and to assist in setting up a water balance unit.	FS AV

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Second Tubewell Project	ADB	1982	Assessment of groundwater and agricultural potential over 9 900 km^2 and preparation of agricultural development programme.	FS OM
Irrigation Management Study	Bangladesh Agricultural Development Corporation	1982	Advising and training the client in organisation of irrigation division.	AV OM TR
Kushtia Jessore and North Faridpur Integrated Agricultural Development	Bangladesh Agricultural Development Corporation	1981	Identification of specific development projects based on groundwater irrigation to be implemented on an integrated agricultural development basis.	FS AV
Airbase Hangar	Helicopter Services (Pte) Ltd	1980	Superstructure for airbase hangar.	DS
Savar Development Area Sewerage and Sewage Treatment Study	Ministry of Public Works and Urban Development	1978	Study of sewerage and sewage treatment facilities for proposed population of 800 000.	FS
BADC IDA Tubewell Project	Bangladesh Agricultural Development Corporation	1977	Installation of 3 000 large capacity wells for dry season irrigation of wheat and rice on a potential area of 2 million ha.	DS CN TR
Dhaka North Irrigation and Flood Control Project	Water and Power Development Authority	1971	Development of a 88 000 ha area subject to flooding. Project primarily consisted of studies of flood control, irrigation and drainage measures.	FS
Satellite Tracking Station	Marconi Company Ltd	1969	Foundations and tower of satellite tracking station.	DS

TABLE 1.4

PROJECTS UNDERTAKEN IN BANGLADESH BY MOTT MACDONALD

Project	Client	Completion	Description	Phase*
Sylhet and Chittagong Tea Irrigation Project	Ministry of Commerce	1967	A study of the tea growing areas subject to droughts, involving studies of surface water supplies, groundwater, irrigation, agronomics and soils.	FS

Figure 1.2

Summary of Project Experience

(for project sheets see appendix II)

Project	Flood Plans / Mitigation and Coastal Protection	Water Resources Planning and Development	Agriculture and Rural Development	Institutional Development	Infrastructure Development	Training
National Water Plan Project-Phase II, Bangladesh (1990)	○	○				○
National Water Plan Project, Bangladesh (1986)		○		○		
Support for the First Urban Development Project, Bangladesh (1993)					○	○
South East Region Water Resources Development Programme, Bangladesh (1993)	○	○				
Dhaka Flood Protection, Bangladesh (1993)	○	○				
Flood Policy Study, Bangladesh (1989)	○	○				
Rehabilitation of Water Development Projects, Bangladesh (1988)	○	○				
Rural Employment Sector Programme, Bangladesh (1989)	○	○	○	○	○	○
Intensive Rural Works Programme, Bangladesh (1986)	○	○	○	○	○	○
IDA Deep Tubewells Project II, Training Services, Bangladesh (1988)		○				○
Water Balance Studies, Bangladesh (1982)	○	○		○		○
Flood Damage Reconstruction, PDR Yemen (1986)	○	○	○		○	
Flood Damage Assessment Study, Somalia (1981)	○			○		
Refugee Farms Studies, Somalia (1980)		○	○			
Water Supplies for Somali Refugee Camps, Ethiopia (1988)		○				
Territorial Land Drainage and Flood Control Strategy Study -Phase I Hong Kong (1990)	○	○				
Jurong Lake Tidegate and Jl. A. Ibrahim Culvert, Singapore (1990)	○					
Zamboanga Research Centre Flood Protection Works, Philippines (1979)	○	○				
Hydrometric Network Program, Palawan, Philippines (1985)		○				○
Sukkur Barrage Flood Management Review, Pakistan (1987)	○	○				
Sukkur Barrage Gates Rehablitaton, Pakistan (1992)	○	○		○	○	○
Wadi Landsab Flood Control, Oman (1986)	○	○				

The Group has permanent specialist staff in the fields of flood hydrology, agriculture, rural infrastructure, irrigation and drainage engineering, flood control and river engineering.

Our staff have been undertaken flood damage assessment studies in the Yemen, Somalia and Bangladesh. Our recent work in Bangladesh is particularly relevant, as we are involved in the development of a strategies for flood preparedness and mitigation.

The Group has also recently completed a land drainage and flood control strategy study for Hong Kong, in which considerable attention was paid to non-structural solutions. The study assessed the socio-economic consequences of flooding and identified the need for certain standards of flood alleviation. The preparation of basin management plans, the introduction of legislation, and a planned approach to maintenance and management were central to the non-structural options.

(b) Maritime Engineering and Coastal Protection

Mott MacDonald offers comprehensive multidisciplinary consultancy services in the fields of river and maritime works. Past and present clients include national transport and planning departments, port and harbour authorities, major international oil and mining companies, construction manufacturing firms, regional and central government departments and public authorities.

Mott MacDonald has experience of all types of river and harbour works: river and coastal protection, surge and tidal barriers, breakwaters, dredging and reclamation and comprehensive waterfront facilities.

The Group also provides services related to other aspects of maritime and river works including immersed tube tunnels, caissons, bridge piers, river improvement schemes, river bank protection works, weirs, river walls, riverside docks and sea outfalls.

For construction works in maritime and estuarine areas requiring extensive dredging we have carried out comprehensive hydrographic surveys, underwater soils investigations and hydraulic model analyses to establish the effect of silting on changes to the channel bed.

Design is often assisted by specialist computer programs developed by us for use in hydrology, structural or maritime engineering design. We have also undertaken extensive studies of tides, littoral drift, currents and sediment transport for sea outfalls and other marine works. Wave and tidal scour action are studied for the design of revetments, rip-rap and rock, gabion and gabion mattress, or proprietary concrete armour protection to breakwaters and embankments.

The Group's staff have a wide experience of coast protection work in the UK for the National Rivers Authority and the District Councils operating as Coast Protection Authorities under the 1949 Act. Projects have ranged from the design and supervision of a £4 million shingle beach recharge to the reconstruction of damaged, or life-expired groynes. Such work demands making comprehensive use of local knowledge and records of coastal processes, together with state-of-the-art analysis and prediction of future trends. Environmental aspects and public acceptability form an important part of such studies, and a rigorous cost benefit analysis is demanded before government grant aid is made available.

The Group has been consulted from the very earliest stages of projects for pre-feasibility studies, and has carried out feasibility studies, detailed design work and site supervision of contractors.

(c) Hydraulic Engineering

The development of water resources requires the provision of engineering works to control, store and convey the available water. We have undertaken such works from conception to operation on projects ranging from small river pumping stations to large inter-basin transfer schemes involving dams, hydropower installations, tunnels, canals and pipelines.

River control structures such as barrages, weirs, flood barriers and navigation locks, river channel and bank improvements as well as coastal protection works are undertaken. Our hydraulic engineering capabilities cover hydrology, survey and site investigation, geotechnical engineering, mathematical and physical modelling, hydraulic and structural analysis, electrical and mechanical equipment and all associated infrastructure.

(d) Strategy Formulation

With over 70 years' experience in the investigation and development of land and water resources, Mott MacDonald is well qualified to plan and optimise the use of resources, maximising benefits while balancing competing interests. The firm has undertaken many assignments involving master planning and strategy formulation at various levels, ranging from studies for whole river basins to planning for flood protection for individual towns.

The objective is to allocate scarce resources such as land, water and funds in the most efficient manner, and usually begins with an inventory of all resources. The specific objectives of the plan and the constraints imposed by economic, political, social or technical factors are taken into account in formulating a development strategy. The strategy adopted is converted into a set of detailed plans which are used, in conjunction with agreed criteria, to rank projects in order of priority of development.

The Left Bank Outfall Drain Project in Pakistan is a good example of our capabilities where drainage, flood protection, improved irrigation and other infrastructure improvements are being applied to an area of 0.5 million ha. Other projects range from the Nile Waters Study, Sudan, the hydrological assessments of the nine SADCC and 23 West African countries, through to the studies into alleviating the misery and impact of flooding in Bangladesh referred to above.

(e) Institutional Development/Building

Strengthening the management capability of public sector bodies in developing countries forms part of many of our overseas projects. As a result, we have many years' experience of institutional development in countries such as Indonesia, Pakistan, China, Ethiopia, Lesotho and Oman. This has included dealing with organisation structures, administrative procedures, management information and accounting systems, manpower planning and training needs assessments. We also advise on the overall management of planning, design, construction, and operation and maintenance. Our institutional development assignments often take the form of technical assistance, where we work in close co-operation with counterpart staff. In many cases we also provide training.

We have carried out institutional projects for a range of clients, notably: the major multi-lateral donor agencies (World Bank, Asian Development Bank, African Development Bank, UNDP and their agencies, FAO, EEC); bilateral donor agencies (ODA, SIDA, SDC); and both central and local government (ministries, water authorities, rural development and agricultural organisations); as well as private organisations in more than 12 countries throughout the developing world.

For an organisation to be effective, it must have an appropriate management structure, efficient procedures, and well-trained and motivated staff. Mott MacDonald has experience of assisting clients with organisation development, identifying objectives, reviewing staff responsibilities, defining staff roles, introducing public participation, assessing training needs, designing programmes, and providing trainers.

(f) Institution Management

Mott MacDonald has many years' experience in transfer of knowledge and advice for institutional arrangements, management techniques and training.

In the water and wastewater disciplines, this has been with overseas clients in China and Indonesia. In other disciplines such work has extended to many countries including Pakistan, Bangladesh, Ethiopia and Malawi.

The firm's services normally consist of expert advice to analyse existing arrangements and to work with local staff to ensure any new proposals are suitable to the situation.

Occasionally institutional improvements require the formation of new bodies but where possible such improvements are based on strengthening existing local government organisations. Where necessary, economic analyses are carried out for individual sectors and cost benefit assessments completed.

(g) Management Information Systems (MIS)

As a global consultancy practice we rely increasingly on information technology to co-ordinate and enhance our services. The Group has extensive experience of developing MIS which run on both local and wide area communication networks. We also design relational databases and geographic information systems (GIS) for the management of resources, assets, inventories and works programmes, and for the financial and economic optimisation of master plans. Computer graphics are used wherever possible to aid the input of data and for interpreting and displaying results.

(h) Management Consultancy

One of Mott MacDonald's strengths is our understanding of our clients' managerial needs and the environments in which they operate. This enables us to offer realistic advice on management issues and to develop practical solutions. We provide specialist expertise to private and public sector clients throughout the world in areas such as organisation design, manpower planning, team building, training, management information systems (MIS), decision making, investment planning, risk analysis and financial engineering.

(i) Developing Management Skills

Mott MacDonald has first-hand experience of project management in a wide range of disciplines. Organisation, project planning, time management, training, cost control, and management information systems are all areas in which the Group offers expertise and training.

(j) Human Resources Development/Training

Mott MacDonald's Training and Management Department provides a comprehensive service in the field of human resources development to clients throughout the world. The Group is involved in developing professional and managerial skills, institution building, as well as training technicians and end-users. One of the main areas of activity is on-the-job in-country training, directly relevant to the participant's work. Mott MacDonald provides a wide range of courses from instruction in basic skills to development of management information systems.

The development of training programmes is also an integral part of many Mott MacDonald projects. We provide a comprehensive service including training needs assessment, development of courses and education materials, the establishment of training units, and the selection and training of trainers. Methods and timetables are tailored to suit the complexity of the subjects and the level of the participants, who vary from senior management to field technicians. Training is carried out both overseas and in UK, and may include formal courses, workshops, seminars, on-the-job training, study tours and secondments to the Group's UK technical divisions.

(k) Agriculture and Rural Development

In developing countries, agricultural and rural development is a first step towards improving living standards. After decades of involvement in formulating development strategies, project preparation, studies, design, construction, agricultural extension, operation and training, Mott MacDonald's capability is not easily rivalled.

We attach great importance to developing local capabilities. Particular attention is given to institutional building and vocational and professional training in agricultural planning and management.

Mott MacDonald maintains close links with some of the world's most advanced agricultural research institutions including those within Cambridge in plant breeding, animal research and applied biology. We are committed to the transfer of modern technology to developing environments through combining modern methods with the best of traditional techniques.

(l) Urban Infrastructure

Many of the projects undertaken by Mott MacDonald involve urban infrastructure: this ranges from industrial estate roads and drainage in the UK, to major developments with all utilities overseas.

Typical rural infrastructure requirements may include:

- roads and footways
- housing compounds
- water supply and treatment
- foul and stormwater drainage
- sewage treatment
- communications facilities
- power supplies

For major projects, in particular, the Group establishes multi-disciplinary design teams since co-ordination of the various infrastructure elements is of primary importance. Every assignment is dealt with as an individual case, the team organisation and size being adapted to suit specific needs. Where necessary Mott MacDonald has collaborated closely and successfully with architects, quantity surveyors and other specialists, to supplement in-house expertise, thus ensuring that thoroughly co-ordinated designs are produced on schedule. Computer aided draughting (AutoCAD) is used to 'overlay' drawings so that each discipline's utilities are properly co-ordinated on base plans.

(m) Water Resources, Irrigation and Drainage

Water resource evaluation and development planning is a major area of activity. From initial investigation and measurement of meterological factors, stream flows, aquifer characteristics and development potential we have assessed and mapped the water resources of whole nations and regions.

We have prepared master plans for all types of water resources development, taking into account pollution control, wastewater disposal and re-use, flood alleviation, watershed management and the local ecology; our staff regularly assist governments in formulating project financing strategies and implementation plans.

The Group has had world-wide involvement in irrigation, drainage and land reclamation for more than 50 years, with particular experience in arid and semi-arid zones. Our drainage expertise has also been applied to a variety of flooding and urban drainage problems.

The rehabilitation of existing irrigation systems is an efficient method of increasing food production and rural income levels. In the last two decades, Mott MacDonald has been involved in a large number of these projects, masterminding techniques using appropriate combinations of modern and traditional construction methods. Technology transfer through preparation of guidelines and systems for efficient operation and maintenance, and training of local office and field staff at all levels, are important contributions made by our irrigation experts in developing countries.

(n) Investment Planning

Many of our clients are facing increasingly complex issues when making long-term investment decisions, including the need to assess a wide range of financing options. Mott MacDonald has considerable experience of developing financing plans for individual projects, as well as for phased infrastructure development projects at national level. As part of the process, we sometimes develop funding plans in association with international loan agencies. Our experience includes combinations of locally generated funding and international loans, as well as private finance, turnkey projects and build-operate-transfer schemes. We also have contacts with a number of leading merchant banks.

Asian Disaster Preparedness Center (ADPC)

Sinces its establishment in January 1986, ADPC has been actively engaged in programmes concerning disasters and disaster management in the Asia/Pacific region. As well as organising specialist courses in disaster preparedness, disaster management and disaster mitigation, ADPC has also been involved in carrying out consultancies and research studies in disaster-related aspects. Post-disaster evaluation reports have been prepared which aim to strengthen the disaster response capability in the affected country to mitigate the effects of future disasters.

To date some 37 Bangladeshis have attended courses at ADPC, mostly attending the Disaster Management Courses.

Project Appreciation

Mott MacDonald

CHAPTER 2

PROJECT APPRECIATION

2.1 Background

2.1.1 General

The cyclone of 1991 was an extreme event which caused the death of over 130 000 individuals. On Sandwip Island alone over 20 000 people were reported to have died whilst many more were injured. The loss of life must be considered as massive even in the context of other world-wide natural disasters. Fairly detailed accounts of the 1991 cyclone events have been published and will be reviewed under the Study. Several of these accounts were available at the time of preparing this proposal.

Damage was inflicted on both rural and urban infrastructure. Quantification of damage is extremely difficult and assessments made in the wake of the cyclone must be considered as indicative. The most realistic estimates are assumed to be those contained in the position paper put together in the Task Force Report dated June 12, 1991.

It should be mentioned that the strengthening of the Ministry of Relief and Rehabilitation and the proposed establishment of a Disaster Co-ordination Office will improve the response of the Government system and the country to major floods and other potential disasters.

Natural disasters can have many causes including floods, cyclones and earthquakes. In the last 100 years Bangladesh has suffered from a series of severe natural disasters from all of these causes. In recent times both severe cyclones (1970, 1985 and 1991) and disastrous floods, most notably in 1974, 1984, 1987 and 1988. Also there have been a large number of other less severe events, both cyclones and floods in recent times. There have also been a number of severe droughts.

The last major earthquake occurred in 1897 and affected areas as widespread as Rangpur (NW region of the country) and Maulvi Bazar (Eastern region of the country). Major earthquakes also occurred in 1762 and 1782 which caused a tremendous shift in the course of the Brahmaputra. Another earthquake could happen which might have disastrous consequences particularly in urban areas with the increase in high rise buildings and populations.

These disasters have resulted, in total, in millions of deaths and have severely dislocated development efforts. After the floods of 1987 and 1988 a comprehensive Flood Action Plan (FAP) was developed and there is a substantial number of studies and other activities in progress to assist in the implementation programme for the FAP. One of the FAP components (FAP 11) is scheduled to establish an office for disaster coordination and it is intended that the coordination office to be established as part of this assignment will be the Precursor to the Disaster Coordination Office to be developed under FAP 11.

However, the current focus of attention is the response to cyclones and the emphasis of this proposal document will reflects this and the desire to develop a cyclone action plan.

The cyclone season refers to the periods before and after the monsoon season when cyclones are most likely to occur. The first cyclone season is in Baishak and Joistha. The second cyclone season is in Kartik and Agrahayan. (Cyclones are storms several hundred miles in diameter which form over the Bay of Bengal and sometimes affect coastal Districts of Bangladesh with very strong winds, heavy rainfall and, occasionally, storm surges. Crop damage may be caused by strong winds, heavy rainfall and/or flooding of the land with rainwater or sea-water. Nor'-westers, hailstorms and tornadoes are much smaller storms which affect inland Districts more often than coastal Districts: they occur especially in the periods of Chaitra, Baishak and Joistha; less commonly in Aswin, Kartik and Agrahayan.)

The major impacts of a cyclone in the rural parts of the coastal area can be seen as related to:

- loss of human life;
- loss of ruminants;
- loss of agricultural properties and produce;
- inundation of land and ponds by saline water;
- loss of houses;
- breakdown of sanitation and the danger of pollution;
- non-availability of safe drinking water;
- non-availability of food due to damage to foodstocks and the collapse of the communication network;
- damage to sea craft and loss of fishing equipment both of which are vital to coastal communities;
- destruction of electrification systems where such exist;
- damage to the road communication network and fortunately to bridges; and
- damage to schools, hospitals, health clinics, mosques and public buildings.

A map of Bangladesh is given as Figure 2.1 and Figures 2.2 and 2.5 indicate the spatial distribution of the damage caused by the cyclone of 1991. The figures have been derived from data contained in the 'Sheba Operation' report.

Figure 2.1

Map of Bangladesh

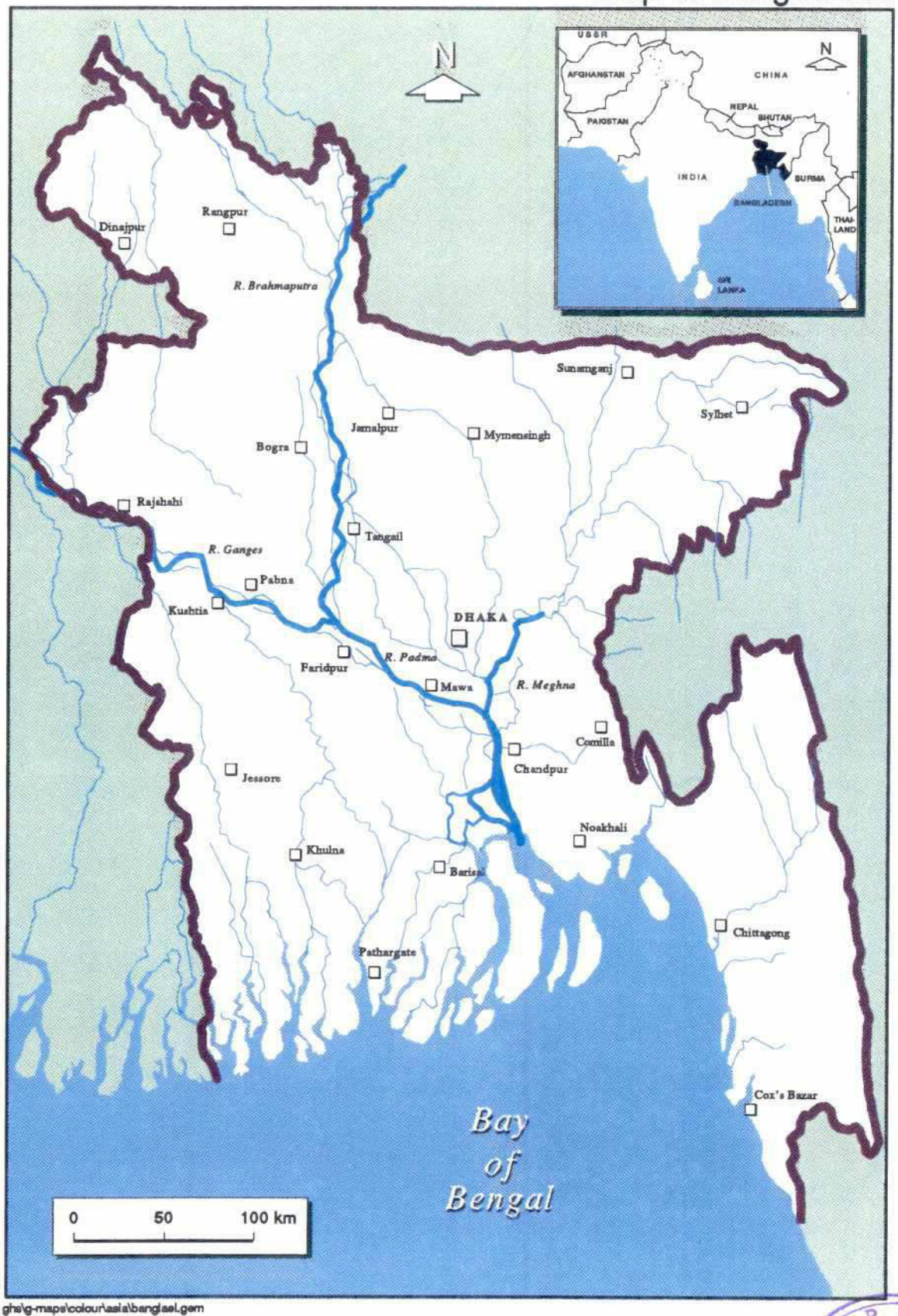

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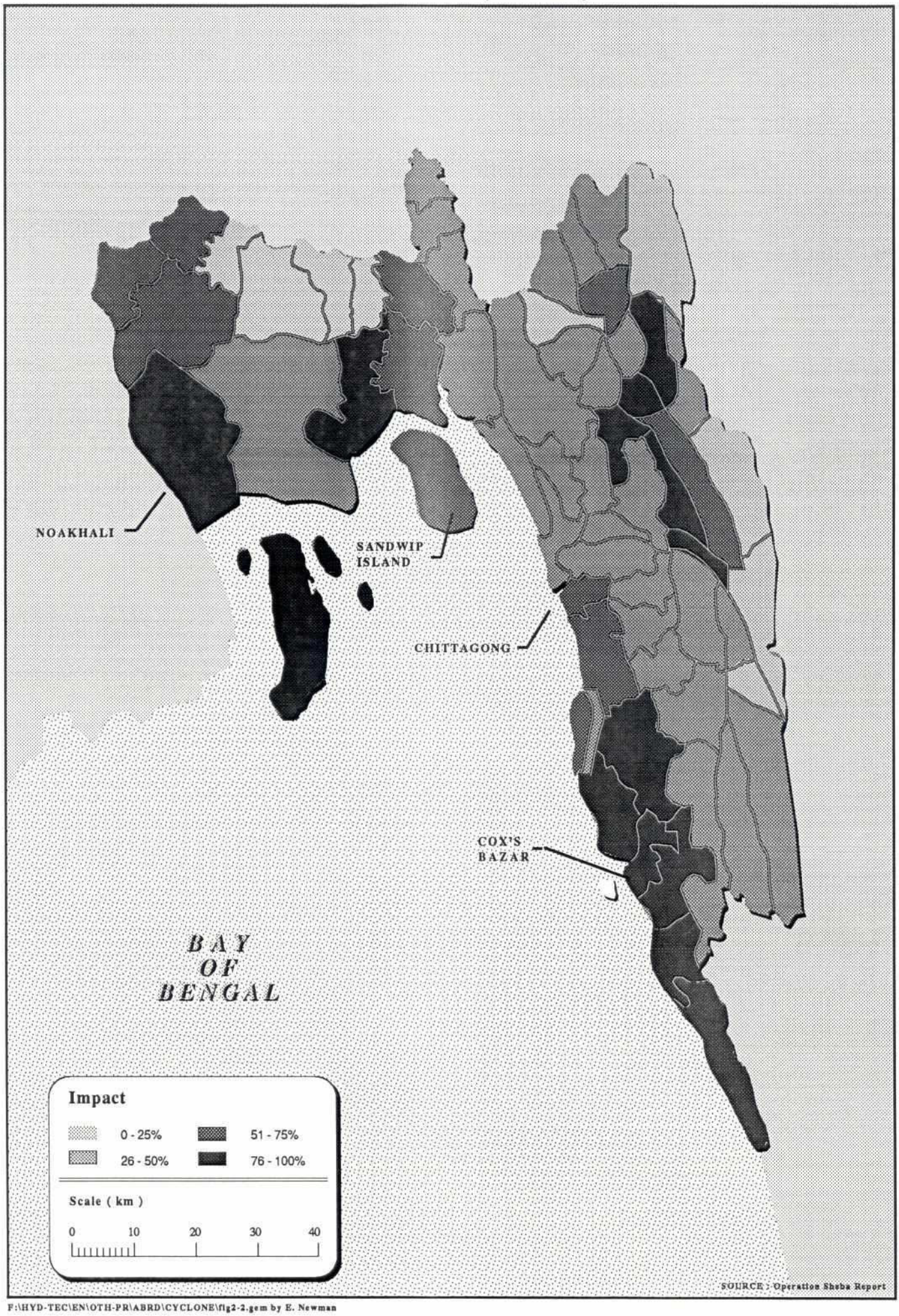
Figure 2.2

Impact of Cyclone of 1991: Affected Area



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Impact of Cyclone of 1991: Affected Population

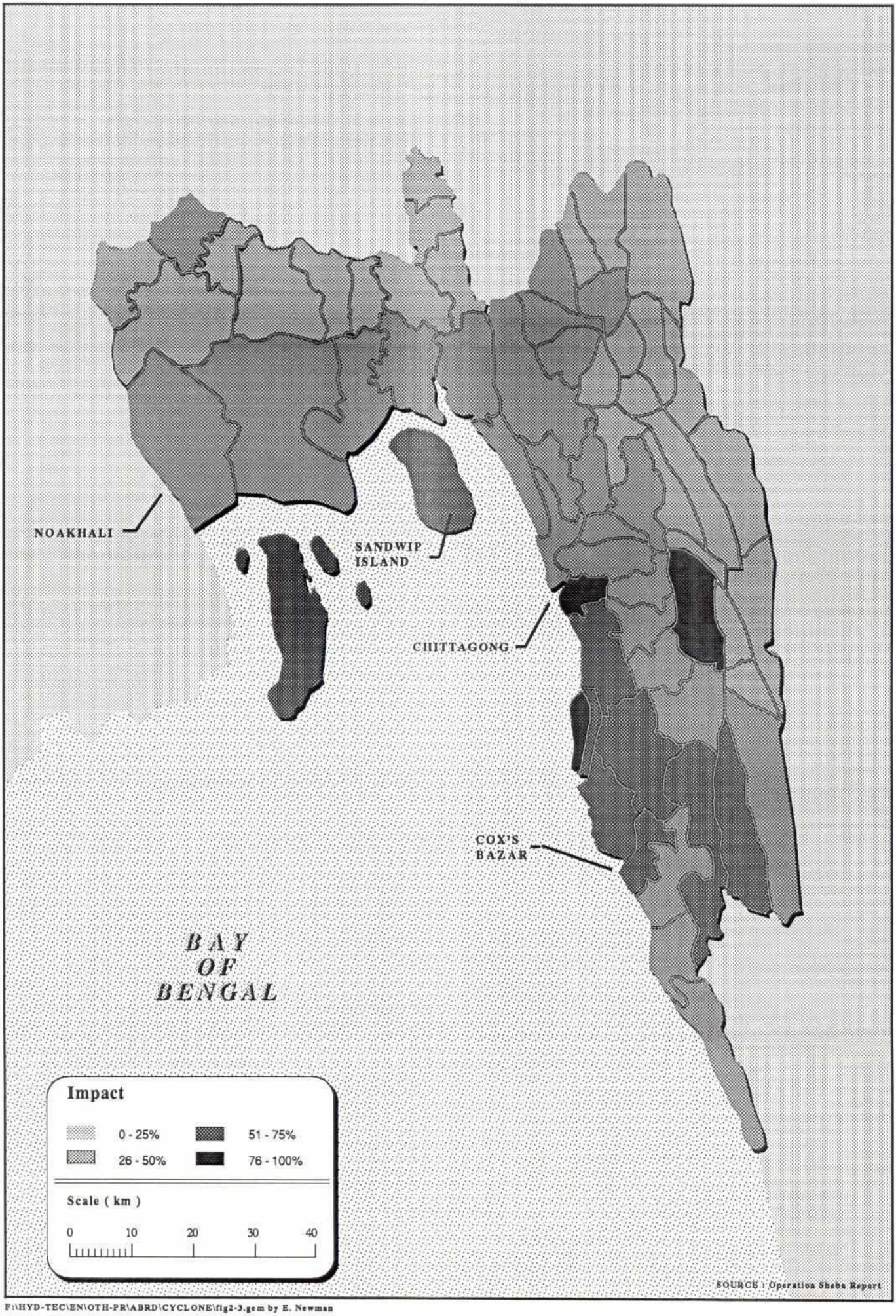

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Figure 2.4

Impact of Cyclone of 1991: Families Affected

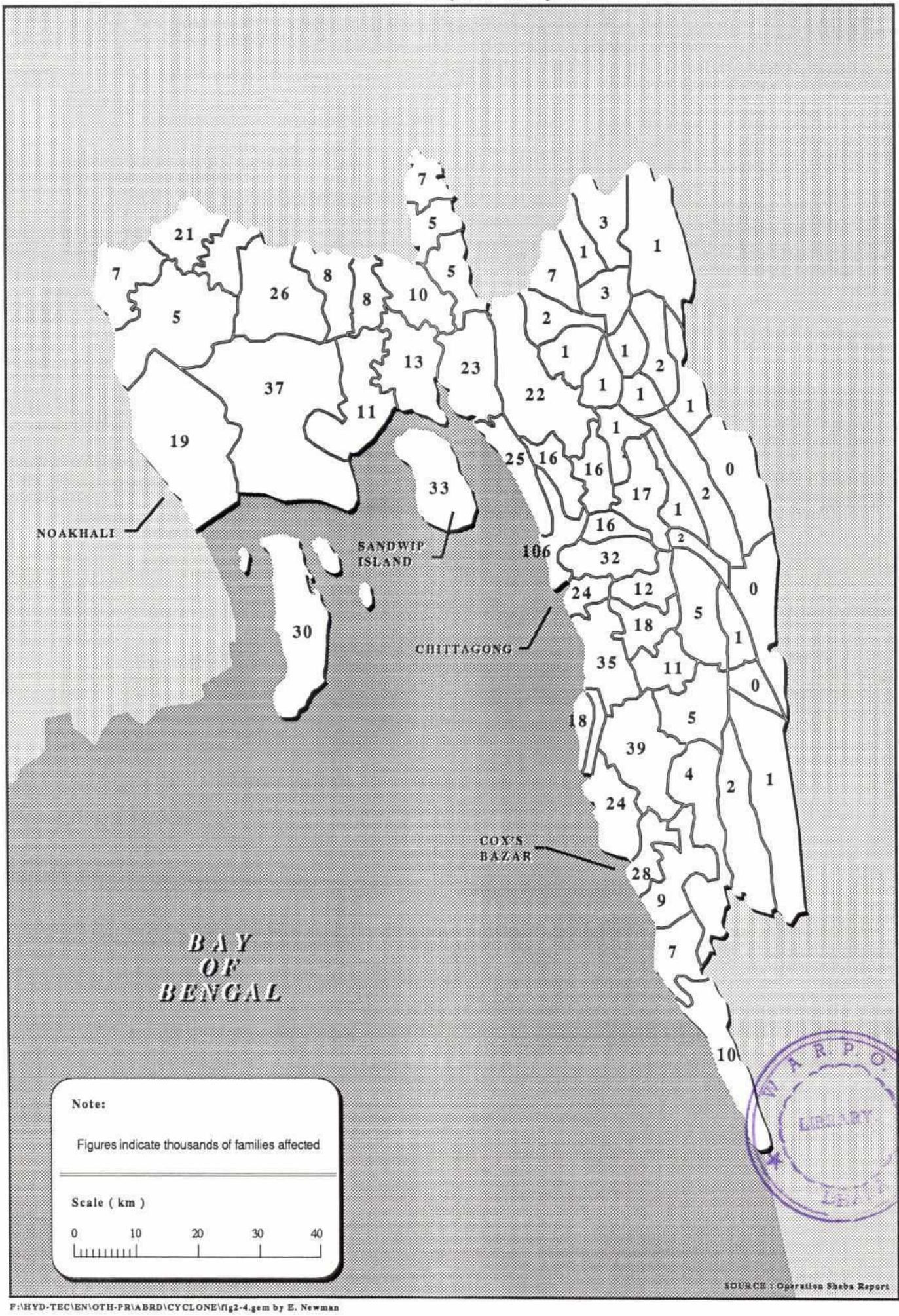

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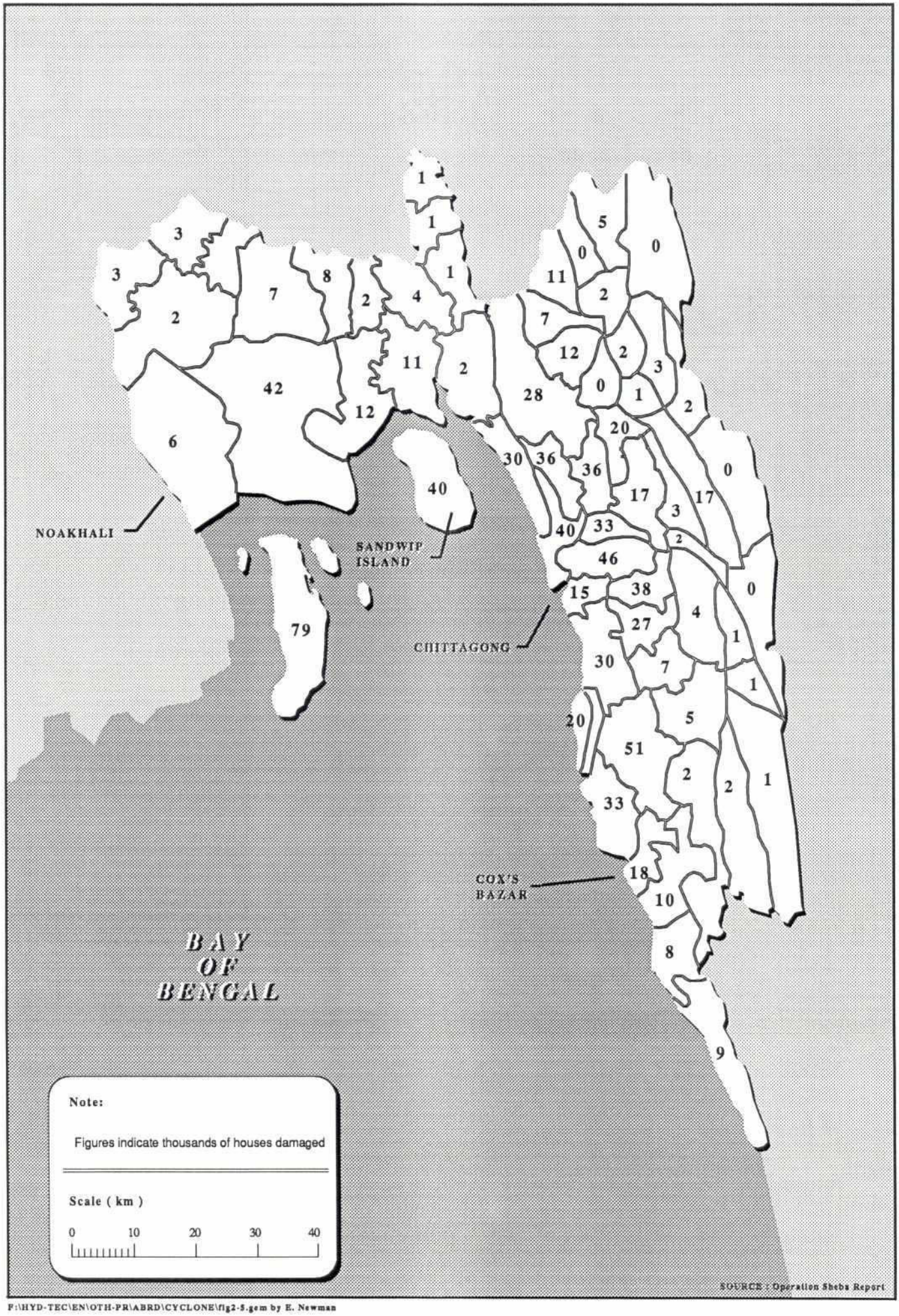
Figure 2.5

Impact of Cyclone of 1991: Houses Damaged



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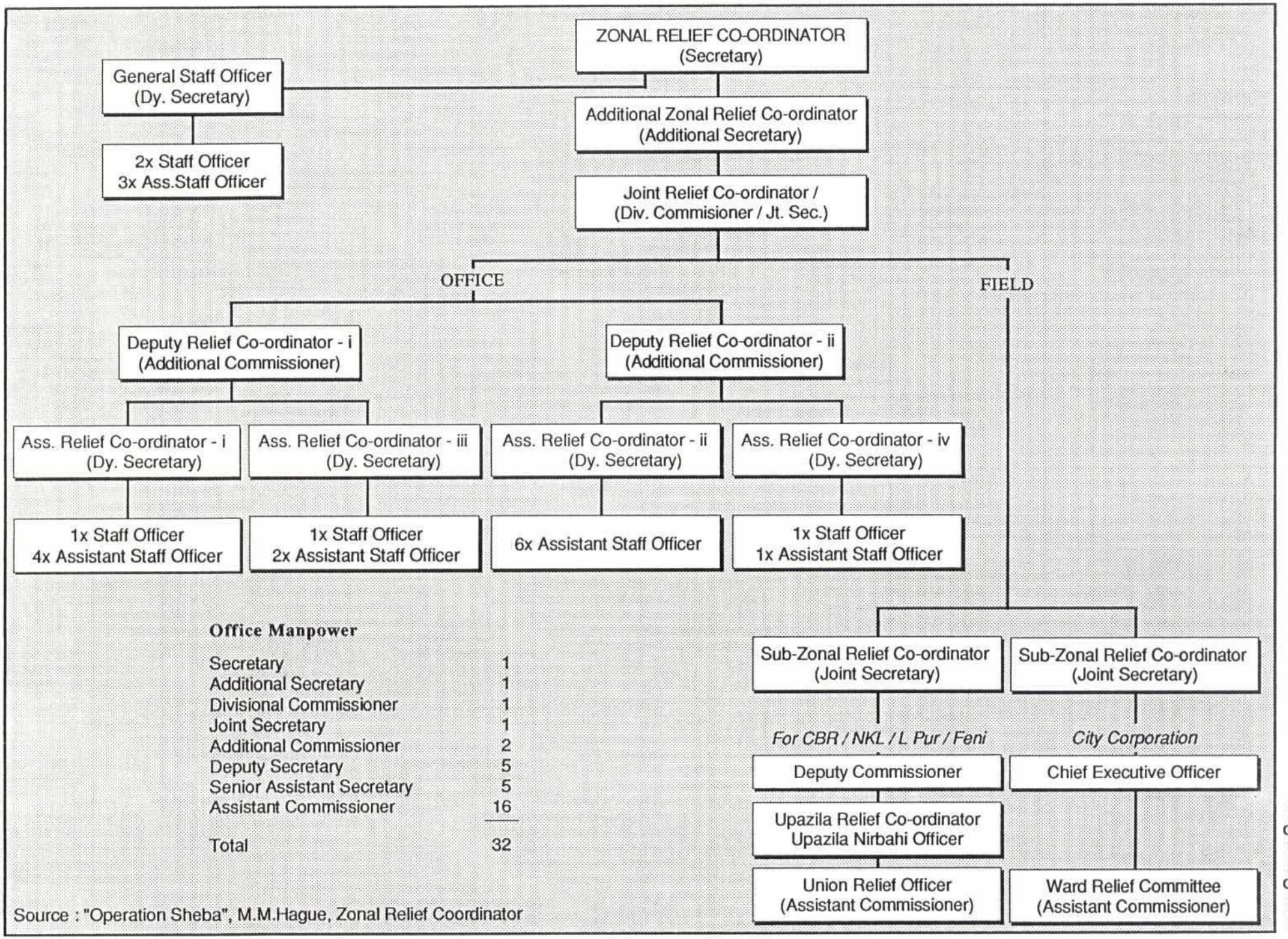


Source : "Operation Sheba", M.M.Hague, Zonal Relief Coordinator

Figure 2.6

Chittagong Zonal Coordination Unit - 1991 Cyclone Organogram

2.1.2 Cyclone Preparedness

In relation to cyclone preparedness two main factors are involved. The first is the process of cyclone tracking and the estimation of its likely degree of severity whilst the second is the dissemination of information both to Government agencies and non-government organisations and also to the population likely to be affected.

A typical feature of the cyclone is the central 'eye'. The eye can be seen clearly on satellite pictures, particularly of severe cyclones, it is small and almost circular and coincides with the area of lowest barometric pressure, having a diameter ranging from 8 to 50 km. The eye is considerably warmer than the rest of the storm whilst the wind in the eye is very light and practically no rain falls. In contrast, the strongest wind and the heaviest rain occurs just outside the central eye. The passage of the eye of the cyclone will correspond to the centre of the swathe of most severe devastation potential. The wind speed diminishes away from the eye of the cyclone. The main core of the cyclone has a diameter ranging from 100 to 800 km and is accompanied by a long tail. The tail usually crosses the land well before the core of the cyclone and as a result the sky is overcast and rain often sets in before the onset of the cyclone. Such symptoms can serve as a warning of the possible approach of a cyclone to the local populace.

The cyclone in its initial stage moves at a rate of 5 to 10 km per hour. In their final stages they may move at 20 to 30 km per hour or more. Cyclones in the Bay of Bengal usually move north-westerly at first and curve eastward. The cyclone decays during the crossing of land. Cyclones are accompanied by heavy rains and storm surges. The maximum height of storm surges can, if coinciding with high tide, be as high as 40 feet in the Bay of Bengal.

Normally flood warnings are issued centrally by the BWDB Flood Information Centre. Cyclone and heavy rainfall warnings are issued by the Storm Warning Centre operated by the Bangladesh Meteorological Services Department.

The Flood Information Centre (FIC) is responsible for issuing flood warnings to relevant Government Departments. Bulletins are also issued to the public by television, radio and through the press.

The Storm Warning Centre (SWC) issues warning of cyclones or nor'-westers and heavy rainfall in the same way as the BWDB FIC. In the case of imminent cyclone danger, warnings are given several times a day over radio and television.

Predicting the movement of the cyclones is extremely difficult hence there is an essential need to track the course and development of cyclones from Satellite Imagery. The NOAA imagery is currently best suited for that purpose and can be obtained on a 6 hourly step from a ground tracking station at Savar. Cyclone tracking is handled by SPARRSO (Space Research and Remote Sensing Organisation), based in Dhaka. SPARRSO has recently developed a mathematical model (named TYAN) in which output parameters from a numerical model are interpreted in a statistical way. The model draws upon

a 100 year record of tropical cyclones stored on tape. The model computes the most probable track for a 72 hour period based on the movement of historic cyclones that had occurred at the same time of the year in the Bay of Bengal and whose position and movement vectors were similar to the present case. The output is a 'probabilistic' statement of track positions at 24 hours intervals up to 72 hours ahead. For each position probability ellipses are defined within which the storm centre has a certain probability of residing at that time period. This process greatly assists the warning process.

A rapid transmittal of information and co-ordination of effort is required between SPARRSO and the Department of Meteorology, the centres are physically very closely located. It is also imperative that the Storm Warning Centre sends warning signals to the Government organisations, NGOs and donor groups at the earliest possible time. Any delay can have costly consequences both in terms of life and financial loss.

2.1.3 Structural Measures against Cyclone Impact

The major structural measures against cyclone impact are embankments, afforestation and cyclone shelters of different descriptions. All these measures require a considerable degree of maintenance to ensure that their effectiveness remains intact.

In an active delta, the land form is continuously changing. The islands in the Bay are perpetually changing their location/outline, this makes fixed structural measures susceptible to destruction. As the coastline of the islands changes, embankments, shelters and tree lines can be lost to the sea. When designing the above mentioned structural measures the likely coastal movement must be taken into account.

The integrity of structural measures should be frequently checked to avoid a false sense of confidence. It would be disastrous to assume a certain number of shelters with a specific holding capacity existed on an island because that number had been built whilst in actual fact 30% had been destroyed by the sea over the years.

(i) Shelters

After the devastating cyclone of November 1970, a programme was started to protect human lives and cattle in the cyclone prone region. It was planned to build multi-storied permanent structures to provide shelter to the people and a similar number of earthen mounds (killas) to protect cattle. The programme was abandoned after the construction of only 238 shelters. After the cyclone of May 1985 some more cyclone shelters were built. In the case of Sandwip Island, there are reportedly only sufficient safe shelters for 5% of the population. The situation is similar or worse in other areas.

The construction of shelters has received a great deal of attention of late and revived interest in the development has been seen primarily owing to their proven effectiveness in the 1991 cyclone.

The overall planning of new shelters needs to be centrally co-ordinated since many donors and aid agencies are expressing interest in funding such development. The spatial distribution of such activity is an essential factor as well as quality control of both design and construction.

It has been estimated that between 1 500 and 5 000 shelters (Sevenhysen report) need to be constructed in the coastal zone to serve as safe havens in the event of cyclones if all the population is to be provided with a secure refuge.

Shelters should wherever possible serve as dual purpose, thereby improving their economic usefulness to the country. Alternative or conjunctive uses could be primary schools, community centres, health centres and mosques. Market sheds could also be used but designs would need improving; the major benefit of a market could be the construction of a significant raised ground area. The multiple use of shelter structures would encourage a sense of belonging by the local population and also could ensure better allocations of maintenance funds.

A building code for proper construction of the shelters should be established. A similar code should be applied to the houses of the more affluent people, as these houses are often also used as shelters during a cyclone. Likewise government buildings and commercial buildings should also serve as shelters in the coastal areas. This to a large extent happens through force of need, however a more formalised and publicised state of affairs should exist. Ideally, shelters should be relatively small units thus reducing the travel distance and hence time factor. On the other hand, large shelters do enable relief to be better targeted.

In the approach to shelter design, due allowance should be made for the needs of women and children.

It should be realised that people do not flee from an approaching cyclone and storm surge for fear of losing their property. Improving the law and order situation is seen as a part of cyclone preparedness. Rehearsals for emergency evacuations combined with extension of knowledge on how to deal with cyclones is essential.

(ii) Embankments

Embankments have been found to be a useful means of reducing the damaging impact of cyclones in the coastal region.

The construction of coastal embankments has been practised in the cyclone affected areas for many years. With a view to improve the potential for agricultural production the BWDB constructed, in the years 1960-1991 under the Coastal Embankment Project, embankments and allied structures in the coastal area and on the offshore islands. The embankments were designed to prevent flooding from high tides but were not designed to prevent overtopping by storm surges during cyclones. The project constructed some 100 polders along the whole coastline of Bangladesh. The following was considered to be the impact of the project on cyclone effects:

'The project reduces or prevents damage from cyclone wave surges, particularly at the margins of the storm. The embankments, however, are not designed to prevent overtopping or to resist the storm surges in the main path of a cyclone. The protection has been shown to be effective in recent storms but this is incidental and may not be guaranteed'.

Owing to poor maintenance many reaches of embankment have fallen into disrepair or have been eroded through wave attack and general coastal erosion.

During and after the 1991 cyclone, relief workers working on Sandwip Island found that although the embankments were incomplete there were considerably fewer casualties at stretches where there were embankments. The main thrust of the waves was broken and people got a little more time to flee. Although not specifically designed for the purpose, coastal embankments have served a function in reducing the impact or severity of cyclones in relation to the coastal areas. Major erosional problems exist with the sea-facing embankments which are attacked by fierce waves created by the strong winds and long fetches. This is added to, in many places, by poor construction and lack of regular maintenance and has resulted in severe deterioration of the effectiveness of the embankments.

More consideration should be given to the construction of embankments in the coastal region. Aspects to be addressed include:

(i) more liberal set-back distances;
(ii) shallower side slopes;
(iii) better construction through the use of better soil or soil stabilisation techniques as well as compaction;
(iv) more revetment protection, particularly if appropriate low cost solutions can be found;
(v) use of turfing, particularly using salt tolerant grass varieties; and
(vi) use of vegetal protection, eg mangrove development.

From a broader perspective, a greater involvement needs to be obtained from the local people to repair and maintain the coastal embankments. The remoteness of these embankments frequently makes their inspection and maintenance difficult to organise through a line ministry.

(iii) Coastal Afforestation

Coastal afforestation helps to lessen the impact of cyclones by increasing the frictional characteristics of the land form and thereby reducing ground wind speeds. In an active deltaic environment a conscious effort must be made to develop afforestation whilst at the same time discouraging deforestation.

An ideal situation would be a wide green belt all along the coast on both sides of the main coastal protection embankment. In many instances mangrove plantations are extremely effective in the saline environment. In the newly formed islands in the Bay the Coastal Afforestation Programme is carrying out this work.

Inland from the main belt areas of taller trees should be developed preferably in clusters near to centres of rural population.

The areas most prone to damage are the newly formed islands where little wind and wave resistance exists. The lack of afforestation programmes in certain areas will probably infer that these are the highest risk settlements, however afforestation needs to be well established to be effective.

2.1.4 Agricultural Context

The loss of crops due to a flood or cyclone seriously affects the welfare of the families of farmers and agricultural labourers. The loss of agricultural production can also have a serious impact on the whole national economy. The constant threat of national disasters and the frequency with which such disasters occur in Bangladesh provide a real and serious constraint to agricultural and socio-economic progress. It is essential to devise and implement measures whereby the impact of such natural disasters can be minimised and the recovery after such events improved.

The approach to agricultural preparedness and recovery from cyclones includes a number of considerations encompassing precautionary and rehabilitation measures. Contingency plans must exist at the union and upazila level to ensure that the farmers are well warned of any imminent cyclone and that they are prepared to meet the cyclone emergency.

2.1.5 Organisations

At the present time, the responsibility for disaster preparedness, response and Co-ordination Policy lies with the National Disaster Prevention Council.

Almost every government organisation in the country has a degree of responsibility and interest during a cyclone event, some of the more relevant organisations which need to be involved in the co-ordination activities will be:

Ministry of Food
Ministry of Local Government Rural Development and Co-operatives
Ministry of Relief and Rehabilitation
Ministry of Home Affairs
Ministry of Health
Ministry of Education

Ministry of Defence
Ministry of Planning
Ministry of Agriculture
Ministry of Communication
Ministry of Irrigation, Water Development and Flood Control
SPARSSO

A major response to cyclones within the country has been the establishment of the Cyclone Preparedness Programme.

The Cyclone Preparedness Programme (CPP) is administered jointly by the Government and the Bangladesh Red Crescent Society (BDRCS). It is organised in 2 089 units in 207 unions under 24 upazilas in 8 Districts of the country. Over 100 professional staff support the activities of over 20 000 trained volunteers, who disseminate warning signals, alert people, evacuate them to safe places, rescue marooned people and provide injured people with first aid. Each team is provided with basic equipment such as a transistor radio, megaphone, siren, first aid kit, etc.

In the events of the 1991 cyclone 23 volunteers lost their lives and 776 were injured. The CPP Headquarters maintained round the clock contact with 56 wireless stations in the affected area. For several days after the cyclone the CPP was the only communication link with the remote coastal areas.

Warnings issued by the Red Crescent are reported to have saved thousands if not tens of thousands of lives. Thereafter medical teams were sent out, each medical team was issued with standard medical kits, even in the second month after the event 33 teams were operational.

Information obtained from officials at the CPP indicated the following potential improvements in the system as it currently exists:

- The SWC should minimise the time-gap between observation and issuance of bulletins. Also the SWC should inform the public about the proximity of the outer edge of the cyclone and should be specific for areas as far as possible. The maritime signals should be simplified so that the public can understand the implications;
- Mass media should be used for educating the public in cyclone preparedness;
- CPP should be strengthened and should be given more resources for procurement and maintenance of field equipment, for training of volunteers, for conducting exercises on disaster preparedness in the coastal area and for preparation and distribution of extension material;
- CPP should be extended to cover the whole coastal zone;
- Wireless communication facilities between CPP offices and CPP Union leaders in remote places needs to be extended;

- In the coastal upazilas, more vessels for rescue and relief work need to be provided. In high risk areas there should a reserve stock of life-buoys, hand pumps and tubewells, emergency medical materials and food; and
- Cyclone shelters should be constructed in large numbers in villages. Killas for the protection of cattle, should be built close to the shelters so that those coming to the shelters can keep their cattle close by.

Other non-government organisations play a vital role during a cyclone event and particularly in the post-cyclone period through the provision of air relief and counselling. The response of the international community results in an influx of relief goods which might not always be what is actually required. Nevertheless, valuable financial support is provided to NGOs by the international community. There follows in Table 2.1 a list of NGO's invovled in the aftermath of the 1991 Cyclone.

The overall reaction to a cyclone disaster is controlled centrally by the Government. Various ministries are involved including the Ministry of Relief and Rehabilitation. Various committees are established to help co-ordinate activities. During a major disaster there is a great deal of efficient non-bureaucratic co-operation between Government and non-government organisations which helps to improve the overall responsiveness to the disaster event.

Outside Dhaka, the Deputy Commissioners play an important role during disaster events. They have overall responsibility for disaster control activities in their district, ensuring that:

- flood and cyclone warnings are issued promptly to sub-divisional officers and upazila officers, and through them to upazila and union parishads for action;
- the District Disaster Control Committee meets to consider what actions should be taken to meet the threatened flood or cyclone and to implement relief and rehabilitation measures;
- information on flood or cyclone damage, relief and rehabilitation measures and additional requirements are transmitted regularly to the Disaster Control Room in Dhaka;
- emergency funds are released to relieve the immediate distress of flood or cyclone victims; and
- additional manpower and facilities are mobilised on a voluntary or compulsory basis to meet emergencies such as strengthening or repair of embankments, evacuation of isolated settlements, construction of refugee camps, transport of relief supplies (including agricultural rehabilitation supplies).

The Deputy Commissioners are supported by the UNO (Upazila Nirbanhi Officers) who draw on the organisational powers of the upazila government officers, the upazila and union parishads.

As in almost all other countries, a central role is played by the military during any disaster event. All three main services perform vital tasks, the army with a well trained and equipped land force with reliable vehicles, the navy and the air force. In the coastal area, the importance of the navy is obvious, however in the immediate aftermath of a cyclone disaster the air force is generally first on the scene being able to distribute relief food by helicopters or to carry out food and material drops to the most remote areas.

TABLE 2.1

LIST OF NGOs INVOLVED IN THE CYCLONE RELIEF AND REHABILITATION OPERATION - 1991

International NGOs	
1	Adventist Development and Relief Agency (ADRA)
2	Lutheran World Mission - Netherlands
3	CARE
4	CONCERN
5	OXFAM
6	Pathfinder - Internatinoal
7	Save the Children Fund (USA)
8	SDC/EDM
9	Service Civil Internatinoal - BD
10	Sight savers
11	The Asia Foundation
12	The Salvation Army
13	World Vision
14	HEED - Bangladesh
15	Save the Children Fund (UK)
National NGOs	
1	Bangladesh Red Crecent Soceity
2	BRAC
3	Caritas Bangladesh
4	Nijera Kori
5	Proshika Muk
6	Proshika Comilla
7	Dhaka Ahsania Mission
8	Gonoshasthya Kendra (GK)
9	CCDB
10	Gono Unnayan Prochesta (GUP)
11	Gono Shahhjyo Shangstha (GSS)
12	Church of Bangladesh
13	Palli Unnayan Sangstha
14	Banchte Skekha
15	Gono Unnayan Foundation
16	Ram Krishna Mission
17	Unnayan Shahojogi Team (UST)

In the past, relief operation has been headed by the President's Relief Co-ordination Cell. Under the new democratic government the responsibility was rested in the Prime Minister through the Relief and Rehabilitation Co-ordination Committee.

Two zonal co-ordinators were appointed, one covering the districts of Khula, Barishal, Barguna and Patuakhali and the other the greater districts of Chittagong and Noakhali. The zonal co-ordinators were appointed with the rank of secretaries to the Government. During the immediate aftermath of the cyclone ministers were posted to different districts to oversee relief operations.

In the Chittagong zone, which suffered the worst impact of the cyclone a zonal Co-ordination Unit was established. This strengthened the normal district administration and acted as a focal point for upazila relief co-ordinators. An organogram of the set up is given in Figure 2.6. Relief co-ordination committees were established at the direct, upazila and union level. All committees contained representatives of the armed forces, the police and senior public representatives.

The actual distribution of relief on the ground is made by the Union Relief Co-ordination Committee on the basis of a Distressed Persons Priority (DPP) List. This is made in the presence of Government officials and members of the Armed Forces wherever available.

Linkage with local NGOs was achieved through twice weekly meetings regularly held between various NGOs and the zonal Relief Co-ordinators Office.

One important recent development which will need to be taken into account in relation to the disaster preparedness and disaster rehabilitation procedures is the current move to abolish the upazila parished. It is proposed that in the future a greater role will be played by the line ministries in relation to development orientated work at the local level. The UNO will, as currently envisaged, continue to play an important role in administration aspects at the upazila level. The form of organisation of the response and relief mechanism will need to be reviewed in this context.

Another dimension to the relief effort was the involvement of other countries. Many countries provided emergency transportation to assist in the distribution of aid to the cyclone hit areas. This included aircarft, helicopters, surface water transport. Over 20 helicopters came through the US Task Force Craft US Tarawa. A US-Bangladesh Task Force Co-ordination cell was also established (Operation Sea Angels).

One of the recent comprehensive documents covering the 1991 cyclone is the report describing Operations SHEBA (Save Humanity in Emergency Bay Affected, although 'sheba' in Bengali means 'service, service to humanity'. The Report was produced in June 1991 and presented a Relief and

Rehabilitation Plan for the Districts of Chittagong, Cox's Bazar, Noakhali, Feni, Laxmipur, Rangamti, Khagrachari and Bandarban. It was produced by the Zonal Chief Co-ordinator in Chittagong, M Mokammel Haque who played a vital role in the relief operation.

The report summarised the disaster, the damage incurred and the preliminary cost estimates for rehabilitation.

Overall 13 recommendations were made by the report, these included:

- the need for 'Emergency Standing Orders of Cyclone and Preparedness' to be reviewed with the view to formulating a briefer yet more effective standing order which can be put into action;
- natural level consciousness and preparedness have to be created for major disasters. In this context it was recommended that the Ministry of Relief and Rehabilitation be strengthend;
- a task force should be set-up with the Cabinet Secretary as its Convener for finalising the National Disaster Relief and Rehabilitation Plan.

Most of the other recommendations related to improving structural preparedness facilities.

2.1.6 Other Studies

Several other studies relate to the improvement of co-ordination which is the focus of the proposed Study.

Technical Assistance Programme for Flood Protection (BGD/88/055)

Technical Assistance for Comprehensive Disaster Preparedness (BGD/88/056)

WHOs Proposed Bangladesh Health Sector Preparedness and Response Project

ESCAP/UNDP Regional Remote Sensing Programme (RAS/86/141)

Cyclone Damage Reconstruction [ADB Technical Assistance]
[road reconstruction work (300 km) on islands in the Bay of Bengal]: Start date early 1992.

and the following Flood Action Plan components

FAP 7	Cyclone Protection Project.
FAP 10	Flood Forecasting and Early Warning Project.
FAP 11	Disaster Preparedness Program.

FAP 14	Flood Response Study.
FAP 19	Geographical Information System.
FAP 26	Institutional Development Project.

During the last cyclone, a database was set up by various NGOs to help co-ordinate their relief activities. This has since been developed further and is currently being upgraded and extended through ADAB (Association of Development Agencies in Bangladesh). This a well developed database which could form the basis for the establishment of the MIS system under the proposed Study. The database is currently set-up on Apple MacIntosh machines which are not IBM compatible. This extensive database is being gradually expanded to incorporate a rudimentary GIS (Geographic Information System).

2.2 Scope of the Study

In relation to the cyclone preparedness and the assistance response to cyclones it is essential to appreciate that a massive organisational structure already exists both within government and non-government organisations.

It must also be appreciated that a great proportion of the materials and many of the personnel needed to deal with any disaster are available within the country. The key element which is required is improved co-ordination. Additionally, as the title of the study infers, greater emphasis is being placed on the relief and rehabilitation period rather than the problems during the cyclone event itself.

The basic objectives of this study are clearly described in the Terms of Reference for this study and can be categorised as follows:

- to strengthen the capability of the Ministry of Relief and Rehabilitation by the establishment of a Disaster Coordination and Monitoring Unit (DCMU);
- to review existing government and non-government agency response to emergencies and to prepare proposals for improved procedures, and practices so as to provide a future strategy for disaster response and related activities;
- to design and implement training programmes in disaster preparedness and management;
- to identify priority investment projects in repair and rehabilitation areas to improve coastal protection and other infrastructure, leading to the preparation of a Cyclone Action Plan.

2.3 Comments on the Terms of Reference

The terms of reference are clearly set out and are reproduced, for reference, in Appendix III of this proposal.

The objectives, activities and outputs expected are clearly indicated and require an immediate and rapid response from the consultants from day one of the assignment.

We have already identified a number of critical activities if the extremely tight programme is to be achieved. During the first month it will be necessary to complete discussions and agreement upon the detailed terms of reference, inputs, identity and scheduling of the local consultants, the specialists both foreign and local totalling approximately 95 person months which are to be completed during the following nine months. In addition the local consultancy contract has to be agreed and signed and the team mobilised. Such a programme will require exceptional energy and local knowledge of a large number of government agencies and of local consultants. We believe this makes our team particularly suitable for this task.

It is also at this time that the DCMU office must be physically established and equipped and we can provide any temporary computer equipment required.

We have recognised that whilst many of the proposed activities are designed to improve and rationalise the ongoing response to the April 1991 disaster that there are two other underlying but important objectives.

Firstly it is necessary that the MIS systems to be developed will need to be structured in such a way that it can be easily adjusted to cope with the longer term requirements when the DCMU develops into the Disaster Coordination Office to be established under the proposed FAP 11 Disaster Preparedness Project (Objective 3).

Secondly the procedures and guidelines to be developed and the corresponding training programmes need to be set at appropriate levels to produce effective administrators and workers at each level (central, district, upazila, union etc). These courses will need to provide clear, detailed yet uncomplicated guidance so that each individual within each organisation knows his role, his agency's role and where he can go to get information or assistance.

The terms of reference also make clear the need for extensive consultation and discussion with the many and various ministries, government agencies and NGOs already involved in the cyclone response. There are a large number of existing reports, procedures, guidelines, recommendations and proposals and it is a clear objective of this assignment to make the most effective use of all the resources and ideas to produce a plan which will be adopted with enthusiasm by all concerned.

Approach and Methodology

Mott MacDonald

CHAPTER 3

APPROACH AND METHODOLOGY

3.1 General

In terms of mitigating the effects of cyclones it is necessary to consider cyclonic storms and tidal surges as two separate but interlinked occurrences.

Any plan should integrate both structural and non-structural elements of disaster management.

It should be noted that structural measures lead to new or revised preparedness and rehabilitation measures. This inter-relationship has to be borne in mind when devising operational plans incorporating the two complementary approaches.

Additionally the various parts of the coastal region will be affected differently and responses appropriate to each must be effected. The main categorisation will be related to whether the affected area is one of the coastal islands, the rural mainland, urban centres or industrial centres.

In the island and coastal mainland, major losses of life can occur in addition to loss of livestock, agricultural production, houses, schools, water supply and sanitation. These areas normally suffer the main thrust of a cyclone and its consequent tidal surge.

Urban centres have more substantial buildings normally reducing the level of loss of life but severe problems exist with the disruption of services and communications. These urban centres are normally the focus of the organisation of relief activities and the disruption of services and communications can hinder any disaster relief operation. The loss of electrical power affects water supply and television communication etc whilst damage to telephone lines has obvious implications.

In industrial centres, severe disruption of economic activity can occur which will directly impact on the economy of the country. Loss of electrical power and disruption in the supply of diesel are major factors but this is aggravated by damage to machinery and contamination of materials in storage etc. Any release or leakage of toxic wastes/materials could also have a serious impact.

3.2 Components

The main components related to the co-ordination activities which should come under the jurisdiction of the Ministry of Relief and Rehabilitation includes:

- Natural hazard analysis;

- Risk and vulnerability analysis;
- Disaster prevention (not applicable to cyclones);
- Disaster Mitigation encompassing both structural and non-structural measures;
- Pre-disaster Preparedness;
- Activities during disaster event;
- Deprivation assessment criteria, data collection and analysis;
- Damage assessment criteria, data collection and analysis;
- Relief operations;
- Rehabilitation programme formulation and implementation;
- Renewed structural and non-structural measure programmes.

The study will need to address each one of these aspects and identify the nature of the various organisations which are involved in each instance and their respective roles.

Each of the components are described below in more detail to provide an indication of their relevance to the approach which should be adopted:

Hazard Analysis. The establishment of the nature of the hazards such as coastal flooding, cyclones, tornadoes, tidal waves and earthquakes and the nature, frequency and degree of risk they offer.

Vulnerability Analysis. The establishment of the degree of vulnerability of particular regions, places, communities and specific types of infrastructure to each type of disaster.

Disaster Prevention. An art rather than a science in which an attempt is made either to reduce the risk through avoidance, ie evacuation of people out of the path of a cyclone, or by reducing vulnerability by seeking to control coastal flooding and tidal waves through engineering infrastructure works and the operation of those works during the time of need.

Disaster Mitigation. A feasible version of prevention activity in which engineering works and management processes seek to reduce the impact of a 'design wave' or 'design wind', nonetheless, accepting that there will be occasions when these will fail to various degrees.

Pre-disaster Preparedness. This can be seen at two levels:

(a) A National Strategy that is widely disseminated and understood.

(b) An action plan that comes into play as soon as information and forecasts suggest a warning is necessary for a particular region, district or community.

When applied to cyclones and cyclone related events:

(i) Forecasts based on observation primarily through satellite imagery and meteorological observations;

(ii) Warning to the people likely to be affected: on the basis of prior knowledge revealed by vulnerability mapping, making use of a communication system that reaches the appropriate audience and through methods of message dissemination that stimulate the population to take appropriate avoidance measures (given that it has already been explained to them what these measures are);

(iii) Evacuation to safer places;

(iv) Food and health measures to bridge the emergency period;

(v) Overall Structuring of the Emergency Response through the employment of the preparedness emergency action plan.

Deprivation Assessment. Without agreed criteria it is not possible to implement effectively (iv) above, food and health measures, during emergencies since those most in need are difficult to recognise and most particularly so at times of widespread destruction, however the communities at the centre of the cyclone are likely to be the worst affected group.

Damage Assessment Criteria. Without agreed criteria it is not possible to arrange efficiently for temporary infrastructure supports such as new water supply systems, electrical supplies, shelter housing, or to determine the preliminary estimates of damage and cost of rehabilitation or renewal of structures.

Relief Operation. Many agencies of GOB, NGOs and of the international community offer help in relief. They share a common problem which is to determine in what way they can best help, given the nature and constraints on the use of the resources at their disposal. If this was clearly defined and simplified, then relief could be expected to flow more speedily. Hence, the disaster management cycle needs to be clearly established in terms of procedures and co-ordination.

Environmental Impact Assessment. Although not central to averting or mitigating the impact of a cyclone, an EIA will have relevance to subsequent activities, particularly during the design of recovery programmes.

3.3 Approach

Having identified the principal components which will affect the development of a disaster management strategy it is necessary to have a clear understanding of the roles of each agency or organisation and how it performs at each stage of a disaster situation.

It is our intention to benefit from recent experience by learning from past inadequacies.

The lessons considered to be learnt from the relief efforts of the 1991 cyclone included:

- a greater efficacy in disaster management is required;
- a need to clearly distinguish rehabilitation programmes from normal development programmes;

- a greater number of multi-purpose cyclone shelters need to be constructed;
- each cyclone shelter should have a specially designed storage building for food, clothing and medical supplies;
- the civil administration needs to be reliably linked by telecommunication to the upazila system;
- all cyclone shelters should be provided with good road access to the national road network to facilitate relief work;
- all cyclone shelters should also be provided with CB radio links with the upazila headquarters;
- districts and upazilas in the cyclone affected areas should be provided with fast, heavy water craft;
- inhabitants of flood prone areas should be provided with transistor radios at a subsidised rate;
- relief and rescue teams should be formed in all villages;
- Upazila and District level Disaster Preparedness and Intervention Committees should be constituted, (training of individuals in relief and rescue work was also advocated).

These lessons will need to be addressed during the formulation of the disaster Management System which should be built into the Unit.

Many reports have identified a number of stages through which each natural disaster passes:

Forecast	) Pre-disaster
Warning	)
The Event	) Disaster
Survival Relief	)
Disaster Relief	) Post-disaster
Rehabilitation	)

The three post-disaster phase are not distinct but overlap in time and in content. There are also clear sectors or types of assistance required some of which are required at all stages and some at only one or two stages. These sectors include, telecommunications, transportation, food supply, medical supplies and treatment, equipment and materials supply, repair, reconstruction and new construction.

Further there are a large number of organisations, local, district, national, and international and both government and non-government agencies which are both willing and able to assist at one or more stages of a disaster.

Each of these agencies has its own resources of money, manpower and materials (equipment) but agency objecives vary, they have different approval and release mechanisms and different capabilities. These factors make some agencies appropriate to particular aspects and elements of disaster mitigation and rehabilitation. Few agencies have the ability to perform usefully at all stages and in all areas.

Perhaps the most crucial aspects for ensuring successful disaster management programmes are those concerned with an understanding of the local cultural, social and economic circumstances of the people affected by the disasters.

The above considerations will guide our approach to the development of the DCMU, its relationships with all other organisations and the procedures, guidelines and plans to be produced.

The basic requirement at all stages is that the proposals should recognise the needs and motivations of the affected populations so that their likely response to proposed initiatives can be correctly foreseen. In this way proposals can be developed which encourage participation of the population in a constructive way. This requires a number of conditions:

- the people must understand the potential benefits of the measured and accept their limitations;
- the people should be involved, as much as possible, in the planning, construction and maintenance of remedial and rehabilitation measures;
- the technology used should be appropriate to the level of education of those who will need to use it and to maintain it.

A great deal has already been written about many of the possible measures which could be undertaken but unless the population are able and prepared to make use of proposed systems then they will fail.

This suggests that major aspects of the approach to disaster mitigation and disaster relief require that information is acquired from the bottom up. It also means accepting that the physical and organisational structures which work well in one area may not necessarily work as well in other areas.

The second crucial element of our approach is to build on and maximise the positive elements which already exist and function effectively. This means assisting the natural development of competent and efficient organisations by filling gaps, extending spatial effectiveness and assisting with training.

The Disaster Co-ordination and Monitoring Unit is well named in that it does not seek to direct and control all aspects of relief work but rather to gather information, analyse it and disseminate it in such a way as to allow all other agencies to provide effective operations in an efficient and consistent manner.

To do this task effectively it will need to develop good relations with a large number of organisations and with individuals within those organisations.

The guiding principals of our approach are, therefore, to understand the needs and motivations both of the people directly affected by the disaster and of the people at each level within the various organisations who are trying to help the disaster victims who, at the local level, will include the staff and volunteers of these organisations. This understanding will allow the development of guidelines and proposals which provide the executing agencies with clear and timely information as to what is required, where it is required, what constraints exist and where assistance can or may be found.

3.4 Methodology - Achieving Objectives

3.4.1 Introduction

The main activities which will need to be carried out by the Consultants relates to the establishment of a Disaster Co-ordination Office within the Ministry of Relief and Rehabilitation. This will require a great amount of institution building both in terms of providing the correct work environment and in professional guidance to ensure that the Unit/Office becomes a recognised focal point in all disaster related activities:

This will entail:

- the provision of office equipment for the new unit. This will include good quality computer equipment and appropriate software;
- the development of a sense of purpose and enthusiasm in the local staff assigned to the unit. This will be achieved through appropriate training and the transfer of both enthusiasm and knowledge from the Consultants to the government personnel;
- the identification of the information and report requirements of the Unit. The data required and the sources of that data;
- the development of a useful and reliable database with a system introduced to ensure it's frequent updating and verification;
- the identification of the institutional framework within which the Unit should function and the establishment of clearly defined relationships and linkages with other organisations;
- the establishment of committees and regular meetings with other organisations;
- the identification of training needs and the formulation of a mixed training programme incorporating in-service training (personnel) and more formal institutional training elements;
- the establishment of a management information system to structure the data held by the unit and translate that into a number of specifically designed reporting formats both for internal use of the Unit and the Ministry of Relief and Rehabilitation and for external organisations and agencies;
- the establishment of guideline procedures for the operation of the unit in the periods of:

- disaster preparedness
- disaster event
- survival relief
- emergency relief
- emergency rehabilitation
- rehabilitation (short, medium, long)

- the MIS reporting and data use structure would need to be different in each of the above stages of a disaster;
- the provision of guidelines for the formulation and design of rehabilitation programmes. This would encompass liaison with other ministries and agencies to ensure rehabilitation co-ordination;
- the structuring of all reporting and guidelines would need to take into account the disparate needs of Government agencies, local NGO's, the military, donor agencies and internationally supported efforts.

The reputation of the Unit will be highly dependent on its performance and perceived usefulness to other agencies and organisations. This must be appreciated by all associated with the Unit from the outset of its existence.

A high profile needs to be portrayed from the outset. This must be achieved by the exposure of individuals from the Unit and the Consultants involved whenever possible. The use of committees, seminars and integrated multidisciplinary training sessions will be the key to meeting this goal.

The Consultant would endeavour through co-ordination with all agencies to identify real relief needs and the levels and type of relief, which is required for different situations. Excessive relief aid can have a debilitating effect on the local economy. Whenever possible people should do work rather that be given food, and local sources of produce should always be sought.

Excessive and inappropriate relief aid should be avoided because the appearance of an excessive number of relief workers and volunteers can hinder relief operations; local people need to be involved as much as possible rather than 'strangers'. These factors need to be appreciated by those in the Co-ordination Unit.

As well as strengthening the Government Institution, disaster management information should be disseminated quite widely. The inexperience of some NGOs in disaster management, often caused by a lack of information and experience, and a lack of overall supervision by donors who are not really equipped for such activities has resulted in mismanagement of funds and sometimes corruption. The whole system would improve by improving disaster management overall and providing the donor with an assistance to facilitate relief effectiveness. This should be seen as an important role for the Unit.

The institutional framework within which the unit will have to operate is outlined in Figure 3.1 and the figure shows how the activities propsed for this consultancy are intended to lead into the development of the Unit in a Disaster Coordination Office under FAP 11.

One of the recent comprehensive documents covering the 1991 cyclone is the report describing Operation SHEBA (Save Humanity in Emergency Bay Affected, although 'sheba' in Bangali means 'service, service to humanity'). The Report was produced in June 1991 and presented a Relief and Rehabilitation Plan for the Districts of Chittagong, Cox's Bazar, Noakhali, Feni, Laxmipur, Rangamti, Khagrachari and Barndarban. It was produced by the Zonal Chief Co-ordinator in Chittagong, M Mokammel Haque who played a vital role in the relief operation. The report summarised the disaster, reported the damage incurred and the preliminary cost estimates for rehabilitation.

Overall, 13 recommendations were made by the report, these included:

- the need for 'Emergency Standing Orders of Cyclone and Preparedness' to be reviewed with the view to formulating a briefer yet more effective standing order which can be put into action;

- national level consciousness and preparedness have to be created for major disasters. In this context it was recommended that the Ministry of Relief and Rehabilitation be strengthened;

- a Task Force should be set-up with the Cabinet Secretary as its Convenor for finalising the National Disaster Relief and Rehabilitation Plan.

Most of the other recommendations related to improving structural preparedness facilities. However, these above issues are now to be addressed by the proposed project.

3.4.2 Strengthening of the Ministry of Relief and Rehabilitation

(a) Establishment of a Disaster Co-ordination and Monitoring Unit and Information System

The establishment of a new unit within the Ministry of Relief and Rehabilitation must be seen as being a necessary and valuable development. A specific role must be clearly established and the unit must establish strong links with government organisations as well as NGOs and donor agencies.

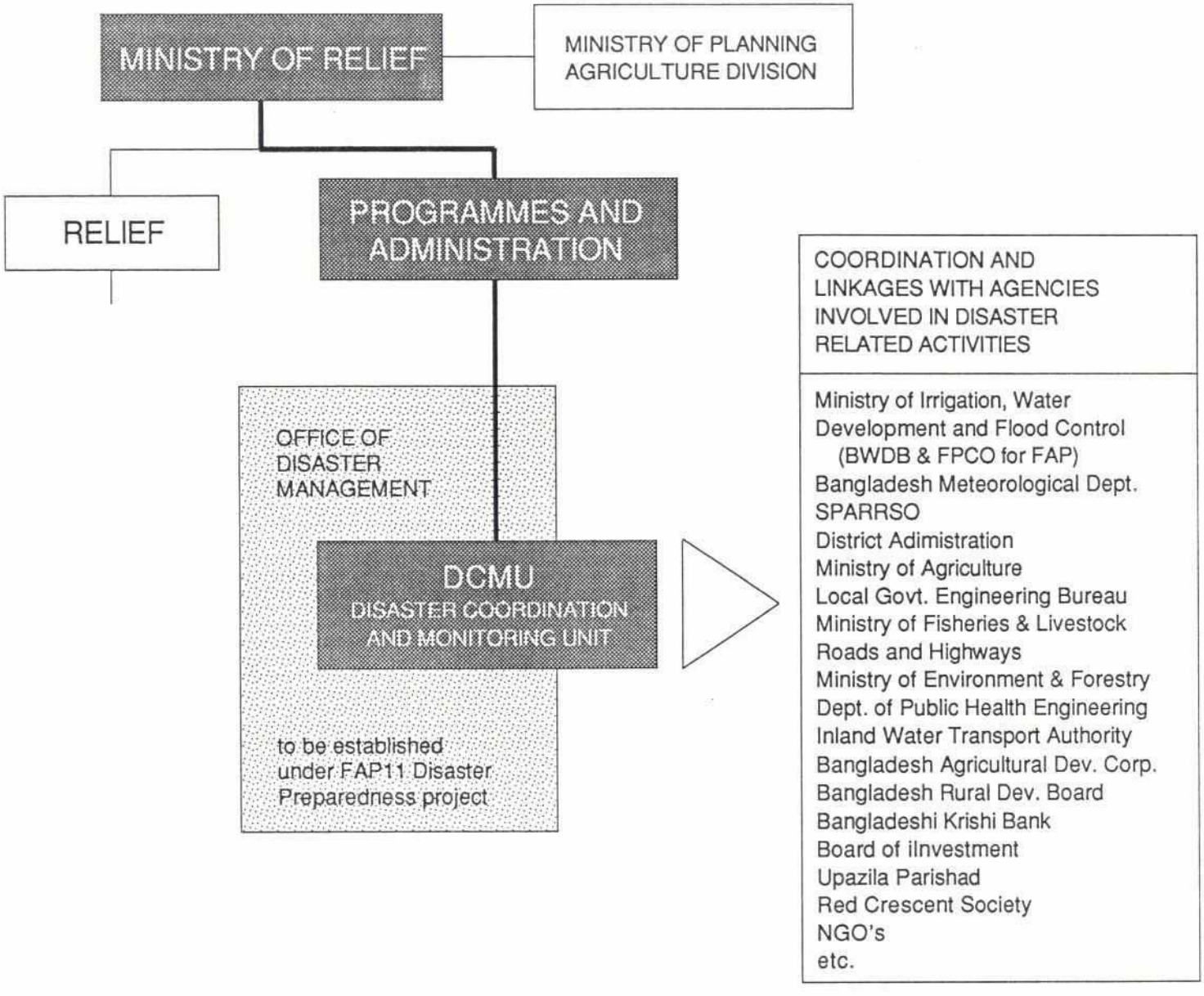
One method of ensuring this is by the establishment of an efficient and effective management information system. Ideally this should be designed to be compatible with, or even linked to, other information systems which have been or will be set up by other organisations.

The management information system must encompass information related to:

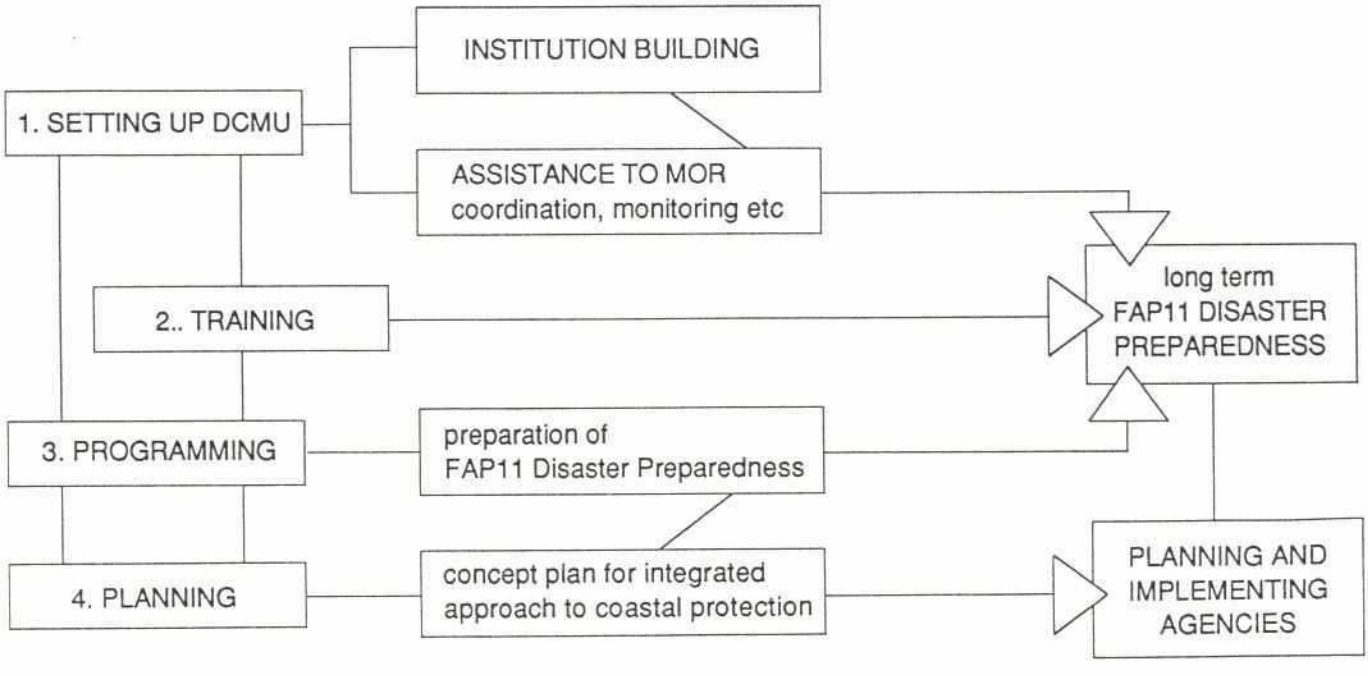
- population centres, their distribution and vulnerability (function or level of embankment protection and afforestation, facilities etc);
- categorisation of coastal areas into coastal mainland, older coastal islands, new chars and islands, newly formed char lands just above high water levels (each will carry a risk weighting; associated population densities must be evaluated/estimated);

Figure 3.1

a) Institutional Framework



b) Generalised Activities



- sources of potable water supplies (including tubewells);
- location, size and condition of cyclone shelters;
- location, size and condition of killas;
- details of civilian and military communication networks with vital links identified, their condition and susceptibility to damage (roads, railways, bridges, airports, helipads and navigable waterways);
- location and condition of Government storage go-downs, their contents and capacities;
- location and condition of private sector storage go-downs, their contents and capacities;
- location and capabilityof commercial airlines, shipping and freight companies (number of trucks, boats, planes, etc);
- military transport capability (trucks, planes, helicopters, boats);
- government personnel and non-government organisations forming a hierarchy of monitoring sources;
- government personnel and non-government organisations responsible for cyclone response activities including military and security adminsitrations (locations, capacities, facilities and response characteristics);
- donor agencies and their representatives (capacities, facilities and response characteristics);
- media organisations and their representatives;
- locations of hospitals, clinics and their administrative and professinal personnel;
- location of sanitation facilities and their senior personnel;
- cyclone warning centres and their linkage to the central office;
- telecommunicatinos register;
- development agencies register (national and international).

During the course of a cyclone and during its aftermath the needs of the affected population will change. It is essential to ensure timely provision of appropriate aid, this requires a highly efficient and responsive organisational structure.

Damage aspects to be monitored and damage assessments made include:

- roads, main and other categories;
- bridges;
- railways;
- telephone communications;
- electricity supply;
- schools;
- hospitals;
- health centres and clinics;
- mosques;
- drinking water supply
- sanitation facilities.

(b) Setting up a Management Information Systems

The previous section has described the type of information that needs to be gathered, stored, analysed and made available to the DCMU and to its users. Other agencies have already started to assemble database systems. For example, a database system has been put together by ADAB, and this needs to be integrated within the system established under the Study. ADAB have indeed been investigating the possibility of linking it to a rudimentary GIS. This has been initiated with a local firm of computer specialsits. The information related to each upazila and each unit is displayed on a screen adjacent to a map of the respective area. The information covered the locations of hospitals, their facilities and the names and telephone numbers of the key medical staff. Other information included the numbers of water supply wells and the location of food storage go-downs. The work was undertaken just after the last cyclone, however it has not yet been developed beyond a demonstration level.

The Consultants will:

- Assess the volume of data requirements for the Unit having first evaluated what data is currently held by other organisations and in what format it is held;

- Assess hardware and software requirements in light of investigation of existing provision within other related organisations in Bangladesh to encourage data transfer/sharing between organisations.

- Examine the need for the unit to have a network with shared printing and software services as well as a common single database system accessible by all rather than having separate versions of the same data.

- Investigate the possibility/desirability of having the unit's computers attached to network(s) within other organisations and thus sharing hardware and software resources.

- Evaluate the possibility of software which accommodates the use of Bangla as well as English.

- Investigate the possibility of having permanent computers for data entry work in district offices with local versions of the same MIS.

The hardware and software to be specified and purchased will be dependent on these considerations.

It is not possible to predict the selection at this stage. However, it is anticipated that the hardware will be a multi-user minicomputer based system using an SQL (structured query language) program to allow easy access to the diverse sources of information.

(c) Gathering Data

The Consultants will examine several options for gathering data including:

- Design and implement data collection from a local level up to the main unit. Development of suitable documentation for each level of collection.

- Organise collection of data to district centres. Entered on local permanent computers or portables. Data uploaded via modem to main centre.

- Data summarised and sent by fax or other more basic methods to main centre.

The gathering of data also requires a reliable communication network whereby the necessary information can be collected and disseminated from and to the cooperating agencies.

In order to establish a reliable communications network the consultants will review and assess existing systems and propose upgrading and extension of those systems as far as is possible within the project budget. The overall objective should be a common standard of communications between all districts and the centre.

This standard should, if possible be equivalent to the highest standard currently available.

To increase reliability consideration will be given to the purchase of power back up facilities (generators). This would be particularly important for the central unit which must remain live at all times.

Possible improvements at district levels could include:

- Fax machines at district level to communicate with central office.
- Modems at district centres with portables for communicating with main central computer operations.

(d) Consolidation of Data

Alternative systems can be considered as follows:

- Entering all data into the main central database either as a result of direct entry from faxes and other paper copies of information.

- Loading data files sent on disk or by modem from district centres which have data entry facilities.

Both (c) and (d) above may well involve a combination of methods and a gradual development to the more sophisticated systems. However the original selection of equipment will allow for such development without making existing equipment redundant.

(e) Analysis and Reporting

The Consultants will:

- Provide reporting/enquiry facilities which allow the user to judge whether provisions available are appropriate in terms of type, volume and location.

- Assessment of suitability of geographical information system for integrating the raw data into a recognisable presentation method. Evaluation of necessary upgrades in hardware associated with this.

(f) Effective Coordination, Monitoring and Planning of Disaster Related Activities

The activities described in the previous sections are prerequisites for effective coordination and monitoring at all stages of a cyclone disaster. If the information can be reliably and rapidly compiled then the tools for coordination are in place.

However coordination requires the establishment and development of working relationships. If the DCMU is to become effective the staff will need to be carefully selected and trained because they need to be excellent communicators both in interpersonal skills and by the ability to present clear, meaningful yet uncomplicated messages both orally and in report form. Since the unit will also need to operate at international level all the senior staff will need to be fluent in the English langauge.

There will be a requirement to work for extended periods under great pressure and difficult circumstances and probably in the glare of the international media. If the unit is to succeed its staff will need to be trained to respond to such pressures and thrive under the high profile exposure. The adoption of a high profile from the outset will be at the core of our approach to effective coordination. There will be a need to meet and consult with many people and organisations in such a way as to enlist their support by ensuring that each organisation gains obvious benefits from the relationship. In every case our methods will be designed to ensure that every organisation gets something it will value from its relationship with the DCMU. This will involve understanding what each organisation needs to function more efficiently and then trying to assist each organisation in obtaining those needs.

The objective must be to bridge information gaps, fill gaps in materials and transport requirements and to bring agencies together where cooperation financially, materially or administratively is possible and logical.

The methods used to achieve these goals will include preparation and dissemination of timely, accurate reports in a clear manner and also the covering of meetings at which representatives of organisations can either put their requests and or identify gaps or surpluses in their needs. Providing the channels to exchange information between agencies is a key to successful coordination.

In all these efforts the application of improved procedures and guidelines for all organisations need to be developed appropriate to their abilities and requirements at each level. These procedures need to be consistent and compatible so that each agency knows what to expect from the DCMU and what the DCMU will expect from the agency. These procedures and guidelines will form part of the materials required for the training programmes.

(g) Preparation of Disaster Related Projects and Programmes

The preparation of projects and programmes requires longer and more detailed consideration. This is the interface between disaster management and national development programmes. The methods to be employed will include identification of missing data, the promotion of surveys and investigations to remedy those gaps and the identification of projects or programmes required to achieve improved disaster management.

The implementation of the methods requires that the relevant executing agencies which can contribute to these programmes are identified and consulted and that project documents are prepared for prospective funding agencies.

The DCMU can act as a catalyst in these endeavours and/or can be directly involved by providing direct inputs to such initiatives.

(h) Coordination of Short Term Repair and Rehabilitation Efforts

This activity directly relates to the 1991 cyclone. It is anticipated that by the time the consultants are in place many projects will already be well advanced but the unit could still provide a useful service by preparation of reports on progress and impact of projects and by identifying any problems which may have arisen. The consultants will also offer advice and assistance in resolving the problems by proposing remedial activities or works by the appropriate agencies.

3.4.3 Review Operation of Existing Procedures for Disaster Management with a View to Improvement of Procedures

(a) Review and Assess Status of Existing Procedures

This activity clearly requires that all disaster procedures, codes, standing orders and forecasting or warning systems are reviewed both in the light of past experience and of the expected future requirements.

The consultants will collect existing documentation and discuss the various elements with the agencies concerned to obtain their own views on how they might be improved. This process will include discussion of suggested changes made by others to endeavour to identify constraints imposed by the organisation's constitution or procedures which the organisation's staff feel unable or unwilling to change.

(b) Recommend Modifications to Improve Procedures

This is a sensitive issue and the DCMU must be seen to offer constructive comment and must not be seen to coerce other agencies. The objective should be to assist in a mutual understanding of what role the organisation wishes to play in disaster relief activities and how its procedures may be made most appropriate to this.

(c) Assess Training Needs, Identify Suitable Institutions for Providing Training in Disaster Management and Initiate In-country Training

The consultants are particularly well equipped to undertake this activity since the Asian Disaster Preparedness Centre is part of the Asian Institute of Technology and has been preparing and running courses of this type for many years. ADPC has connections with other similar institutions in other countries.

Training will be a vital element of the structuring of Disaster Co-ordination and Monitoring Unit within the Ministry of Relief and Rehabilitation

Various aspects of the functioning of the Unit should receive attention with a major emphasis on management and management information systems. Topics which serve as a coverage to the issues will include:

- analysis, forecasting and the preparatory planning related to disaster preparedness;
- management information systems;
- crisis or disaster (event) management;
- logistical support;

- monitoring and evaluation of relief work activities;
- damage assessment in quantitative and financial terms;
- assessment methods in prioritisation of rehabilitation needs;
- formulation of rehabilitation programmes for short term, medium term and long term activities.

The formulation of training programmes and the production of training materials will depend on the training needs assessment which is to be undertaken.

Ideally the Disaster Co-ordination Unit should comprise a number of staff who have proven managerial ability in the 1991 cyclone. This will provide a firm base on which to build a credible disaster management organisation.

Training will be provided to the staff both within country and for short courses overseas. It is envisaged that role playing training sessions will form a focal point of training activities. Due consideration will be given to the adoption of already tried systems such as the disaster management exercise. ATLANTIS which was developed between the Cranfield Disaster Preparedness Centre and the Scientific Centre of IBM (UK). Full use would be made of the training facilities available to the Asia Disaster Preparedness Centre.

Whilst involving participants in the realities of disaster management, the role playing exercise is designed to emphasise the nature and value of disaster preparedness and sound overall management.

Separate training in relation to role playing would be conceived for the provision of training in logistical support requirements and the co-ordination of aid requirements.

In all cases the training at central level would be undertaken with a view for this to be replicated by local staff at the district and upazila levels. Different aspects would need to be covered and different approaches necessary, however, it would assist the recipients of the initial central level training in how they would be able to get similar messages down to field level.

Training sessions would be designed to also accommodate the involvement of NGOs, the Red Crescent and also military personnel. This linkage of the diverse organisations in training sessions would be seen as a vital part of bringing individuals together who might not otherwise meet unless there was a real disaster situation at hand.

Regular training courses and topic discussion sessions would be initiated to ensure that the key personnel in the various groups link together as frequently as possible. This development of personal bonds is considered to be a vital catalyst to the success of the Disaster Co-ordination Unit and will form an essential element in the efficiency and effectiveness of future disaster management activities.

Training in disaster management is a specialised topic, however management training in general is carried out already at several institutions in Bangladesh. These include:

Bangladesh Management Development Centre, Dhaka
Bangladesh Academy for Rural Development
Institute of Business Administration
BRAC (Bangladesh Rural Advancement Committee)
PROSHIKA
Academy for Planning and Development
Bangladesh Public Administration Training Centre (BPATC)
Bangladesh Project Management Institute

Details exist of the courses these institutions provide as well as their cost and frequency. However, apart from perhaps utilising some of the courses available, the organisations would be contacted with the view to utilising their facilities including:

- library facilities
- computer equipment and software
- training and dormitory accommodation
- catering facilities
- reproduction and special equipment facilities (overhead projectors, etc)
- available technical and support staff

Many of these organisations have been set up with a great deal of internal and external support and full use should be made of these establishments. The use of an independent venue for the training sessions would help promote interest by the diverse organisations which it is intended to involve in the training activities.

It is of interest to note that ODA (British Government Overseas Development Agency) are considering initiating a training course for disaster preparedness at the Bangladesh Armed Forces Defence Staff College. This would be more related to disaster response activities which are undertaken by the armed forces. Consideration is being given to the involvement of the South Asia Development Preparedness Centre in this training project. The proposals are currently being formulated and it would be useful to link the training activities with the proposed UNDP Project. The Consultants are maintaining contact with the concerned parties.

3.4.4 Prepare a Comprehensive Project Document for FAP 11 - Flood Disaster Preparedness Project

The DCMU is intended as the precursor of the DCO and the consultants would intend to proceed on the basis that the one should evolve out of the other. However the FAP has many components and is primarily concerned with flood disasters whereas the current project is primarily concerned with

cyclone disasters. This proposal has already indicated (Section 3.4.2) that the unit and its management information systems should be established in an open and flexible way so that they can be readily expanded and developed to incorporate additional functions as and when necessary.

Thus the preparation of the project document will identify what additions are required to the DCMU for upgrade to become an effective DCO which is able to coordinate both flood and cyclone disasters.

The document will identify the additional manpower resources needed. The additional computer hardware and software requirements will be specified. Additional training needs will also be identified. In order for these resources to be mobilised and made effective any necessary additional technical assistance requirements will be specified. The document will also identify whether any alterations are required in the structure of the organisation and what should be its relationship with the Flood Plan Coordination Organisation (FPCO).

The preparation of this paper will require close consultation with the staff of the Ministry of Relief and Rehabilitation, the UNDP office and the FPCO.

3.4.5 Prepare a Conceptual Plan for the Integration of Coastal Cyclone Protection Measures with Works Proposed under the FAP

There are a number of river and coastal embankment projects proposed under the FAP and these are currently under consideration by various teams. The following FAP components include aspects directly relevant to coastal protection works

FAP4 - South West Area Study
FAP5 - South East Regional Study
FAP7 - Cyclone Protection Study
FAP10 - Flood Forecasting and Early Warning
FAP14 - Flood Response Study

These Flood Action Plan components will provide a range of proposals for flood protection and mitigation and it will be essential that the separate needs of coastal areas for a degree of protection from both cyclone damage as well as from flood damage is considered in an orderly and rational manner.

It is imperative that the scheduling of the various components provides a rational sequence of activities which will result in the most cost-effective measures which can be devised taking into account the budgets available.

Protection from river derived floods may be achieved by relatively modest embankment levels with limited protection but cyclones and their associated tidal surges require different standards of protection and different embankment designs. The DCMU will be well placed to ensure that such conflicts are understood by all parties and that appropriate action is taken to avoid conflicts. The preparation of a paper identifying potential problems and recommending a conceptual plan for an integrated approach is therefore an essential element in prioritising investment projects and in ensuring effective solutions for critical locations.

During the 1991 cyclone the existing coastal embankments were hit by surges of 4 to 5 m high coupled with waves generated by 200 kph winds. Over 1 000 km length of embankments were reportedly affected.

There is a demand that all coastal embankments are heightened to provide greater levels of protection. Increases of 2 m have been proposed in the Sheba Report. Such rehabilitation work would be extremely costly and probably of doubtful effect. This would need to be investigated by the coastal engineer on the study and his recommendations will be incorporated into the conceptual plan.

3.5 Detailed Work Plan

It is intended that the Team Leader would spend the first month in Dhaka together with the Local Disaster Management Specialist who has been introduced into the International Consultants Team. With the managerial skills and energy of the Team Leader and the Local Disaster Management Specialist's recent intimate knowledge of disaster related organisations and personalities it can be guaranteed that the Project will get off to a dynamic start.

Once the Local Consultants have been selected the Team Leader in association with the Local Disaster Mangement Specialist and the Co-Team leader of the Local Consultants will finalise the activities programme and the staffing schedule.

The intention would be to introduce the entire expatriate consultancy team into the project within 2 weeks of the appointment/mobilisation of the local consultants. During the initial period the Team leader and Local Disaster Mangement Specialist would make contact with most government, donor, NGO and military personnel seen as being focal to the eventual activities of the proposed Unit. In the period prior to the arrival of the short-term expatriates and the fielding of the local team, a collation of relevant reports and documentation would be undertaken to establish the basis for a library within the Unit.

The detailed activities schedule is shown in Figure 3.2. This figure links the preparation of reports to the various activities to be undertaken and the timing of these reports also dictates the timing of most of the consultants inputs which are shown on Figure 4.1 (see Chapter 4). The allocation of tasks amongst the consultants team members (both local and foreign) is shown in a responsibilities chart (Figure 3.3).

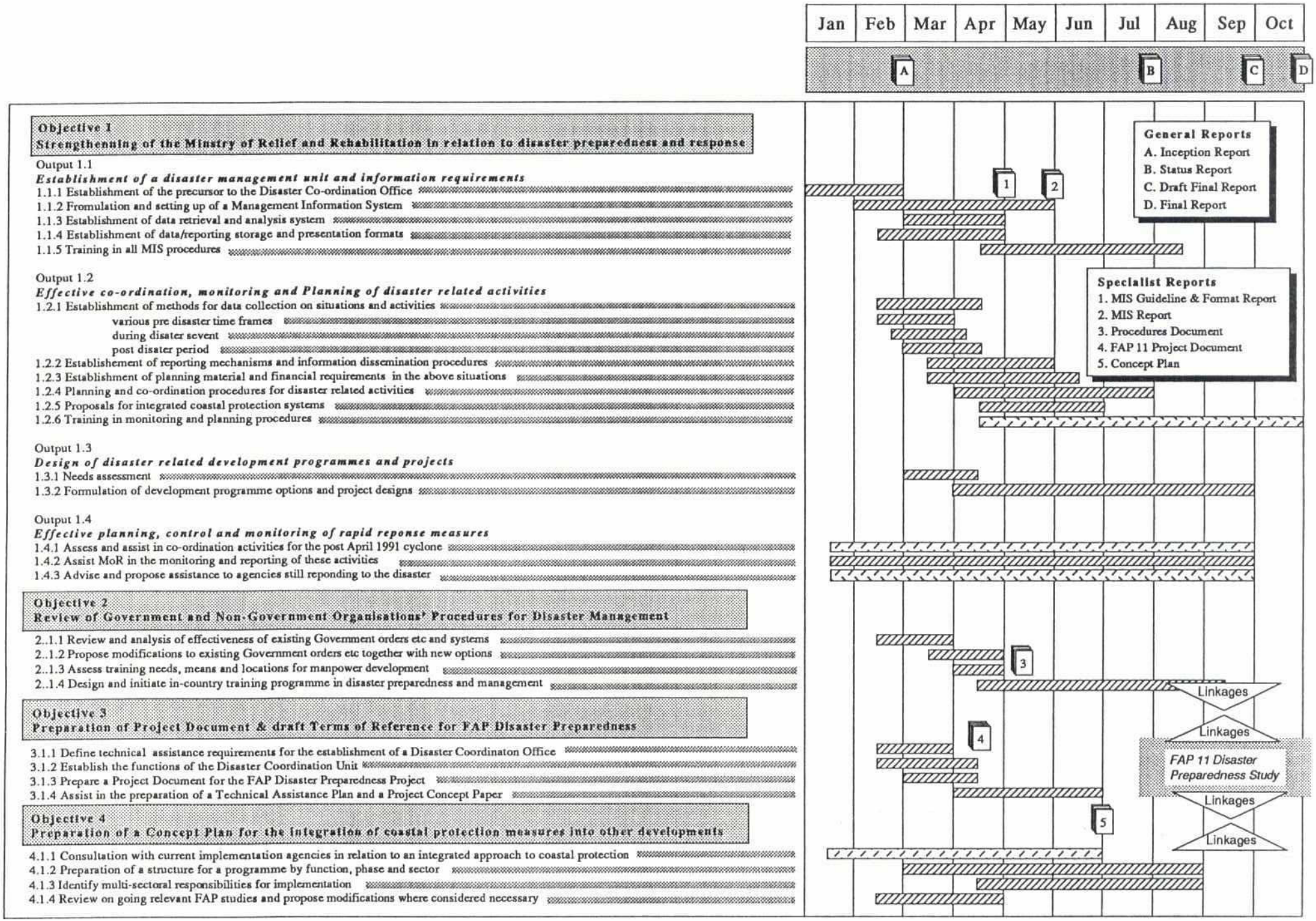


Figure 3.2
Activities Schedule

Figure 3.3

Staff Responsibilities Chart

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There is a need to specify and order both computer equipment for the MIS/GIS systems and communications equipment for the transfer of information and data at the earliest possible time. Unless this is done the equipment will arrive too late in the programme to enable delivery, development of the MIS, and training of staff within the 10 month programme. We have therefore proposed that both an MIS specialist and a telecommunications specialist arrive early in the programme to review the requirements and produce comprehensive specifications for this equipment (software and hardware). The MIS specialist would then return to the project when the equipment has arrived and together with the MIS training specialist and their counterpart will develop the system and prepare the Reports 1 and 2.

The MIS training specialist will complete the staff training in the use of the developed system. The MIS specialists will also prepare specifications for further upgrading and expansion of the system under FAP 11.

The inputs of the coastal engineer are scheduled to provide timely production of the concept plan (report 5) and to have an input in the FAP 11 project document (Report 4).

All members of the team will be involved in preparation of report 3 and the final reports but the two most important inputs in this respect will be those of the Team Leader and Disaster Management Specialist and their local counterparts.

It is emphasised that at all stages the consultants would work as an integral part of the DCMU alongside the permanent staff members so that they develop their capabilities as the Unit is established.

Personnel

Mott MacDonald

CHAPTER 4

PERSONNEL

4.1 Proposed Staffing

4.1.1 Introduction

The invitation documents make clear that the staff selected for this assignment require extensive experience in the South Asia Region.

In our view the short duration of the study and the very substantial work programme make it essential that members of the team, in every discipline should have experience in Bangladesh. This factor has been central to the selection of our team for this assignment.

The team's curriculum vitae are given in Appendix I and brief descriptions are given below.

4.1.2 Team Leader - M P Gillham

Mr Gillham has gained extensive experience in Bangladesh during the last 11 years and as can be seen from his curriculum vitae has worked for various Bangladeshi organisations. An important quality Mr Gillham will bring to the assignment is his boundless energy and enthusiasm. He has exceptional managerial capability and has helped develop many institutions in the past. In particular he played an important role in the development of the Local Government Engineering Bureau from what was the Works Programme Wing. He provided untiring support to the organisation which strengthened the Bureau into what it is today. As a result of his various assignments in the country Mr Gillham is already well known to many of the Senior Bangladeshi Government Officials.

4.1.3 MIS Specialist - S L Marsden

Mr Marsden is head of the Mott MacDonald computer services division with many years experience in the selection of computer equipment for engineering offices and institutions all over the world. He has also been extensively involved with development of databases and management information systems for many organisations and for a wide variety of purposes. He has recent experience in Bangladesh where he has been advising the World bank on the MIS systems to be used by the Flood Plan Coordination Organisation and is thus familiar with the proposals for development of a Disaster Coordination Office.

4.1.4 MIS Training Specialist - J Y David

Mr David has spent his entire career in teaching, training and computer systems development. He has extensive recent experience in the development and analysis of systems specifically created for disaster management orientations. His mixture of experience makes him ideally suited for the development and training of the DCMU staff on this assignment.

4.1.5 Disaster Management Specialist - R F Ockwell

Mr Ockwell has spent almost his entire career either as a disaster management operative or as a consultant to disaster management organisations. He has extensive experience in a wide variety of countries.

His recent experience in Bangladesh and in preparation of several handbooks and manuals for disaster workers and managers including those for UNDRO and UNICEF make him ideally suited to the work of preparing improved guidelines and procedures for disaster management in Bangladesh.

4.1.6 River and Coastal Engineering Specialist - M L A Brett

Mr Brett has worked in many countries including Bangladesh in recent years. He has considerable experience in coastal works and in tidal estuaries. His knowledge of the coastal area near Chittagong will be especially useful in this assignment. He has frequently been involved in the preparation of detailed reports for operation and maintenance of river structures and embankment systems and has encountered many different types and designs of embankment protection.

4.1.7 Local Disaster Management Coordinator - M S Rahman

Mr Saidur Rahman has spent his entire career in disaster relief work as relief worker, as a manager and as national director for highly regarded national and international NGOs in Bangladesh. He has travelled widely and has acquired an exceptionally broad understanding of how government and non-government agencies work in Bangladesh. He is widely known and respected in Bangladesh and his understanding of the coordination problems, about which he has written many papers, will prove invaluable in enabling the team to make rapid progress at the beginning of the assignment.

4.1.8 Visiting Specialists

The terms of reference indicate that there may be a requirement to supply additional short term consultants (5 months) during the assignment.

We have identified a number of disciplines which we believe may be required and have included some sample curricula vitae to demonstrate the standard of consultants available. Again many of these staff have considerable experience in Bangladesh and all of them are highly regarded in their fields of expertise:

Mr Don Moore is currently Mott MacDonalds resident director in Bangladesh and is widely known and respected for his local experience and his broad knowledge of both flood and cyclone disasters.

Mr Brian Ward is currently the director of the Asian Disaster Preparedness centre with unrivalled experience of disaster management.

Mr David Sorrill has exceptional experience of sheltered housing for disaster areas and has substantial Bangladesh experience.

Miss Marion Glazer also has extensive experience in Bangladesh and is highly respected socio-economist and women's issues specialist and is well known to the ODA.

Mr Michael Wilcox has extensive experience of telecommunications in several countries including Asian countries.

Mr Robin Wardlaw is a highly respected hydrological and computer modelling specialist with extensive and recent experience in Bangladesh.

All these specialists are currently available and the combined resources of the Mott MacDonald Group and the Asian Disaster Preparedness Centre can produce a wide variety of specialists for many other disciplines at short notice.

4.2 Staff Scheduling

The Terms of Reference make clear that at the proposal stage the work plan and staff scheduling must be considered as indicative and the consultants are prepared to be highly flexible in respect to staffing. There are two reasons why such flexibility is essential.

Firstly until the local consultants (36 months) are selected and the panel of experts (24 months) has been decided it will not be possible to identify which areas of expertise are required to support and supplement the team.

Secondly the TOR further indicate that another 30 months of specialist inputs will be required by a variety of visiting consultants. Thus, in total, the 23 months of consultancy presented in this proposal will be supplemented by a total additional 95 months of local consultants and specialist consultants in a wide variety of disciplines. All these inputs will need to be decided in a relatively short space

of time in agreement with the Ministry of Relief and the UNDP. This will require a high degree of flexibility and mutual understanding by all parties. The tentative staff schedule is shown in Figure 4.1 and the rationale for the distribution of inputs is explained in section 3.5 of Chapter 3. All the core team must be in place to produce the reports for which they bear the principal responsibility and this largely dictates the present arrangements of the inputs. However a number of items will be dependent on matters outside the direct control of the consultants.

The inputs relating to the development and training for MIS/GIS will be dependent on the timely arrival of that equipment since until it is in place only a limited amount of work can be usefully done on development of the systems.

The timing of the inputs relating to the preparation of a project document for FAP 11 must be arranged, as far as possible, to fit in with the requirements of the Flood Action Plan and the Flood Plan Coordination Organisation. However there are limits as to how early this paper can be prepared since there must be adequate time to review documents, research the relevant issues and to consult the appropriate organisations. The timing shown in our work programme is thought to be possible but again the consultants are prepared to be flexible.

4.3 Selection of Local Consultants

The assignment requires that the foreign consultants team leader shall agree the detailed terms of reference for the local consultants based on those presented in the invitation document and reproduced in Appendix III of this proposal.

The TOR also clearly indicates that the selection of the local consultants and contractual arrangements shall also be completed within one month of the team leaders mobilisation. It is assumed that this selection will also include the provision of many of the short term specialist inputs so that a more definite work plan can be prepared in time for the inception report.

As we have already stated in Section 1.1.4 of Chapter 1, Mott MacDonald International have extensive experience of working with many of the nominated local consultants and our regional director, Mr Don Moore, and the team leader, Mr Martin Gillham, know many of their directors and senior staff.

Thus we believe that it will be possible to assemble a team of local consultants which will perform at a high standard. However, we would suggest that it may be desirable to use more than one firm if the most appropriate selection of consultants is to be assembled and we have prepared such consortia successfully for other projects in the past.

Description of Personnel Inputs	Name	Inputs Man-months
Foreign Consultants		
Team Leader	**M P Gillham**	10
Management Information Systems Specialist	**S L Marsden**	3
Management Information Systems Training Specialist	**J Y David**	3
Disaster Management Specialist	**R F Ockwell**	3
Coastal and Hydraulic Engineering Specialist	**M L A Brett**	2
Local Disaster Management Coordinator	**M S Rahman**	2
	Sub Total:	23
Additional Short Term Consultants (to be agreed)		
Disaster Management Specialist	**B Ward**	
Shelter Housing Specialist	**D Sorrill**	
Womens Issues Specialist	**M Glaser**	
Telecommunications Specialist	**M Wilcox**	
Hydrology Specialist	**R Wardlaw**	
Coordinator	**D Moore**	
	Sub Total:	5
Local Consultants [Selected by GOB/UNDP/TL]		
Co Team Leader	TBN	9
Disaster Preparedness Specialist	TBN	9
Rural Infrasructure Specialist	TBN	9
Natural Resources and Environmental Specialist	TBN	9
	Sub Total:	36
Professional Panel Specialists [Selected by GOB/UNDP/TL]		
Water Resources Specialist	TBN	4
Natural Resources Specialist	TBN	4
Social Institutions Specialist	TBN	4
Communication Specialist	TBN	4
Economist	TBN	4
Hydraulic Engineering Specialist	TBN	4
	Sub Total:	24
Visiting Consultants (to be detailed during Project execution)	Sub Total:	30
possible disciplines: *Disaster Management, Flood Control, Environment, Socio-Economics* *Hydology and Meteorology, Mass Communications etc.*		
Inputs by Foreign Consultants (man months):	(23+5)	28
Inputs by Visiting Consultants (man months):		30
Inputs by Local Consultants (man months):		36
Inputs by Panel Specialists (man months):		24
	Total (mm)	118

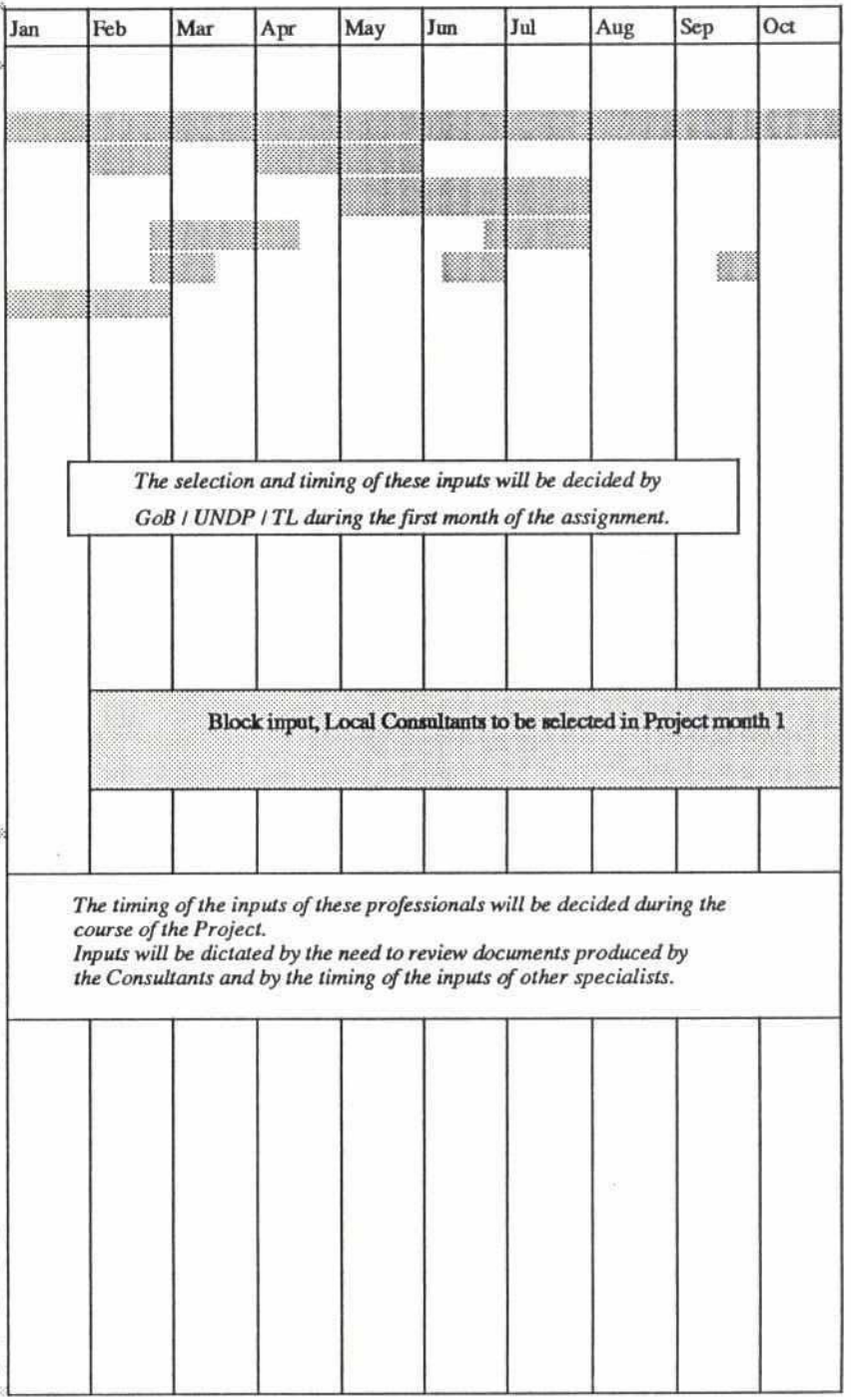

Figure 4.1
Staffing Schedule

Logistics

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CHAPTER 5

LOGISTICS

5.1 Office Support Services and Facilities

It is understood from UNDP that the Office which the consultants will use will be near the Ministry of Relief and Rehabilitation in Dhaka, probably in the area of Lalmatia or Dhanmondi. It is planned that this office is acquired shortly and that the office would be available fully furnished and equipped for the immediate use of the Consultants. This arrangement is believed to be under the control of UNDP in Dhaka.

Office staff could be employed directly by UNDP, however the Consultants would prefer to appoint and employ the staff directly since this will provide a greater degree of control. This would be organised by the Team Leader on his arrival in Dhaka. Financial provision has been made in the proposal assuming the consultants employ the support staff as listed below.

- 1 Office Manager/Administration Assistant
- 1 Senior Secretary/Computer Operator
- 2 Secretaries/Wordprocessors
- 4 Drivers

In the initial period of the Consultancy, if the office is not functional, then it would be possible for the Team Leader and Local Specialist to make use of the regional office of Mott Macdonald International in Gulshan. The office has several computers with comprehensive software packages, full office facilities including 3 telephones and a fax. Secretarial and transport facilities are also available for the initial days until UNDP transport is organised and the unit's support staff are recruited.

The availability of these facilities will ensure that there is no impediment to the immediate effectiveness of the Consultants staff.

The financial proposal includes provision for office running costs including international communications.

5.2 Transport

As indicated in the previous section, it may be necessary to hire transport in the initial period of the study. However, no financial provision has been made for this since it is hoped that UNDP will be able to provide temporary transport until final arrangements have been made and new vehicles delivered.

It is believed that OPS UNDP New York have already placed an order for four vehicles and that they will be delivered early in the New Year.

This proposal has assumed that the consultants would be responsible for the running costs of the vehicles during the assignment.

5.3 Equipment and Materials

It is understood that the offices which are being set up through the UNDP in Dhaka will be fully equipped with furniture and other normal office equipment including an A3 photocopier with collating facility, overhead projector, large plan printer, telephone and fax machines. It is hoped that most of the equipment will be available at the start of the assignment. However the TOR clearly indicate that the computer equipment is to be specified by the consultants and will therefore not be available for about three months. However, as indicated above, the Mott Macdonald regional office could provide rented equipment on a temporary basis as required. No financial provision has been made for this in this proposal.

In relation to computer equipment, we recommend that this should be procurred through a local company to ensure that a maintenance contract can be arranged. Since the equipment is intended for eventual use by staff of the Ministry, it is essential that the equipment can be supported locally through Taka expenditure.

All office supplies will be obtained locally and provision has been made for this in the financial proposal.

5.4 Accommodation

The short term international consultants would be accommodated in Gulshan at a rest house provided and maintained by Mott Macdonald International. The team leader and his family will be accommodated in a rented house.

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Appendix I

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APPENDIX I

CURRICULA VITAE

The Curricula Vitae for the consultants nominations are presented in the following order:

Post	Name	Company
Foreign Consultants		
Team Leader	M P Gillham	MMI
Management Information Systems Specialist	S L Marsden	MMI
Management Information Systems Training Specialist	J Y David	ADPC
Disaster Manager Specialist	R F Ockwell	ADPC
Coastal and Hydraulic Engineering Specialist	M L A Brett	MMI
Local Disaster Management Coordinator	M S Rahman	MMI
Additional Short Term Consultants (to be agreed)		
Disaster Management Specialist	B A O Ward	ADPC
Shelter Housing Specialist	G D Sorrill	MMI
Womens Issues Specialist	M Glaser	MMI
Telecommunications Specialist	M R Wilcox	MMI
Hydrology Specialist	R B Wardlaw	MMI
Co-ordinator	D N Moore	MMI

MARTIN P GILLHAM — **Team Leader**

Nationality	British
Year of Birth	1941
Profession	Civil Engineer
Specialisation	Project Management, Rural Development, Drainage and Flood Control, Water Resources and Monitoring and Evaluation
Position in Group	Divisional Director Mott MacDonald Water & Land Development Ltd
Year of joining Group	1962

KEY QUALIFICATIONS

Specialisation in project management, particularly related to rural development, relief programmes and drainage and flood control projects. As a Divisional Director he has extensive experience of managing overseas projects. He has worked on numerous assignments in Bangladesh, Indonesia, Nigeria and most recently Pakistan. Most relevant to this assignment is his long involvement in rural development and post flood relief work in Bangladesh from 1980 to 1988. From 1985 to 1988 he was Secretary of a group of relief organisations and NGOs in Dhaka.

EDUCATION AND PROFESSIONAL STATUS

BSc, University of Birmingham, 1962

Fellow of the Institution of Civil Engineers

Fellow of the Institution of Engineers (Bangladesh)

Member of the American Society of Civil Engineers

EXPERIENCE RECORD

1989 - present **MOTT MACDONALD GROUP**
(formerly Sir M MacDonald & Partners)

1989 - present **Divisional Director**

1991 - present **Drainage Engineer,**
Pakistan Sectoral Environmental Assessment/National Drainage Programme

Assisting local consultants with the assessment of the environmental impact of 30 years of drainage project development in Pakistan and the formulation of a 25 year National Drainage Programme.

1989 - present **Team Leader, Pakistan**
Study from Lower Indus Right Bank Master Plan

Leading a multidisciplinary team of up to 55 expatriate and Pakistani consultants and up to 60 government staff in the preparation of a master plan for the agricultural development of some 2 Mha. The two year study, funded by ODA UK, focused on the integration of irrigation and drainage facilities and in particular measures to combat internal flooding. Feasibility studies for key projects identified for implementation in the first phase of development were also prepared.

1989 **Organisation and Management, UK**

Following creation of Mott MacDonald with some 3 000 employees world-wide, reviewed staffing structure and classification, appraisal system and general conditions of employment throughout the company. Prepared the framework for a management information system with particular reference to manpower utilisation. In addition, he provided general assistance to the Director responsible for South Asia including head office technical and administrative back-up for projects in this region.

1988 **Consultant, Bangladesh and FAO Rome**
Final evaluation of Irrigation Management Programme (BRD/83/007)

Assisted by a Bangladeshi consultant and a team of field investigators, carried out an evaluation of the Irrigation Management Programme (IMP), which is a major component of the World Bank (IDA) supported Rural Development II Project. Mr Gillham formulated institutional support requirements both for the organisations involved in the overall programme as well as institutional arrangements to help ensure an equitable distribution of project benefits.

1988 **Team Leader, Indonesia**
Irrigation Sub-sector Project

Led a team of expatriate and Indonesian engineers preparing preliminary designs and assessments for approximately 50 ongoing projects, including those under the Second Provincial Irrigation Project, involving some 100 000 ha, in the improvement and flood protection projects and swamp improvement projects.

1986 - 1988 **Supervising Consultant, Bangladesh**
Rural Employment Sector Programme

Was responsible for supervising the firm's technical input to this rural development programme which is funded by SIDA and NORAD and, since July 1987, in co-operation with Swedish Consultant Hifab International AB. This is a follow-on from the Intensive Rural Works Programme.

Specific activities involved proposals for review of local government administration with respect to rural infrastructure as well as for action research on Management Operation and Maintenance of small rural development projects.

As Supervising Consultant on the Rural Employment Sector Programme (RESP) and the Intensive Rural Works Programme (IRWP) assisted institutional strengthening and establishment of national training programmes in Bangladesh for the Local Government Engineering Bureau.

Also responsible for the recruitment, administration and training of more than 400 technical assistance staff, including professional engineers.

Whilst in Bangladesh in the capacity of both the Project Manager and the major rural development project and as representative for Sir M MacDonald & Partners was responsible for the mobilisation and management of the resources of both organisations to give assistance during the various disaster events which occurred in the country during the period of his residence in the country.

Mr Gillham provided invaluable management and logistical support to relief efforts working closely with both government and non-government agencies. This was particularly effective in the north-west region of the country where severe flooding problems were experienced in the 1987 monsoon season.

In 1987, special financial sanctions were provided by the donors which were translated into emergency relief aid. An immediate programme of rehabilitation and reconstruction was undertaken based on-field level assessments of damage. This meant reprogramming normal development work and was all undertaken in close co-operation with the various government agencies.

1986 - 1988 **Team Leader/Management and Training Specialist, Bangladesh**
Rehabilitation of Water Development Projects

Responsible for the firm's input on this assignment for the Bangladesh Water Development Board. The project involved rehabilitation of 21 sub-projects of different types - many of which were in costal areas where rehabilitation of coastal embankments received particular attention owing to their vulnerability to storm damage. This problem was aggravated by their remoteness. Methods of involving the local population in their maintenance and annual repair was studied as well as various means of providing protection by using revetments and through the use of vegetation such as mangrove development. Also prepared reports covering the organisation of sub-project operation and maintenance after rehabilitation and the training of personnel concerned.

1985 - 1988 **Secretary, Donor Agency Local Consultation Group, Bangladesh**
Sub-group on Rural Infrastructure

Acted in the above capacity at the request of SIDA which acts as Chairman of this sub-group. Has, inter alia, prepared a paper on the Organisation and Management of Small Scale Water and Irrigation Schemes. Also established close relations with all donors active in the area including World Bank, UNDP, CARE, RDRS, World Food Programme and USAID, as well as national non-government organisations.

1984 - 1987 **Resident Representative, Bangladesh**

Responsible for the activities of the firm in both Bangladesh and Burma to the Partner-in-charge.

1984 - 1987 **Monitoring Specialist, Bangladesh**
IDA Deep Tubewells II Project

Provided short inputs to this project with the Bangladesh Agricultural Development Corporation on the development of a physical monitoring and evaluation system. Inventory and report systems were formulated.

1984 - 1986 **Supervising Consultant, Bangladesh**
Intensive Rural Works Programme

Was responsible for supervising the firm's technical and administrative support which included up to eight expatriate staff and some 300 Bangladeshi nationals to this SIDA, DANIDA and NORAD funded rural development programme that covered 40 upazilas. This programme aimed to alleviate flooding and improve the basic infrastructure. Amongst other studies carried out by the firm's staff were reports on Operation and Maintenance of Water Schemes at upazila level and on all Local Government Engineering Bureau training activities.

1980 - 1984 **Development Specialist, UK and Bangladesh**
Intensive Rural Works Programme

Made numerous visits to Bangladesh in connection with the Intensive Rural Works Programme in Faridpur, Mymensingh and Rangpur Districts. Specific duties included:

- co-ordination of 19 local consultancy firms engaged in programme planning studies;
- review of flood control, drainage and irrigation projects proposals;
- the preparation of a detailed report on programme monitoring.

In addition, he was responsible to the senior partner, and was responsible for co-ordinating and managing many of the firm's projects. In this position he made visits to: Cameroon, Burma, Barbados, Ivory Coast, India, Canada, Kenya, Iraq, Guyana, Niger, Jamaica, Tanzania, Trinidad, Uganda, Zimbabwe and Greece. Made regular contact visits to EDF (Brussels), FAO, IFAD, (Rome) and UN agencies in Geneva.

1980 **Planning Engineer, Bangladesh and UK**
Kushtia, Jessore, North Faridpur
Integrated Agricultural Development Project

Responsible for all engineering aspects of this groundwater irrigation development project financed by IFAD. Special emphasis was placed upon the channelling of project benefits to the rural poor.

1979 - 1980 **Chief Engineer, Nigeria**
Various Projects

Co-ordination of the works being jointly undertaken with the local associates, Enplan Group of Lagos.

1979 **Irrigation Adviser, Burma**
Groundwater Exploration and Pilot Development Project

Carried out a four-week assignment in connection with this UNDP financed project, prepared training notes on irrigation design and management and gave lectures to Burmese project staff on these topics.

1978 - 1979 **Project Engineer, UK**
Projects in Nigeria and East Africa

Appointed an Associate of the firm in April 1978.

Deputy to the Partner responsible for the firm's work in Nigeria. In this capacity, prepared a number of proposals for new work in Nigeria and made frequent short visits to that country and also visited Niger and the Ivory Coast.

1975 - 1978 **Project Manager, Nigeria**
South Chad Irrigation Project

Responsible for supervision of construction of seven contracts, totalling US$ 100 million in value, for the 23 000 ha Stage 1 of the project on behalf of the federal government executing agency, the Chad Basin Development Authority. Duties involved close liaison with clients and contractors, and included the preparation of detailed organisation and management proposals for the development authority.

1975 **Senior Irrigation Engineer, Nigeria**
Bakolori Project

Participated in a review of the design of the Bakolori Project, a 30 000 ha irrigation project on undulating sandy soils.

1975 **Senior Irrigation Engineer, Nigeria**
Taraba Project

Was engaged on this pre-feasibility study of an area of 20 000 ha based upon the Taraba River in the North-Eastern state.

1973 - 1975 **Deputy Project Manager and Project Manager, Nigeria**
South Chad Irrigation Project

Engaged on the feasibility study of the second (western) area of the project. Responsible for running most of the field studies and for the preparation and editing of the engineering sections of the report. In 1974 appointed Project Manager in charge of the study team for a third (eastern) area on the same project. This involved a full feasibility study of 28 000 ha to give a total area of 66 000 ha net for the whole project.

1971 - 1973 **Senior Irrigation Engineer, Nigeria**
Lake Chad Irrigation Project

Responsible for the organisation of all engineering surveys and site investigations. Also had responsibility for the collection of data for infrastructural works and the hydrology of Lake Chad. In 1972 returned to London to complete the Feasibility Report for presentation to FAO and the Nigerian Government.

1970 - 1971 **Chief Assistant to Project Manager, Iraq**
Lower Khalis Irrigation and Drainage Project

Member of the project team for a feasibility study of intensive irrigated agricultural development over an area of 90 000 ha close to Baghdad. Participated in the overall planning of the project and administration of the investigation. Had special responsibility for hydrology and irrigation and carried out the operation study for the assessment of available water supplies and their utilisation in the entire Diyala river basin. Prepared detailed planning of the irrigation distribution system and operation and maintenance requirements, and was responsible for the planning of all infrastructure works and preparing cost estimates.

Completed the feasibility report under preparation for appraisal by IBRD in the UK.

1969 - 1970 **Technical Adviser, Iraq**
Mandali Irrigation Project and Others

As assistant to the firm's Resident Representative, engaged on technical matters connected with various projects.

Then assigned to the supervisory staff of the Mandali project. Construction on this pumped irrigation scheme had recently commenced under the supervision of Iraq Government engineers. Posted as an Adviser to the Government Staff on technical matters occurring during the course of construction. Particularly concerned with the initial stages of the pump station construction.

1967 - 1969 **Commissioning Engineer, Iraq**
Dalmaj Irrigation Project

Engaged on the final stages of construction and for the commissioning and initial operation of the Mazzaq canal system. Personally supervised all performance tests and took a close interest in the operation of all parts of the scheme, proposing modifications where necessary to meet specific local requirements and advising the local operating authority of methods to achieve the maximum efficiency from the system.

1966 - 1967 **Assistant Resident Engineer, Iraq**
Diyala Irrigation Project

Appointed to the site supervision staff on construction of the Diyala barrage, was responsible for the supervision of setting out of the earthworks and foundations of this major river diversion structure across the Diyala River. During his period of duty at Diyala many of the critical phases of construction were carried out, including the temporary river diversion arrangements.

1965 - 1966 **Assistant Resident Engineer, Iraq**
Dalmaj Irrigation Project

Supervision of construction of the Mazzaq canal and drain system. The particular contract included the head regulator, numerous small regulators and other hydraulic structures and a system of unlined irrigation distribution and drainage channels. Duties included responsibility for the correct setting out of the works, for inspection and testing of materials and for measurement of the completed works for payment purposes.

1962 - 1965 **Assistant Engineer, UK**
Irrigation Projects in Iraq

Engaged initially on design of irrigation projects. Gained experience on design of all types of irrigation distribution works including both large and small canals, major hydraulic structures and small regulators and minor canalisation and drainage layout designs. Also assisted in the preparation of contract documents for a number of different works and was particularly concerned with the calculation of earthworks quantities using computers.

LANGUAGE CAPABILITY

English : Mother tongue

SIMON L MARSDEN **Management Information System Specialist**

Nationality	British
Year of Birth	1953
Profession	Civil Engineer
Specialisation	Computer Applications, Mathematical Modelling
Position in Group	Senior Engineer Computer Services Manager
Year of joining Group	1977

KEY QUALIFICATIONS

Head of Computer Services at the Group's international head office. Responsible for formulating and implementing the firm's policy for future development of its computer systems, procurement, software development and user support including in-house training of engineers and support staff. This encompasses the development of integrated data and voice networks. Responsibilities also include consultancy for external clients. Extensive engineering experience in the UK and overseas water industry.

EDUCATION AND PROFESSIONAL STATUS

Chartered Engineer

BSc, Civil Engineering, University of Southampton, 1975

MSc, Irrigation Engineering, University of Southampton, 1976

Member of the Institution of Civil Engineers

Panel Engineer to the British Hydromechanics Research Association

EXPERIENCE RECORD

1977 - present **MOTT MACDONALD GROUP**
(formerly Sir M MacDonald & Partners)

1985 - present **Computer Services Manager**

Responsible for providing the computer services required by engineering and administrative staff in both the UK and overseas offices. The scope of this work demands a thorough involvement with all aspects of software and hardware used within the Group.

Mr Marsden has been responsible for devising and implementing the Group's Information Technology strategy. The main thrust of this strategy has been the effective use of networked microcomputers whilst retaining mini computers for appropriate tasks. The network currently has more than 500 PCs connected in 10 offices throughout the UK. The networking has been provided using Novell Netware for the PCs with support for TCP/IP to give access to Prime, Digital (Vax), and Hewlett Packard mini computers together with Unix workstations from Sun and Digital. Wide area communications use leased lines with multiplexed data and voice.

Services provided over the network using a combination of standard and in-house software, include:

- A unified wordprocessing system, spreadsheets, presentation graphics, and desktop publishing;
- Communications with telex, fax and electronic mail facilities provided at every workstation;
- Computer aided design and drafting;

- An extensive management information system developed in house using structured query language databases;
- Accounting with access and data entry distributed to divisional level.

The firm has an extensive library of specialist engineering software, largely written in-house, which is maintained and updated under the supervision of the Computer Department. Much of the recent development has involved use of multidisciplinary teams comprising, modelling specialists, computer scientists and graphic designers to enhance and update proven algorithms from existing mini computer applications and make them available on PCs. These specialist teams have been formed on a project basis under the management of the Computer Department. Within this work Mr Marsden has developed a special interest in the use of computer graphics in role playing and management training.

Mr Marsden directs the user support group which is responsible for the day-to-day running of the computer and telephone systems. The team covers first line support, procurement, maintenance and trouble shooting for all the firm. He supervises and directs in-house computer training programmes for engineers and support staff at all levels. Beginners' and advanced courses are held on a regular basis for training in word processing, spreadsheet, database and DOS.

The following recent projects in which information technology and Management Information Systems are important elements have been directly supervised by Mr Marsden:

Flood Action Plan Co-ordination, Bangladesh - Carried out an information technology review for the Flood Plan Co-ordination Organisation. The existing situation with regard to computer and software use by FPCO was investigated and recommendations made for future development. The basis for future development was to maintain/establish compatibility with other units (Flood Action Plan Project teams, etc) to ensure ease and speed of data transfer.

Central and West Java Irrigation Projects, Indonesia - Advising the Ministry of Irrigation at national and provincial level on implementing a distributed Management Information System for physical and financial progress control as well as all aspects of computer use, training and development within the organisations.

Rehabilitation and Improvement of Water Delivery Systems in Old Lands, Egypt - This US$ 30 million project funded by UNDP to optimise the use of Egypt's limited water supply required tailoring of the firm's existing programs. The training of counterpart staff in the use of this specialist software was an important part of Mr Marsden's input.

Surface Water Simulation Modelling Project, Bangladesh - For this input Mr Marsden was working on secondment for the World Bank. He was directly responsible for supervising the work of teams of consultants developing mathematical models to simulate the behaviour of river systems in Bangladesh.

Surabaya Unaccounted Water Control Project, Indonesia - He adapted the firm's pipe network analysis program to suit the project requirements and to make it simple to use with the inclusion of a graphical user interface. Training of other team members, both international and local consultants, and Client's staff was carried out.

The Great Man-Made River Project, Libya - Developed a mathematical model of the conveyance and control system, with a graphical presentation of a major water transmission system over 600 km long, with up to 4 000 mm diameter pipeline with a rated capacity of 1 million m^3/d. This simulator is for familiarising both managers and operators in the design and operational concepts of the conveyance system and to enable them to operate it under a variety of simulated real-time conditions.

Sukkur Barrage Rehabilitation, Pakistan - Responsible for the development of a simulation model for the managers and operations staff as part of the rehabilitation of the barrage across the Indus River. A simplified version of the model was developed to provide the basis for a role-playing game which enables the trainee to understand the fundamental relationships between the operating variables and the requirement to predict the trends in the river levels without the risk of actually operating the barrage, which Mr Marsden presented at International Congress for Irrigation and Drainage held in Morocco, September 1987.

Water Industry Software Development, ICL Computers Ltd UK - The objective of this project was to develop a new network analysis program for the client's existing base of UK water authority customers.

Well Inventory, Anglian Water, UK - This comprises a Geographical Information System to maintain records on extensive borehole data. The system is based on a standard database integrated with in-house mapping and analysis software.

1985 Senior Distribution Engineer, Pakistan
Karachi Bulk Water Supply

The firm carried out the feasibility study and detailed design of the Karachi Water Supply Project financed by the World Bank.

Responsible for the detailed examination and analysis of the existing system and its incorporation into the proposed network by means of a mathematical model incorporating both hydraulic and economic analyses.

1983 - 1984 Hydraulic Analyst, Head Office, UK
Water Supply and Sewerage Projects

Responsible for computer applications including mathematical modelling of control systems, pipeline design, network simulation, demand, surge analyses, unaccounted water and leakage studies.

In addition to this role in analysis, he implemented software development and maintenance for the hydraulic analysis packages.

Mr Marsden has been responsible for the analysis and design in the following projects:

Greater Aden Water Supply, PDR Yemen - The project studied the development of groundwater resources to augment the water supply to Aden with an extra 10.5 million m^3/year and to update the 1979 Master Plan for water supplies to Greater Aden to the year 2010 supplying a design population of 560 000.

Responsible for developing a mathematical model of the network of the transmission and distribution systems. The model is being used for development of optimal operating strategies and for examining a phased development plan for new capital works. The analysis identified leakage within the existing system of 35% to 40% of total water produced.

Fort William Water Supply, UK - The £5 million project is to refurbish and augment the existing water supply in Fort William and to improve service levels until the year 2001. Responsible for the analysis of the existing distribution systems.

Jubail Industries Park Seawater Cooling System, Saudi Arabia - The US$ 112 million project will supply up to 2.2 million m^3/d of seawater from the Arabian Gulf for industrial cooling purposes. It includes a pumping station and supply and return networks comprising more than 90 km of large diameter pipelines. The pump station control system may be run completely automatically using a configurable microcomputer system which optimises the selection of pump units. Responsible for hydraulic analyses of both the steady and transient flow conditions and extended the transient flow analyses computer program written to include the simulation of the pump station control logic, allowing selected events such as start up or power failures to be modelled.

Capital Area Western Wellfields, Oman - Undertaken the hydraulic design of a booster pump station including surge analyses and suppression equipment to limit pressures in the existing system, and new transmission mains completed in a phased development. Peak water demands designed to provide an additional 50 000 m^3/d.

Kano Rural Water Supplies, Nigeria - Recommended improvements to. alleviate fatigue failures in the ABS plastic rising mains of hand pumps by use of a mathematical model development from a reciprocating pump. World Bank financed the £16 million project to improve water supplies for villages up to 2 000 populations throughout the state including more than 2 000 handpumps.

Unaccounted for Water and Leakage Control - Involved with new methods of leak detection. In addition to monitoring procedures and water accounting, he became familiar in the use of the equipment required, including insertion flow meters, pressure transducers, data loggers, master loggers, buried pipeline tracers and leak detectors, including the recently developed leak-noise correlator.

Computerised System for Storage of Digital Utility Records - Responsible for development of a computerised system for storage of digital utility records for water and sewerage systems to UK National Water Council standards. The system is designed to be compatible with Ordnance Survey digital mapping.

1983 **Distribution Engineer, PDR Yemen**
Laboos Area Water Supply

This project is to bring a water supply to 150 remote mountain villages. Work included high accuracy surveying for ground control of aerial photography, a programme of interviews to establish consumers' current and future water requirements, identifying pipeline routes and reservoir sites and checking the hydraulic design of the distribution system.

1981 - 1983 **Pipeline and Computer Engineer, Head Office, UK**
Various water supply schemes

Engaged on the design of various water supply projects including:

Chittagong Second Water Supply Project, Bangladesh - Designed a 100 000 m^3/d raw water pumping station and the surge analysis by computer of a 26 km transmission pumping main 1 200 mm in diameter. The World Bank funded project provides an additional water supply including a river intake, treatment works, main and booster pumping stations, transmission mains, extensions to an existing treatment works and other facilities.

River Dee Abstraction Scheme, UK - Responsible for the computer modelling of the pumped system and designed surge suppression equipment for an additional 75 Ml/d of treated water to augment existing supplies to the City of Aberdeen at a cost of £7.9 million.

Rabat/Casablanca Pipeline, Morocco - This IBRD/KFW funded project for ONEP includes a 6 km raw water main comprising 2.2 m, 1.6 m and 1.4 m diameter sections, treatment works, 82 km long, prestressed concrete transmission main and pump stations. Computer modelled the pipelines, including the design of surge vessels and control valves.

Capital Area Water Supply, Oman - Computer analysis of distribution systems for a number of projects and updating work for the Muscat distribution network, costing £15 million. Responsible for modifying and developing the firm's NETWORK analysis program to meet the particular needs of leakage analysis for the Capital Area unaccounted water study.

Prepared a handbook for field design of rural water supply systems, which has been used on the Kedah Perlis project in Malaysia and in Indonesia and Ethiopia.

1981 - 1982 **Water Engineer, Nigeria**
Kwara State Water Supplies

Involved in pre-design surveys and field investigations for 50 communities ranging in population from 400 to 130 000.

1980 - 1981 **Assistant Resident Engineer, Saudi Arabia**
Riyadh Additional Water Supply Project

Supervised the main pipeline contract comprising 30 km twin 1 100 mm diameter ductile iron pipe.

1979 - 1980 **Assistant Engineer, Iraq**
Lower Khalis Irrigation Project

Supervision of the installation of field drains and construction of canal embankments and concrete linings for the 160 km of major canals.

1977 - 1979 **Assistant Engineer, UK and Nigeria**

Engaged in head office on designs of irrigation systems and subsequently on site in Nigeria.

SUPPLEMENTARY INFORMATION

Mr Marsden's MSc thesis at the University of Southampton was a statistical analysis of the pumping requirements of sprinkler irrigation systems. The project's mathematical models were implemented using FORTRAN computer language on an ICL 1900 series machine.

Mr Marsden is currently Visiting Lecturer at the University of London.

LANGUAGE CAPABILITY

English	:	Mother tongue
French	:	Spoken - basic; written - basic; reading - basic
Arabic	:	Spoken - basic; written - basic; reading - basic

PUBLICATIONS

'Computer Simulations in Games for Training in Irrigation and Management', Co-authors J I M Dempster & I K Smout, Irrigation and Drainage Systems 3, May 1989.

'The Use of Simulation Models in the Management of Irrigation Systems', Co-authors R F Stoner, J I M Dempster, Irrigation Theory and Practice, Proceedings of the International Conference, Southampton, September 1989.

'User Friendliness Through Interactive Graphics' Co-authors J Van Wonderen, S M Evans, ModelCare 90, Proceedings of the International Conference on Calibration and Reliability in Groundwater Modelling, The Hague, September 1990.

JAY Y DAVID **Management Information Systems Training Specialist**

Nationality	Philippines
Year of Birth	1960
Specialisation	Systems analysis of Management Information Systems and Communications Systems in the disaster management sphere
Position in Group (ADPc)	Systems Analyst
Year of joining Group (ADPc)	1989

KEY QUALIFICATIONS

Systems analysis with specialisation in systems development of Management Information Systems (MIS) and Communications Systems in disaster management. Carries out research and development assignments. Has carried out work concerning disaster management for Philippines, Sri Lanka, Singapore and Indonesia. Training in MIS and communications systems as well as use of computers and software.

EDUCATION

Bachelor of Science in Electrical Engineering (digital electronics, control systems and power systems), University of Philippines (Quezon City, Philippines), 1984

Master of Science in Electrical Engineering (data communications, computer architecture and advanced engineering mathematics), University of the Philippines (Quezon City, Philippines), 1985

Master of Engineering (information systems, systems analysis and design, databases), Asian Institute of Technology, 1988

EXPERIENCE RECORD

1989 - present **ASIAN DISASTER PREPAREDNESS CENTER, ASIAN INSTITUTE OF TECHNOLOGY, Thailand**

Systems Analyst

Directly responsible for the Center's systems development programme and focused specifically on information and communications systems for disaster management. Involved in training Center's Staff and others in MIS and communications systems application and development.

Undertook the following missions and consultancies:

1991 **Conference on Disaster Communications, Tampere, Finland**

Represented ADPC with funding provided by UNDRO (3 days).

1991 **Cranfield Disaster Preparedness Centre, Shrivenham, Swindon, UK**

Provided assistance in the development of a Logistics Decision-Support System for Disaster Management (LogDSS) and in the revision of the Atlantis Training Exercise.

1991 **United Nations Office of the Disaster Coordinator (UNDRO), Geneva, Switzerland**

Liaison visit to discuss issues related to information and communication systems in disaster management particularly on the role of UNIENET.

1991 **Singapore Counter-Disaster Staff Training, Singapore Joint Civil Defence Forces, Singapore**

Gave a lecture on information and communications systems for disaster management. Demonstrated applications software of practical value in disaster management.

1990 **National Disaster Management Workshop, Colombo, Sri Lanka**

Designed and implemented a simulation training exercise (Exercise ANXIETY) illustrating response to refugee situations arising from civil strife.

1990 **Department of Social Welfare and Development, Quezon City, Philippines**

Provided technical advice on establishing a link to UNIENET and the feasibility of a nationwide electronic mail and bulletin board system for DSWD.

1990 **Third Philippine Disaster Management Workshop, Tagaytay City, Philippines**

Designed and implemented a simulation training exercise (Exercise UZI) on management of displaced people. Served as a resource speaker on information and communications in disaster response.

1989 **Indonesian Disaster Management Center, Jakarta, Indonesia**

Upon request from the United Nations Office of the Disaster Relief Coordinator (UNDRO), established a link to UNIENET. Programming of communications software for IDMC needs and training of staff on its use.

During this period undertook the following research and development assignments:

- design of information and communications systems relevant to disaster preparedness and response, with emphasis on the requirements of quick-onset disasters;
- technical assistance to disaster management institutions in developing and setting up computer-based systems;
- liaison with agencies involved in systems development for disaster management;
- evaluation of the feasibility of new information and communication technology for disaster management in Asia-Pacific countries;
- design and conducting of computer assisted simulation exercises for disaster management training, eg ATLANTIS.

Carried out design and development work for the following projects:

- Exercise UZI: A non-computer based simulation exercise for disaster managers involved with displaced people during civil strife. The exercise stresses the value of information and communication and the problems arising from unavailability thereof (Philippines, 1980);
- Exercise ANXIETY: A non-computer based simulation exercise for the management of (refugee) camps. The exercise concentrates on the value of coordination, communications and management of resources (Sri Lanka, 1990);
- An interface for linking to the United Nations International Emergency Network (UNIENET). This communications program enables easy access to international bulletin boards and to send/receive electronic mail.

As Systems Analyst, was responsible for design, development and evaluation of the Center's Management Systems and carried out the following functions:

- providing recommendations on ADPC's organisational and management systems;
- enhancement of office computing capability - in hardware, software and training - in support of ADPC's activities;
- served as a resource person on information systems on APDC courses.

Carried out general in-house systems development work including:

- installation of a cost-effective Novell Local Area Network;
- a database application package for ADPC-run courses, automating the process of course reservation, management and alumni directory maintenance;
- a multi-user mailing-list cum directory of ADPC contact persons and organisations, enhancing the process of network building;
- a completely automated communications package for accessing UNIENET, simplifying the process of data communications and electronic mail;
- establishment of desktop publishing in the production of brochures, manuals and books;
- a microcomputer-supported project accounting system to supplement the AIT system;
- design of computer-aided presentations;
- design for an Asian Disaster Manager's Information Network (ADMIN).

1984 - 1987 **COLLEGE OF ENGINEERING AND AGRO-INDUSTRIAL TECHNOLOGY, UNIVERSITY OF THE PHILIPPINES**
Laguna, Philippines

Instructor

Primary responsibilities involved teaching/training and advisory work on engineering science, electrical engineering and computers. Established and maintained the microcomputer facilities of the college. Provided assistance to the Instrumentation Section.

During this period, undertook the following consultancy and research assignments:

1985 - 1986 **Philippine Coconut Research and Development Foundation, Diliman, Quezon City**

Led the design and development of an information system for coconut research. Conducted training of staff in use of microcomputers and associated software.

1986 **Research Work, Tokyo Institute of Technology, Japan**

Part of scientific exchange programme between Japan and the Philippines. Conducted research on the interfacing of sensors with microcomputers.

WORKSHOPS AND TRAINING

1990 **AGSHA Workshop on Executive Management, Kathmandu, Nepal**
Organised by the Asian Institute of Technology,
German Scholarship Holders Association.

1989 **Tutorial on Techniques for Supporting Decisions Based on Multiple Criteria** Asian Institute of Technology in collaboration with Casewestern Reserve University.

1989 **International Conference on Multiple Criteria Decision Making: Applications in Industry and Service** Asian Institute of Technology in collaboration with Casewestern Reserve University.

1989 **Computer Network Management** Continuing Education Center and the Computer Science Division, Asian Institute of Technology.

1989 Editor: **The AGSHA Newsletter**. AIT German Scholarship Holders Association.

1988 Editor. **The Voice**. AIT Student Union Newsletter.

1988 Computer Training Assistant on MicroISIS. **Library Information Management**. Library Regional Documentation Centre, Asian Institute of Technology.

1985 **Seminar on Instrumentation and Control Systems** National Engineering Centre, Diliman, Quezon City, Philippines.

1985 **IBM Familiarisation Course** Integrated Computer Systems, Greenhills, Metro Manila, Philippines

AWARDS AND RECOGNITIONS

1988 **Norsk Data Prize**

Given by the Asian Institute of Technology 'in recognition of the most outstanding performance among students of the Division of Computer Science'.

1985 **Certificate of Recognition**

Given by the Institute of Integrated Electrical Engineers (Philippines) 'for garnering the 8th Place in the Electrical Engineering Board of Examinations'.

RONALD F OCKWELL **Disaster Management Specialist**

Nationality	British
Year of Birth	1944
Specialisation	Disaster Management in developing countries, logistics management, relief and rehabilitation planning and management
Position in Group	Independent Consultant

KEY QUALIFICATIONS

Specialisation in disaster management including situation analysis, operations planning and evaluation systems analysis and organisational development. Experienced in the systematization of policies and procedures and has prepared organisational handbooks and manuals in disaster management. Has experience in Bangladesh, Thailand, Pakistan, Switzerland (Geneva), Ghana, Nigeria.

EDUCATION AND PROFESSIONAL STATUS

BSc, Physics, University of Birmingham, 1966

Diploma, Social Science, University of Birmingham, 1967

MA, Business Analysis, University of Lancaster, 1977

EXPERIENCE RECORD

1988 - present **Independent Consultant**

1991 **WHO Handbook Review**

Reviewing and commenting on draft of new edition of WHO handbook ('The Management of Nutritional Emergencies in Large Populations'), and participating in expert group meetings.

1987 - present **Consultant, Rome**
Emergency Procedures and Handbook for WFP

Compiling, editing and producing a new, two-volume emergency handbook ('Food Aid in Emergencies') on the basis of detailed review of existing policy documents and internal procedures, and consultations with large numbers of staff in WFP headquarters and county offices. Helping to refine and develop policy guidelines and organisational procedures where gaps or inadequacies are identified. Contributing to the discussion and development of improved internal systems and arrangements for collaboration with other organisations.

1990 - 1991 **Consultant, New York, Geneva**
Disaster Management Manual for UNDP

Principal author of new UNDP/UNDRO disaster management manual, working in Geneva with another contributor and in close collaboration with UNDRO. Preparing detailed, practical guidelines for field staff based on existing documents and practices, and available 'state of the art' knowledge and materials. Helping to refine and develop or propose organisational policies and procedures where gaps or inadequacies are identified. Liaising with other UN agencies, and participating in an inter-agency taskforce meeting.

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1990 **Consultant, Mozambique**
Emergency Management and Disaster Preparedness, UNICEF

Reviewing proposals for continuing assistance to the management of the emergency operations in Mozambique, and preparing proposals for assistance to disaster preparedness planning. Four-week mission involving review of documents and detailed discussions with government, UN and NGO personnel, and the preparation of a detailed report.

1989 **Consultant, UNDP**
Disaster Management Manual

Participant in UNDP/UNDRO workshop to establish requirements for a new UNDP/UNDRO disaster management manual.

1989 **Consultant, Bangladesh**
Emergency Training, UNICEF

Principal resource person and rapporteur for one-week emergency training workshop for UNICEF staff in Bangladesh.

1989 **Consultant, Bangladesh**
Emergency Food Aid Management, WFP

Reviewing and making recommendations concerning arrangements for the management of emergency food aid in Bangladesh in the light of separate proposals concerning the establishment of a new national Office for Emergency Preparedness, and possible new arrangements for the management of development food aid. Suggestions made for contingency preparedness measures for the imminent 1989 flood season, and for refinement of the draft UNDP project document 'Comprehensive Disaster Preparedness'.

1977 - 1989 **Consultant, Birmingham, UK**
Information Systems for Social Services Department

Assisting in the design, testing and introduction of new forms and case recording arrangements for social work teams, preparing related procedures and guidelines, and developing specifications for a new computerised client record system. Following an initial engagement October 1977 - September 1978, work undertaken on an intermittent basis.

1969 - 1988 **Consultant and Staff Officer with UNICEF**

1988 **Consultant, Pakistan**
Emergency Training

Resource person and joint rapporteur for one-week emergency training workshop for staff in Pakistan.

1988 **Consultant, Angola**
Emergency Operations

Reviewing the emergency assistance programme (for displaced persons) in Angola, and making recommendations for future assistance. Four-week mission involving review of documents and detailed discussions with government, UN and NGO personnel, and the preparation of a detailed report.

1986 - 1987 **Consultant, New York/Geneva**
Manual Editor

Complete re-editing of draft material for a new Water and Sanitation Manual (programme guidelines), including researching and incorporating new material.

1984 - 1987 **Consultant, New York/Geneva**
Emergency Handbook and Manual

Finalising the text of the emergency handbook ('Assisting in Emergencies') in close consultation with all UNICEF divisions, WHO, and other agencies. Designing the layout, assembling and preparing graphics, and arranging production of the handbook. Preparing the separate, complementary reference desk manual (UNICEF field manual, Book E, 'Emergencies'). Arranging the translation of the handbook into French, participating in the review and correction of the translation and arranging production of the French version.

1984 **Regional Emergency Officer, West Africa**
Abidjan

Assisting the UNICEF regional director in co-ordinating response to the drought in the Sahel, and assisting country offices in assessing the situation, planning and programming relevant agency assistance. Participating as resource person in regional emergency training workshop for agency staff in Anglophone Africa.

1982 - 1983 **Consultant, Geneva, Switzerland**
Emergency Operations Evaluation and Manual

Preparing a confidential report on lessons to be learned from the Kampuchea emergency operation. Preparing a draft for a new emergency manual/handbook for use by UNICEF field staff, and in staff training. Both tasks undertaken on the basis of a thorough review of existing documents, and extensive consultations with serving and retired agency staff and personnel of other agencies.

1981 - 1982 **Emergency Officer, Geneva, Switzerland**

Liaising with other UN agencies, NGOs, and potential donors in Geneva and elsewhere in Europe, to exchange information and ensure co-ordination of activities in response to emergency situations world-wide.

1979 - 1980 **Emergency Programme Officer, Thailand, Bangkok**

Assuring the necessary support - including communications, personal and programme supplies to the UN teams in Phnom Penh. Preparing reports, and liaising with the agency headquarters and other organisations concerning supplies, personnel, and funds for operations in Kampuchea.

1975 - 1976 **Consultant, Bangladesh**
Education Planning and Management, UNESCO

Advising and assisting the Government of Bangladesh in developing plans for the development of primary and non-formal education in Bangladesh. Specific project documents drafted for the development of primary schools and teacher training, and a comprehensive report prepared with additional observations and suggestions.

1971 - 1975 **Programme and Supply Officer, Bangladesh**
Head of Education Section,

1972-1975: Responsible for the development and implementation of a major UNICEF-assisted primary school and teacher training rehabilitation programme, and the transition to longer-term development assistance.

1971: Assisting in assessments and the co-ordination of relief efforts, including the establishment of a child-feeding programme and a network of sub-offices.

1969 - 1971 **Assistant Programme and Supply Officer, Nigeria**

1970-1971: Responsible for the establishment and operation of an agency office, warehouse and truck fleet in Port Harcourt for the receipt and distribution of rehabilitation supplies. Detailed survey of rehabilitation needs of health facilities.

1969-1970: In Lagos assisting the Regional Director in all matters relating to the international relief effort within Federal Nigeria, and assisting the Red Cross Relief Centre in planning, organising and monitoring food supply movements.

1967 - 1968 **Reports Officer (Volunteer), Ghana**
UNDP

Assisting in the preparation of periodic reports on UNDP projects, and various administrative functions.

LANGUAGE CAPABILITY

English : Mother tongue

PUBLICATIONS

Food aid in emergencies, Book A, Policies and Principles, a WFP handbook, WFP Rome, Sept 1991.

Food aid in emergencies, Book B, Operational Procedures for WFP Staff, draft, WFP Rome, 1991

UNDP/UNDRO Disaster Management Manual, draft, UNDP New York, May 1991

Institutional support for emergency-related assistance operations in Mozambique, UNICEF Maputo, Feb 1990.

Management of emergency food aid in Bangladesh - some observations and tentative suggestions, WFP, Dhaka, July 1989 (revised Sept 1989)

Contingency flood preparedness measures 1989 - some suggestions, WFP Dhaka, July 1989

UNICEF emergency assistance in Angola - Report of Mission, UNICEF Luanda, June 1988

Assisting in Emergencies - a resource handbook for UNICEF field staff, UNICEF New York, 1987

Lessons learned from the Kampuchea emergency operation, a confidential report to UNICEF, UNICEF New York, 1983

Policy and procedures manual, Vol X, Case Recording, draft, Social Services Department, City of Birmingham, England, 1986

The operation of hospital-based social service teams in Birmingham, Social Services Department, City of Birmingham, England, 1979

The operation of area-based social service teams in Birmingham, Social Services Department, City of Birmingham, England, 1977

The planning and management of fundamental education in Bangladesh, UNESCO Bangkok and Dhaka, 1976

Proposals for the restructuring of educational administration in Bangladesh, Ministry of Eduction, Dhaka, 1974, 1976

Various papers and draft project documents on: Improvement and development of primary school facilities; Primary teacher training institutes facilities; and other aspects of primary education and teacher training in Bangladesh; Ministry of Education and Directorate of Public Instruction, Dhaka, 1974, 1975, 1976

Numerous unpublished internal UNICEF reports and papers on the emergency assistance operations in Nigeria (1969 - 1971), Bangladesh (1971 - 1975), Kampuchea (1980 - 1981), and assistance to refugee water supply operations in Somalia, 1982.

MARK L A BRETT **Coastal and River Engineering Specialist**

Nationality	British
Year of Birth	1939
Profession	Civil Engineer
Specialisation	Hydraulic Design, River Engineering, Sediment Transport
Position in Group	Associate, Hydraulic Engineering Division
Year of joining Group	1967

KEY QUALIFICATIONS

Wide experience in the UK and overseas on surveys, investigations, designs and supervision of gravity flow irrigation and drainage works, river diversion works and coastal works mainly in Iraq, Indonesia, Somalia, Pakistan and Bangladesh. Specialist in the investigation and design of river diversion works, alluvial canals, dredging, sediment extraction, settlement and removal works. Has held posts in project management, advisory and consultant capacities in the above fields.

EDUCATION AND PROFESSIONAL STATUS

Chartered Engineer

BSc, Engineering, Imperial College, University of London, 1961

Diploma in Hydraulic Engineering, Delft 1967

Member of the Institution of Civil Engineers

Associate of the City and Guilds Institute

EXPERIENCE RECORD

1967 - present **MOTT MACDONALD GROUP**
(formerly Sir M MacDonald & Partners)

1991 - present **Operation and Maintenance Specialist, Pakistan**
Left Bank Outfall Drain Stage 1 Project

Prepared draft operation and maintenance manuals covering sub-surface and surface drainage, canal remodelling, and workshops for the whole project.

1991 **Team Leader, UK**
River Ness Weirs and Erosion Study

Surveys, hydraulic and rehabilitation study of a river reach including a weir and protected islands following severe floods.

1991 - present **Senior Hydraulic Design Engineer, UK**
River Spey Abstraction Scheme, Bank Protection Works, Scotland

Advised on design and specification of rock armour to protect the banks of a steep reach of the River Spey (430 m^3/s flood capacity). Recommended oversize armour to accommodate turbulent flood flows and the placing of rock under water during construction.

1990 **Team Leader, Bangladesh**
Systems Rehabilitation Project

Supervised and assisted a Bangladeshi design team in reviewing, updating and completion of existing designs and tender documents for 16 projects for the Water Development Board, involving polder embankments, and drainage and irrigation works. The schemes were located widely across the country and included river tidal drainage and coastal embankments for Polders 64/1A and B and Polder 67, in the vicinity of Chittagong.

1990 **Senior Design Engineer, UK and Pakistan**
Sukkur Barrage Flood Management

Prepared a planning document (Planning Commission Proforma) detailing proposals and costs for river training works, physical model tests and equipment for flood monitoring.

1990 **Sediment Engineering Specialist, UK**
Yonki Dam Sediment Removal

Reviewed available methods for removal of fine sand from a 300 l/s proposed raw water supply.

1990 **Hydraulic Engineering Specialist, UK**
Welbeck Landfill and Reclamation Project

Developed hydraulic design criteria for diverting the River Calder (350 m^3/s capacity). Reviewed alternative methods of grade control including a weir and a series of rock lined riffles and pools. Investigated and reviewed up-to-date methods of rip-rap protected channel design and prediction of associated channel roughness.

1989 **Hydraulic Structures Engineer, Guyana**
Drainage and Irrigation Rehabilitation Project

Reviewed existing designs for a 6 m^3/s coastal pump station and tidal sluice for stormwater drainage involving the installation of pumpsets already available.

1989 **Water Management Specialist, Pakistan**
Sukkur Main Canals Control and Telecommunications

Member of a study team assessing water control and communications improvement for 1 400 km of main canals offtaking from Sukkur Barrage on the River Indus. Studied methods and costs of proposed water measurement facilities and reviewed operational practices leading to recommendations for an integrated system of voice and data communications and flow measurement facilities at selected sites.

1986 - 1989 **Chief Design Engineer, Pakistan**
Left Bank Outfall Drain, Stage I

Supervision of design teams engaged on designs and tender documents for surface drainage, tubewell drainage, interceptor drains, canal remodelling, and electrical distribution. Supervision of design and mathematical and physical model studies for the 40 km long proposed Tidal Link channel. The 85 m^3/s channel will cross the Rann of Kutch from the remodelled outfall drain to a tidal creek. Coastal works included flood embankments, an erosion control weir connecting the channel with large inter-tidal depressions and a tidal gauging station.

1984 - 1986 **Secondment to PRC Engineering/Checchi Consultants Inc.**

Design Engineer (Hydraulic Alluvial Specialist), Pakistan
Irrigation Systems Management Project

Member of a team providing technical assistance to the provincial irrigation departments. Assisted with research and development of up-to-date design methods for alluvial canals and drain rehabilitation schemes.

1984 **Team Leader, Pakistan**
Sukkur Barrage Gates Study

Carried out inspection and studies for 66 barrage gates (60 ft (18.3 m) span) and 55 three-tier head regulator gates. Supervised design studies for a floating caisson gate capable of closing off any barrage gate bay under normal operating conditions.

1983 **Design Engineer, Pakistan**
Left Bank Outfall Drain, Tidal Link

Supervised field survey and preliminary engineering soils investigations using small hovercraft including setting out alignment for proposed tidal link channel 30 miles (48 km) long and partly over water connecting an interim outfall site with an active tidal creek.

1981 **Hydraulic Design Engineer, UK and Overseas**
Various River Works

Studies and designs for major hydraulic works including:

Jonglei Canal Control Structures, Sudan - Review of tender designs for the Jonglei Canal control structures. The review included the morphological effects of the canal abstraction on the Jonglei Canal and White Nile.

Babai Diversion Weir, Nepal - Tender designs for weir on Babai River with 7 500 m^3/s flood capacity. Design included fish pass, scour sluices with 3 Nr 10.0 m gates, 52 m^3/s capacity intake structure, settling basin and desanding sluices.

Wadi Mawr Diversion Weir, Yemen Arab Republic - Studies and tender designs for weir with 3 100 m^3/s flood capacity. Design includes scour sluices 40 m^3/s capacity intake with flow limiting baffles.

Left Bank Outfall Drain, Pakistan - Developed preliminary hydraulic designs for vortex tube sand extractors for the 145 m^3/s Jamrao canal headworks proposed re-modelling.

1980 - 1981 **Team Leader, Somalia**
Flood Damage Assessment Study (FAO)

Aerial reconnaissance, field survey work and data collection were carried out in the Shebelle and Juba valleys. A report was prepared which recommended immediate action and measures to reduce damage from future floods.

1978 - 1980 **Hydraulic Design Engineer, UK**

Jowhar Offstream Storage Reservoir, Somalia - Specification for model studies, preparation of operation guidelines.

Bura Irrigation Settlement Project, Kenya - Feasibility study for sediment control works. Prepared an interim design report for alternative river diversion works.

Flood Control Project, Philippines - Flood estimates and supervision of topographical survey were followed by outline design of flood protection works and the submission of a report.

Rahad Irrigation Project, Sudan - Prepared an operation and maintenance manual for the 105 m^3/s capacity pumping station, the supply canal and structures, and the Rahad barrage.

Mogambo Irrigation Project, Somalia - Hydraulic design of the sediment settling basin at the head of the 3.7 m^3/s pumped main supply canal.

Sunsari Morang Irrigation Project, Nepal - Hydraulic design of the triple barrel 0.9 m diameter vortex tube sand extractor for the 38 m^3/s Chatra main canal. Following construction, trials demonstrated that the extraction efficiency exceeded design expectations.

Chandra Irrigation Project, Nepal - Hydraulic design of a double barrel 0.9 m vortex tube sand extractor and gravity flow disposal channel for the 11 m^3/s main canal.

Warujayeng Kertosono Irrigation Project, East Java Indonesia - Hydraulic design of a triple barrel 0.8 m diameter vortex tube sand extractor for the 10.5 m^3/s Mrican Canal.

1977 - 1978 **Project Manager, Somalia**
Studies for Saakow Dam, River Juba

Project Manager for engineering studies for Saakow dam on the River Juba, Somalia. Supervised topographical surveys, river sediment and discharge measurements and geological survey work. Co-ordinated the analysis of the results, preparation of preliminary designs, evaluation of costs and preparation of a report.

1976 - 1977 **Project Engineer, UK**

Undertook preliminary supervision work for construction of the Hull Tidal Surge Barrier, UK.

Liaised with specialist subcontractors concerning approval of the gate lifting gear and control system design. Reviewed provision for pressure relief behind sheet pile abutments.

1975 - 1976 **Team Leader**
1972 - 1975 **Design Engineer**
Kali Progo Project, Indonesia

From 1972 to 1975 supervised preparation of designs for irrigation rehabilitation works. From 1975 to 1976, responsible for construction aspects in addition to the design work and office management, planning and liaison between four design teams.

1971 **International Course on Land Drainage**
Wageningen, Netherlands

1970 - 1971 **Acting Resident Engineer, Iraq**
Diyala Weir

Responsible for supervision of work during the maintenance period and for training client's operational staff during the initial operational phase.

1967 - 1970 **Assistant Resident Engineer, Iraq**
Lower Diyala Irrigation Project

Assisted in design modifications to the structures and the supervision of construction of canals, drains and control structures, and the commissioning and initial operation of the canal system.

1966 - 1967 **International Courses in Hydraulic Engineering, Delft, Netherlands**

Attended the International Courses in Hydraulic Engineering, Delft, Netherlands, and gained a diploma with distinction.

1961 - 1966 **BINNIE AND PARTNERS**

Worked mainly on water supply and sewerage projects commencing in the design section. Later an assistant resident engineer on sewers, pumping stations and sewage treatment works on the Lincolnshire coast. Also worked on a reinforced concrete roof design for a large water supply service reservoir.

SUPPLEMENTARY INFORMATION

In 1966, received the C H Roberts' Bequest Award of the Institution of Civil Engineers and worked in Spain on the construction of a concrete dam, the Pantano de Iznajar, located on the River Genil.

LANGUAGE CAPABILITY

English	:	Mother tongue
French	:	Spoken - good; written - fair; reading - fair
Spanish	:	Spoken - fair; written - fair; reading - fair

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MD SAIDUR RAHMAN — **Local Co-ordination Advisor**

Nationality	Bangladeshi
Year of Birth	1943
Specialisation	Disaster Relief Management
Position in Group	Independent Consultant

KEY QUALIFICATIONS

Has over 20 years' experience in disaster relief and rehabilitation work in Bangladesh including operations, management and training responsibilities. Has worked for various large International Relief organisations in the most senior positions and has worked in Somalia, Thailand and the UK.

EDUCATION AND PROFESSIONAL STATUS

MSc, Applied Chemistry, 1966

Graduate in Disaster Management, Counter Disaster College, Melbourne, Australia, 1979

EXPERIENCE RECORD

1980 - 1991 **OXFAM**
1988 - 1991 **Country Representative of Oxfam in Bangladesh**

During this period he was responsible for planning and managing the implementation of emergency relief and rehabilitation programmes for major disasters in Bangladesh. He also organised several meetings and training courses for NGO workers on Disaster Preparedness and Post Disaster Management.

His duties have included:

1991 : Aerial survey and report on areas affected by the cyclone of 30 April 1991. This report was presented to the Government, Bilateral Donors and NGOs as the first report on this major disaster. The report included a detailed short-term emergency relief programme, co-ordination amongst NGOs and medium and long term relief and rehabilitation programmes.

Also planned and implemented the Oxfam emergency relief programme in the affected parts of south-east Bangladesh after the cyclone.

1990 : Attended the National Conference of Oxfam in UK. Presented a case study on '1988 Floods in Bangladesh'; spoke as a member of a Panel on Environment.

- Visited UK, France, Germany, Belgium, Netherlands, USA and some countries in the Middle East.

1989 : Attended Management Development Course in Bangalore, India.

- Gave a presentation of Flood Preparedness and Integration of Preparedness Programme into Development at the meeting of British Charities in London.

1988 : Director of a massive relief and rehabilitation programme after the devastating floods of 1988. This programme was, at that time, the largest operation ever conducted by Oxfam in Bangladesh. Short term relief included provision of large quantities of food including over 100 000 chapattis per day, which was collected and distributed to people over a period of three weeks. Thereafter responsible for rehabilitation programmes including employment creation, agriculture rehabilitation and house construction. Over 1.5 million people directly benefited by this assistance.

1988 : Attended Oxfam induction course in Oxford. Visited different regions of UK and spoke on the problem of the Third World with particular reference to Bangladesh.

- As visiting lecturer, conducted a session on Flood Preparedness and post Flood R & R operation at the Asian Disaster Preparedness Centre at Asian Institute of Technology in Bangkok.

1987 Deputy Country Representative of Oxfam, Somalia and UK Disaster Relief Management

Responsible for the co-ordination of a huge food distribution programme in the drought affected areas of Somalia and particularly in the border areas near Ethiopia and Kenya. He also visited regional offices of Oxfam in the United Kingdom.

1980 - 1987 Assistant Field Director/Deputy Country Representative, Oxfam, Bangladesh

During this period he was responsible for a number of disaster relief programmes and also attended disaster related courses both as a participant and as a lecturer. Amongst other assignments he carried out the following works:

1987 : Supervised a flood relief programme in the north-western part of Bangladesh.

1986 : Travelled widely in the UK lecturing to groups of Oxfam staff, funders, journalists and the media on social development and the struggle of the landless in Bangladesh under the 'Hungary for Change' campaign.

1985 : Responsible for an emergency relief and rehabilitation programme for the people affected by cyclone in Noakhali and Feni districts of Bangladesh.

1984 : Attended disaster Management Course in Calcutta. Travelled extensively in Japan and also visited South Korea, and the Philippines.

1984 : Supervised a large flood relief and rehabilitation programme.

1981 : Assisted with the tornado relief and rehabilitation programme in Noakhali.

1981 : Attended an orientation and management course in Oxford, UK.

1980 : Attended one month course on development in Belgrade, and visited several provinces of Yugoslavia.

Travelled extensively in West Germany, Belgium, Switzerland and UK.

1972 - 1980 THE BANGLADESH RED CROSS SOCIETY AND THE LEAGUE OF RED CROSS SOCIETIES

1974 - 1980 Deputy Secretary General

1979 : Nominated by the President of Bangladesh as a Member of the Drafting Committee for the National Disaster Preparedness Plan.

1979 : With a scholarship awarded by the Australian Development Assistance Bureau, graduated on the course entitled 'Disaster Management' from the Counter Disaster College at Mt Macedon, Melbourne, Australia.

Studied disaster preparedness against flood, earthquake, bush fire etc in all states of Australia, excepting Western Australia.

1978-79 : Planned and directly implemented relief programmes for 190 000 refugees pushed from Burma into the hilly south-eastern part of Bangladesh. Operation included provision of shelter, food ration, special feeding programme for the children and medical services etc. 85 000 people of vulnerable groups eg children, lactating mothers and the aged were provided with cooked food every morning for 8 months.

1977 : Visited the national Red Cross Societies of the Philippines and South Korea.

Sponsored by the office of the Prime Minister of Japan, through the National Association of Youth Development, visited almost the whole of Japan during a 10 week tour.

1976 : Attended international committee meeting of Service Civil Information in Dublin, Ireland.

1974 : Flood and Famine Relief Programme - over half a million beneficiaries were provided with food, clothing, medicines, etc.

1972 - 1974 **LEAGUE OF RED CROSS SOCIETIES**
Director, Cyclone Preparedness Programme

As the first Director of the Programme, developed an effective warning system in the coastal belt and offshore islands against approaching tropical cyclones. Organised and trained over 10 000 volunteers in 2 000 villages in the coastal belt in Disaster Preparedness and Post Disaster Management.

1973 : - Training in League of Red Cross Societies in Geneva.

- Conference on 'Civil Protection in Disaster' organised by the International Civil Defence Organisation in Caracus, Venezuela in south America.

- Studied the Disaster Management and Control system in Philippines.

- Visited several states of USA; studied the Hurricane Centre of USA in Miami, Florida.

1972 **Sector Administrator, Relief and Rehabilitation**

Operated massive relief and rehabilitation programme to provide food, clothing, utensils etc to millions of people returned from India after the War of Liberation.

1967 - 1971 **Teacher**

Served as a Lecturer of Chemistry in Netrakona College. Participated in all major disaster relief and rehabilitation programmes as volunteer of Red Cross and Secretary of Service Civil International, East Pakistan branch.

LANGUAGE CAPABILITY

Bengali : Mother tongue
English : Fluent

BRIAN A O WARD **Disaster Management Specialist**

Nationality	British
Year of Birth	1932
Profession	Disaster Management Specialist
Specialisation	Disaster Management including preparedness and mitigation/relief
Position in Group (ADPC)	Director of ADPC
Year of joining Group (ADPC)	1985

KEY QUALIFICATIONS

Specialisation in all aspects of Disaster Management for the Third World including legislation, prevention, mitigation, warning, logistics, training, relief, rehabilitation, evaluation and coordination. Liaison with Senior National and Provincial Government officials. For the past six years has been Director of the Asian Disaster Preparedness Center at the Asian Institute of Technology, Bangkok, Thailand. He has travelled widely throughout the Middle East, the Indian Sub-Continent and South-East Asia.

EDUCATION AND PROFESSIONAL STATUS

Marlborough College, UK, 1945 - 1950

Royal Military Academy, Sandhurst, UK, 1951 - 1953

EXPERIENCE RECORD

1985 - present **ASIAN INSTITUTE OF TECHNOLOGY, Bangkok, Thailand**
ASIAN DISASTER PREPAREDNESS CENTER (ADPC)
Director

Responsible for planning and supervising of all ADPC activities. This has involved collaborating with national and international agencies in the Asia-Pacific region as well as involvement with training courses, both at AIT and in other countries, and in-house systems development. He has also supervised the library and database information facilities offered at ADPC as well as taking part in Missions and Consultancies. He has also been involved in directing research and studies and in application of appropriate technology.

Work in the national and international agency field has included assistance in formulating policies and developing capabilities in all aspects of disaster management.

During his period as Director, he has undertaken the following promotion and cooperation missions:

- Presentation at Seminar on Education and Public Awareness in Disaster Management, Australian Counter Disaster College, Melbourne (1987).
- Liaison visits to OFDA, Washington DC; UNDRO Geneva; participation at WHO workshop, Geneva (1987).
- Participation at Aseismic Design and Construction of Structures, University of the Philippines (1987).
- Conducting workshop on disaster management and response in Colombo, Sri Lanka (1988).
- Liaison visit in reference to ADPC project in Nepal (1988).
- Resource person at 1st National Disaster Management Workshop, Tagaytay, Philippines (1988).

- Liaison visit, Indonesian Disaster Management Center, Jakarta (1988).

- Liaison visit in reference to an ADPC/UNDRO technical assistance program, Manila, Philippines (1988).

- Participation in Earthquake Counter-Measures Conference, Beijing, China (1988).

- Liaison visit, European Economic Community, Bangkok, Thailand (1988).

- Liaison visit in reference to preparation of a training workshop for storm prevention officers, Hanoi, Vietnam (1988).

- Participation in AIT/Bangladesh University of Engineering and Technology seminar on floods in Bangladesh, Dhaka (1988).

- Participation in Emergency '88 conference, London, UK; liaison visit, European Economic Community, Brussels, Belgium (1988).

- Participation in OFDA's Disaster Operations Advanced Management Course, Florida, USA; liaison visit with OFDA, UNDRO and UNDP officials, New York, and Washington DC, USA (1989).

- Participation in a joint UNDP/UNDRO evaluation of disaster-related programs in Nepal (1989).

- Liaison visit to finalise projects with UNDP, ADB and Philippine authorities, Manila (1989).

- Participation in joint UNDP/UNDRO evaluation of disaster-related programs, Yogykarta and Jakarta, Indonesia; liaison visit to IDRC, Singapore; meet with JICA officials, Tokyo, Japan (1989).

- Resource person at 2nd National Disaster Management Workshop, Philippines (1989).

- Resource person at Disaster Management Workshop, University of Dhaka; liaison visit to UNDP (1989).

- Discussions with Asian Development Bank officials on a regional disaster mitigation study, Manila, Philippines (1989).

1975 - 1985 **UNITED NATIONS DISASTER RELIEF OFFICE (UNDRO)**
Consultant

LEAGUE OF RED CROSS SOCIETIES (LRCS)
Delegate

Work for UNDRO entailed advice and assistance to National and Provincial Governments in disaster-prone countries in all aspects of disaster management - legislation, prevention and mitigation, warning measures, contingency planning, logistics, training, public information, relief, rehabilitation, evaluation and coordination.

Work for the Red Cross entailed advice and assistance to Third World National Societies in their long-term development plans and current operations - including disaster preparedness and relief, management systems, budgets and traditional Red Cross activities.

All missions involved liaison at a senior level (usually Minister, Governor or Head of Mission) with governments, diplomatic missions, voluntary agencies, UN delegates and other non-governmental organisations.

Specialist missions during this period were:

1985 **Joint Feasibility Study (UNDRO/WMO/AIT), South East Asia**

To examine needs of Asian/Pacific countries in field of disaster management and make recommendations for the establishment of a programme to meet these needs. Visited ten sample countries.

1983 - 1984 **Chief Delegate, LRCS, Uganda**

Five year Development Plan for Ugandan Red Cross; major international relief operation for displaced people and other projects.

1983 **UNDRO Consultant, Papua New Guinea**

Advice to Provincial Government of East New Britain in preparation of evacuation plan for the city of Rabaul, in anticipation of a volcanic eruption.

1982 **LRCS Relief Delegate in Disaster Relief Operation, Liberia**

1982 **UNDRO Consultant, Western Samoa**

Advice to National Government in disaster management.

1982 **UNDRO Consultant, Papua New Guinea**

Advice to National Government in disaster management.

1980 - 1981 **LRCS Chief Delegate, Indonesia/Philippines**

Indo-Chinese refugee relief operation. Visited operations in Malaysia and Singapore.

1979 - 1980 **Administrator, Refugee Affairs, with Hong Kong Red Cross, Hong Kong**

Administrator for Indo-chinese refugee relief operation (including management of a centre for 16 000 refugees). Visited operations in Macao and Thailand.

Earlier missions for UNDRO included missions to the following countries:

Sudan;
Ethiopia;
Bangladesh;
Yemen Arab Republic;
Indonesia.

1953 - 1973 **BRITISH REGULAR ARMY**
ROYAL ENGINEERS

Retired at own request in 1973. Last four appointments were:

1971 - 1973 **Staff Officer (Lieutenant Colonel) Logistics Planning Division Headquarters South East Asia Treaty Organisation (SEATO), Bangkok, Thailand**

Responsible for detailed logistics planning for SEATO including reconnaissances, studies and the preparation of reports, proposals and plans. Maintained close liaison with the representatives of the SEATO Member Countries especially the regional ones - Thailand, the Philippines and Pakistan. Organised international conferences, familiarisation trips and briefings. Member of specialist study groups.

1970 - 1971 **Staff Officer (Major) Military Secretary's Department, Ministry of Defence, UK**

Responsible for selecting officers to fill all majors' and captains' staff appointments in the British Army worldwide (approximately 900 appointments a year).

1968 - 1970 **Officer Commanding (Major) a Field Squadron, Royal Engineers, providing combat and logistics engineer support to NATO, West Germany**

Responsible for all aspects of unit training and administration. Undertook various construction projects including camps and roads.

1966 - 1968 **Brigade Major, Strategic Reserve Engineer Brigade, UK**

Brigade Commander's principal staff officer (five regiments and six specialists teams under command totalling about 6 000 men). Coordinated engineering projects and training exercises undertaken by units of the brigade worldwide, including the evaluation of requests, the supervision of planning and the preparation of work programmes, the assembly of the task force, its development and administrative support.

Previous appointments on the staff and at regimental duty included five years attached to the Malaysian Armed Forces during which period participated in several rural development projects, worked in the Malaysian Ministry of Defence and on liaison duties with the police. Twice worked as an instructor.

Passed 15 months course at British Army Staff College, Camberly (1964 - 1965), including three months technical staff training at the Royal Military College of Science studying applications of technology.

LANGUAGE CAPABILITY

English	:	Mother tongue
Malay	:	Fair
Indonesian	:	Fair
Thai	:	Fair
French	:	Fair

PUBLICATIONS

Executive Summary, 'Disaster Mitigation in Asian and the Pacific', Asian Development Bank, 1991.

Report on South Pacific Mission prepared for the Office on the United Nations Disaster Relief Coordinator (UNDRO), 1990

Disaster Management Training in the Asian-Pacific Region. 'Managing Natural Disasters and the Environmental', World Bank, 1991.

Trends in Disaster Management in Asia, International Seminar on Regional Development Planning for Disaster Prevention, Nagoya, Shizuka and Tokyo, 1986.

The Uganda Experience, The Red Cross Relief Operation in the Luwero Triangle 1983 and 1984, League of Red Cross Societies Report.

East New Britain Provincial Disaster Plan, Papua New Guinea, 1983.

Mano Landslide Disaster, Liberia, League of Red Cross Societies Report, 1982.

Disaster Management in Western Samoa, UNDRO Technical Advisory Mission Report, 1982.

Disaster Management in Papua New Guinea, UNDRO Technical Advisory Mission Report, 1982.

The Red Cross Relief Operation for Indo-chinese Refugees in Indonesia and the Philippines, League of Red Cross Societies Report, 1981.

The British Red Cross Relief Operation for Indo-chinese Refugees in Hong Kong, British Red Cross Society Report, 1980.

Disaster Prevention and Preparedness in the Yemen Arab Republic, UNDRO Technical Advisory Mission Report, 1977.

Disaster Prevention and Preparedness in the Democratic Republic of the Sudan, UNDRO Technical Advisory Mission Report, 1977.

Ethiopian Disaster Preparedness Seminar, UNDRO Technical Advisory Mission Report, 1977.

UNDRO Assistance to the Government of Bangladesh, UNDRO Technical Advisory Mission Report, 1976.

The Organisation for Disaster Prevention and Preparedness in Indonesia, UNDRO Technical Advisory Mission Report, 1975.

G D SORRILL

Shelter Housing Specialist

Nationality	British
Year of Birth	1941
Profession	Building Engineer
Specialisation	Consultant for Third World Aid and Charity Programmes

KEY QUALIFICATIONS

Extensive experience in Bangladesh in appropriate building technology in the aid and development sector. He has been actively involved in low cost building programmes for housing, hospital accommodation, infrastructure works and associated defence works. He has more recently held consulting and executive positions in aid programmes working for CARE in Bangladesh and India. In 1990 he established his own consultancy specifically tailored to undertake services concerning organisation, management, building works and associated logistics, especially in disaster situations to support aid/charity programmes in Third World countries and UK.

EDUCATION AND PROFESSIONAL STATUS

ONC and HNC in Building, Hall Green Technical College, Birmingham, UK

BSc in Building (including Accountancy), University of Aston in Birmingham, UK

Member of the Institute of Charity Fund Raising Managers

Fellow of the Royal Society of Health

EXPERIENCE RECORD

1990 - present **DAVID SORRILL ASSOCIATES**
Founder and Principal of the Practice

Mr Sorrill established his own consultancy specifically to undertake services to support aid and charity programmes in Third World countries and in UK. Tasks undertaken include all aspects of organisation, management, building and associated logistics. In the Third World the need for appropriate technology and sound logistics, especially in disaster situations, has been emphasised.

Consultancies that have been undertaken include:

CARE International, Dhaka - Carried out a rapid appraisal of a proposed cyclone shelter construction project for areas affected by a cyclone event in April 1991. This appraisal was at the request of the Government of Bangladesh. CARE is a non-governmental organisation (NGO).

World Vision, Dhaka - Carried out voluntary research into disaster preparedness with special emphasis on the stockpiling of appropriate materials to deal with immediate post-disaster emergency works. World Vision is an NGO.

Centre for the Rehabilitation of the Paralysed (CRP) Dhaka; Friends of the CRP, London - Review of the existing situation in Dhaka and preparation of proposals for all aspects of future development including building works, strengthening of management structure and establishing a self-sustaining income generation framework. Both CRP and Friends of CRP are NGOs.

Bangladesh Tea Board, Ministry of Commerce - Three month review consultancy for DMC International Ltd, London for feasibility of community development projects for Bangladesh Tea Estate labourers. The project received ODA funding. DMC is a Private Company.

BRAC, Dhaka - Eight man-month research and development consultancy for low cost bamboo bridges to serve BRAC groups for use on village roads. BRAC is an NGO and funding was by NOVIB of the Netherlands. Bridges were built by contracting with the upazilas.

IDEAS International, Dhaka; IDEAS (UK), London - Worked in collaboration with Camarthenshire College of Technology and Art, Wales, on development and implementation planning of degree level training in all aspects of cottage industries for developing countries. IDEAS is an NGO.

The Next Step - Three month review of fund raising operations for this UK-based NGO and preparation of development proposals.

Kembleland Ltd, UK - Three month consultancy to establish, develop and produce all relevant documents associated with a new health insurance policy for alcoholism and drug addiction. Kembleland is an NGO.

1988 - 1990 **BROADWAY LODGE LTD (Registered Charity)**
Weston-Super-Mare, UK

Deputy Chief Executive
Alcohol and Drug Addiction Rehabilitation Centre, UK

Responsible for health care administration in two centres totalling over 100 beds and 72 staff. Rehabilitation followed the Minnesota Model.

1984 - 1988 **CARE INTERNATIONAL**
New York, USA

1987 - 1988 **State Administrator**
West Bengal, CARE India, India

Responsible for nutrition and health programmes serving some 1.5 million children and mothers under the Government of India's child welfare programme.

1984 - 1987 **Project Co-ordinator**
Landless Owned Tubewell Users Support (LOTUS) Project
CARE Bangladesh, Bangladesh

Responsible for originating and subsequently co-ordinating this ODA funded project which assists landless groups of peasants to buy Government of Bangladesh irrigation wells. This project also trains the peasants in all aspects of cultivation and profitable management. Advised on use of appropriate building materials and logistics, to ensure that self-sustaining communities become established.

1983 - 1984 **INDEPENDENT CONSULTANT**

Food For Work - Roads Project
CARE Bangladesh, Bangladesh

Acted as a consulting engineer to this low cost roads project under the 'Food for Work' programme. Acted as appropriate technology adviser and dealt with appropriate methods and materials for road construction as well as associated logistics.

1966 - 1983 **BAPTIST MISSIONARY SOCIETY**
London, UK

Resident in Bangladesh in periods 1966 to 1980 and 1982 to 1983.

1982 - 1983 **Co-ordinator**
Baptist Union Society Welfare and Institutions Board, Bangladesh

Acted in administrative capacity for the board of the charity.

1974 - 1980 **Property Manager and Government Representative**
Baptist Union, Bangladesh

Acted as Property Manager for the charity in Bangladesh.

1974 - 1978 **Secretary for Expatriate Personnel in Bangladesh**
Bangladesh

Acted as secretary for expatriate personnel attached to the charity who were in Bangladesh.

1972 - 1973 **Hospital Administrator**
Chandraghona Hospitals, Bangladesh

Dealt with all aspects of health care administration for two hospitals caring for general patients and those suffering from leprosy.

1966 - 1971 **Project Engineer**
Chandraghona Hospitals Rebuilding Programme, Bangladesh

Supervised all stages of this five year programme to rebuild two hospitals. Involved in construction of hospital accommodation as well as associated new roads, bridges, river protection and hill retention/soil stability works.

1958 - 1965 **CITY OF BIRMINGHAM**
Housing Department, Birmingham, UK

Works Inspector
Technical Assistant
Bonus Surveyor
Technical Trainee

Involved in a construction programme for some 3 000 low cost houses in Birmingham.

SUPPLEMENTARY INFORMATION

Additional Courses

One year part-time study of African and International Affairs at St Andrews, Selly Oak Colleges, Birmingham, (1965 - 1966)

One year full-time sabbatical studies at Bristol Baptist College, Bristol University (1980 - 1981)

David Sorrill Associates

Special interests of David Sorrill Associates include: Consultancies for charities, building projects including design, estimating, co-ordination, supervision, site visits and trouble-shooting, Third World development, charity organisations review and evaluation, orientation sessions for newly assigned expatriates, low cost housing and roads, project organisation and management, community and health care, water and sanitation, appropriate technology, techniques and logistics, and women's issues.

LANGUAGE CAPABILITY

English : Mother tongue
Bengali : Fluent

MARION GLASER **Womens Issues Specialist**

Nationality	German
Year of Birth	1960
Profession	Socio-economist
Specialisation	Rural Sociology, Women's Issues and Institutions
Position in Group	Consultant

KEY QUALIFICATIONS

Marion Glaser gained her PhD in agrarian sociology after extensive field research in Rajshahi. She has continued to work on rural sociology in Bangladesh, first on the TADP and then on the Deep Tubewell Project. She has also been a member of two World Bank appraisal missions for World Bank supported irrigation projects. She has undertaken a socio-economic study incorporating an environmental assessment of the Deep Tubewell Project. One of her specialisations is Womens Issues.

EDUCATION AND PROFESSIONAL STATUS

MSc, Development Studies, University of Bath, UK, 1983

PhD, (Agrarian Sociology), University of Bath, 1988

Member of the UK Development Studies Association (DSA) and its Rural Development Study Group

Member of the British Sociological Association (BSA)

EXPERIENCE RECORD

1990 - present **Sociologist/Institutions Specialist, Bangladesh**

On appraisal mission for the National Minor Irrigation Development Project (IDA/ODA).

1990 - present **Rural Sociologist (Irrigation), Bangladesh**
IDA Deep Tubewell II Project

Socio-economic and impact study including environmental assessment of project deep tubewells covering income distribution, land tenure, irrigation and co-operative management issues, crop diversification and differential impact on female household members.

1990 **Rural Sociologist, Bangladesh**

World Bank Project Appraisal Mission member assessing equity and sustainability aspects of project design, NGO involvement, institutional innovations in the form of water user associations, and the development of project monitoring and evaluation structures.

1989 - 1990 **TADP, Bangladesh** - Responsibilities included:

- evaluation of irrigation management and co-operative practices, development of irrigation by-laws;
- socio-economic advice on irrigation development in new project area;
- responsibility for implementation of three experimental/pilot programmes;
- advice to co-operative and irrigation management unit of the project.

1988 **Socio-economist ODI, London**

Editor of the Irrigation Management Network Newsletter and associated Papers and co-researcher on Nyanyadzi irrigation scheme, Zimbabwe.

Responsibilities:

- Running the ODI world-wide Irrigation Management network including the upkeep of the library, correspondence and information exchange with and between network members.

- Participation in a research project on a small-scale irrigation scheme in Zimbabwe which aims to develop socio-economic guidelines for the design of small-scale irrigation schemes in Sub-Saharan Africa.

1984 - 1988 **Research Student**
University of Bath, UK

Doctoral thesis: 'Water to the Swamp? Irrigation and Patterns of Accumulation and Agrarian Change in Bangladesh'.

Spent a period of 16 months as an agrarian sociologist in Bangladesh. Research was carried out in eight villages in Natore district, Rajshahi and concentrated on the akternative organisation forms (groups versus individual ownership of equipment) under which mechanised irrigation has been adopted. The work concentrated on agrarian production relations in particular.

1981 Research on low income urban housing in Columbia surveying 50 NGOs and self-help initiatives.

SUPPLEMENTARY INFORMATION

Published papers include:

'The Use of Labelling in Urban Income Housing in the Third World - Case Study of Bogota, Colombia' Development and Change vol 16 pp 409-428.

LANGUAGE CAPABILITY

German	:	Excellent
English	:	Excellent
Spanish	:	Good
Bengali	:	Good
French	:	Good
Italian	:	Basic

MICHAEL R WILCOX **Telecommunciations Specialist**

Nationality	British
Year of Birth	1945
Profession	Chartered Electrical Engineer
Position in Group	Senior Engineer
Year of joining Group	1977

KEY QUALIFICATIONS

Extensive experience of communications systems including radio and railway signalling. Wide design and implementation experience in monitoring and control systems for water, road tunnels and railways. Has worked overseas in Hong Kong and Australia.

EDUCATION AND PROFESSIONAL STATUS

OND Mechanical and Electrical, Hendon College of Technology, 1965

BSc (Hons) Electrical Engineering, Hendon College of Technology, 1969

Member of the Institution of Electrical Engineers

Member of the Institution of Electrical Engineers (Aust)

EXPERIENCE RECORD

1977 - present **MOTT MACDONALD GROUP**
(formerly Mott, Hay & Anderson)

1990 - present **Senior Telecommunications Engineer**

Responsible for contract supervision of road signalling systems installation and electrical and mechanical design for the Lantau Fixed Crossing, Hong Kong including cost aspects.

1987 - 1990 **Senior Resident Engineer**
Hong Kong

Responsible for the construction supervision for all mechanical and electrical services to the Route 5 Project consisting principally of a 2.5 km twin bore tunnel, with a mechanical and electrical capital value of £16 m. Involved in specification and financial/cost aspects of supervision.

1982 - 1987 **Senior Telecommunications Engineer**
Melbourne, Australia

Transferred to JCMHA Railway Engineering Division as Senior Telecommunications Engineer supervising all railway associated telecommunications design and implementation work including radio aspects with staffing, budgeting and cost control responsibilities.

Principal areas of work were the implementation of economic studies for telemetry and telecommunications schemes and project management including contractual and financial matters and specification aspects.

- Planning and financial implications of telecommunications strategies for state Rail Authority New South Wales including use of fibre optic line and short link digital radio.

- Design, specification and commissioning of all station and tunnel electrical/mechanical systems including microprocessor based telemetry and controls for Melbourne Underground Rail Loop, including cost aspects.

1977 - 1982 **Electrical and Mechanical Services**
Croydon, UK

Undertook the following design assignments:

- design, specification and supervision of computer based monitoring and control projects for water conveyance and electrical power schemes in the Middle East, including telecommunications services;
- detailed engineering design for frequency and space diversity microwave radio links and offshore submarine cable transmission system for Aramco and local telephone distribution networks for town developments in Libya;
- planning studies on electrical systems for the Channel Tunnel Project;
- design and supervision of telemetry systems and instrumentation - also electrical and mechanical service, CCTV for Tyne Wear Metro.

1975 - 1977 **BRITISH GAS CORPORATION**
Planning Engineer

Responsible for the successful implementation of a 1.5 GHz radio extension to the St Fergus North Sea Gas Terminal from the British Gas National Microwave Network and for the Planning of future fixed and mobile radio installations in the West of England.

1971 - 1975 **BRITISH RAILWAYS BOARD**
Senior Technical Officer

Involved from initial planning to project completion on major 5 MHz line and multiplex projects for the Boards telephone network.

1969 - 1971 **ROSEFAIR ELECTRONICS LTD**

Major participants in the successful design and development of a high frequency power oscillator for industrial dielectric heating applications.

1965 - 1969 **STANDARD TELEPHONE & CABLES LTD**

Training period in conjunction with degree course, involving the design and testing of UHF/microwave communications equipment.

LANGUAGE CAPABILITY

English : Mother tongue

ROBERT B WARDLAW **Hydrology Specialist**

Nationality	British
Year of Birth	1953
Profession	Hydrologist
Specialisation	Hydrology, Mathematical Modelling
Position in Group	Divisional Director, Water Resources Planning Division Manager, Hydrology and Hydraulic Models Division
Year of joining Group	1978

KEY QUALIFICATIONS

Specialisation in hydrology and mathematical modelling. Wide experience gained on many projects including overseas work in Indonesia, China, Pakistan, Bangladesh and Sudan. Responsibilities have included those of team leader, water resources planning and assessment, evaluation of irrigation and drainage requirements and the training of overseas staff in computer simulation techniques.

EDUCATION AND PROFESSIONAL STATUS

BSc, Civil Engineering, University of Strathclyde, 1974

PhD, Hydrology, University of Strathclyde, 1978

Member of the Institution of Civil Engineers

Fellow of the Institution of Analysts and Programmers

EXPERIENCE RECORD

1978 - present **MOTT MACDONALD GROUP**
(formerly Sir M MacDonald & Partners)

1990 - present **Project/Divisional Manager, UK**

Responsible for a number of projects, including the River Allen and Wallop Brook investigations for which integrated groundwater/surface water hydrological models have been developed, urban drainage studies in Hong Kong, and a number of flood investigations in the UK.

1990 **Project Manager, UK**
Prioritisation and Programming of Flood Defence Work

Responsible for a research project into the development of an approach for prioritising and programming National Rivers Authority expenditure on flood defence works.

1990 **Modelling Specialist, Bangladesh**
National Water Plan Project, Phase II

Responsible for upgrading the Bangladesh Water Balance Model to run on PC-based computers with graphics interfaces. Provided training and support for local staff using the model and its results in developing the National Water Plan.

1988 - 1989 **Team Leader, Hong Kong**
Territorial Land Drainage and Flood Control Strategy Study

Led a multi-disciplinary team investigating flood causes and impact, and the appropriate strategies for mitigation in the Territories of Hong Kong.

Studies included a review of the socio-economic impacts of flooding, the preparation of revised hydro-meteorological design criteria and mathematical modelling of flooding in two rural and one urban catchment areas.

Management and maintenance aspects of the flood problem were considered and in development of the strategy, a basin planning approach was adopted, combining structural and non-structural measures.

1988 **Team Leader/Water Resources Planner, Indonesia**
Bali Water Resources Master Plan Study

As part of the Integrated Urban Infrastructure Development Project for east Java and Bali, a regional water resources evaluation for potable water supplies with particular attention to competing water uses and associated social issues. The study includes economic and financial optimisation of source development for Denpasar, which includes multi-purpose reservoirs, groundwater and spring capture.

1988 **Water Resources Planning Engineer, Indonesia**
Support Study for Master Planning in the Water Supply Sub-sector

Investigation and evaluation of various policy and planning objectives with regard to water resources availability and source type development. The study was directed at national issues and required the determination of objective criteria to permit regional equality in approach.

1987 - 1988 **Hydrologist, Indonesia**
East Java Water Resources Study

Responsible for the assessment of the water resources of the Brantas basin which covers an area of 12 000 km^2 with particular attention to existing agricultural water use. A simulation model was developed for optimisation and allocation of water for hydropower, irrigation, fisheries and water supply.

1986 **Hydrologist, Panama**
Dry Zone Groundwater Exploration

Responsible for the evaluation of irrigation and drainage requirements throughout a study area of 40 000 km^2, and for the evaluation of regional low flows and groundwater recharge.

1986 **Hydrologist/Training Specialist, China**
Shanxi Province Technology Transfer Project

Training of staff of the Water Resources Management Committee of Shanxi Province in computer simulation techniques in hydrology. The River Basin Model (for water and sediment resource evaluation) was also applied to evaluate sediment yields in part of the Fen He basin.

1986 **Hydrologist, UK**

Responsible for several projects including an appraisal of recently completed flood alleviation measures in Brecon, Wales, the hydrological and hydraulic analysis of a 1 500 m^3/s flood relief channel in Madagascar, and hydraulic modelling of the Hundred Foot Washes on the River Ouse to determine design flood levels.

1986 **Water Resources Management Specialist/Hydrologist, Indonesia**
East Java Irrigation Project

Operational aspects of canal headworks were studied with respect to sediment exclusion and rules for gate operation during floods devised. Basin water management models were set up for real time reservoir management for run-of-river irrigation offtakes in tributary systems.

1985 **Hydrologist/Modelling Specialist, China**
Gujiao Water Supply and Waste Disposal Study

Responsible for the modelling of surface water resources of the Fen river in the Gujiao region of Shanxi Province. A thorough review was made of existing hydrometeorological practices and data quality was

checked prior to the application of the simulation technique. Studies also included low flow analysis for pollution control, reservoir operation and sedimentation and irrigation requirements.

1984 - 1985 **Team Leader/Hydrologist, Spain**
Basque Region Water Resources Master Plans

Master planning study to determine the most economic means of meeting potable and industrial water demands until the year 2010 in the Basque region. Recommended works included several dams and river transfer schemes, leakage control and new treatment and conveyance systems. Recommended works had a present value of £90 million.

1983 - 1984 **Hydrologist/Modelling Specialist, Bangladesh**
Water Sector Master Plan Project

Responsible for the extension of water balance modelling studies to the southern regions of Bangladesh and for defining surface water resource availability throughout the country for master planning purposes. All models were set up to aid the master planning process. Considerable emphasis was placed on training and counterpart participation.

1983 **Hydraulic Engineer, Pakistan**
Left Bank Outfall Drain

Hydraulic analysis of the 22 km tidal section of the Left Bank Outfall Drain through the Rann of Kutch. Steady and unsteady state analyses were carried out to assess backwater influences on secondary drains.

1983 **Hydrologist/Computer Specialist, Bangladesh**
Bangladesh Water Development Board

Responsible for the implementation of the Bangladesh Water Balance Model on a Tandy TRS-80 model 16 microcomputer, and for training staff of the water development board in updating and using the model and computer system.

1983 **Team Leader/Hydrologist, UK**
Dingwall Flood Protection and Drainage Improvement

Involved in the initial stages of a study to investigate fluvial and tidal flooding in Dingwall.

1983 **Team Leader/Hydrologist, UK**
Boroughbridge Flood Alleviation Scheme

Feasibility study to investigate river flooding in the town of Boroughbridge. Alternative schemes investigated were flood walls, river diversion works, and upstream storage.

1982 **Team Leader/Hydrologist, UK**
River Foss Flood Alleviation

Feasibility study for the alleviation of flooding attributable to the River Foss in the city of York. Alternatives investigated included gates, pump stations, upstream storage and flood walls. Additional analyses investigated flooding of urban storm drainage along the River Foss.

1981 - 1982 **Hydrologist, UK**
Bangladesh Water Balance Studies

Responsible for the development of a mathematical model to describe the distribution of water resources in the northern regions of Bangladesh. The model comprised a balance subroutine and a systems representation of the channel network. The model, which can quantify both surface water and groundwater resources, was used to test the influence of a series of water resources development plans. Data storage and retrieval techniques were of paramount importance with up to 200 raingauges, 70 stream gauges, 200 groundwater observation wells, providing spatial and temporal inputs to the model for over 100 catchment areas.

1981 **Hydrologist, Indonesia**
Waru-Turi Irrigation Rehabilitation Project

Evaluation of crop water requirements and internal drainage requirements for a project area of 20 000 ha, and an assessment of the flood protection measures required to protect schemes from major rivers crossing the project area. An evaluation was also made of reliable flows in the Brantas River for irrigation and the existing hydrometric network and processing procedures reviewed.

1980 **Hydrologist, Indonesia**
Surabaya Water Use Study

Identification of possible sources for additional water supply to the town of Surabaya. Investigations included low flow studies on a number of river basins and a complete appraisal of the Brantas River, the second largest in Java. Flow records for the Brantas were naturalised to reflect the influence of a series of major development projects on the river, and synthesised records produced to reflect the situation on completion of several on-going projects.

1980 **Hydrologist, UK**

Involved in several projects, including a computer simulation of flood hydrographs to examine the effects of flood alleviation measures in the town of Brecon, Wales. Time was also spent on the development of standard computer programs which included a smooth contouring package which was subsequently used to plot piezometric surfaces and aquifer parameters for the Wadi Tuban project.

1979 **Hydrologist, Sudan**
South Kordofan Project

A complete appraisal including data collection and processing procedures was made of the hydrometeorology of the South Kordofan Province in particular with reference to rainfed agriculture. Water resources were reviewed and several areas with potential for irrigation identified. Recommendations for the improvement of rural and urban water supplies and of road communications were also made.

1979 **Hydrologist, Libya and UK**
Wadi Qattarah Project and Tripoli-Misurata Railway

Evaluation of flood hydrographs for reservoir spillway design and an evaluation of reservoir yields. A mathematical model was developed, based on the LANDS subroutine of the Stanford model in order to synthesise an historic sequence of reservoir inflows.

Responsible for the evaluation of cross drainage requirements for 250 km of a proposed railway alignment. The work included data collection and a field reconnaissance of the main cross drainage channels and their catchment areas.

1978 **SECRETARIAT OF DAMS AND WATER RESOURCES, LIBYA**
Hydrologist, Tripoli

Responsible for the preparation of specifications and for the review of consultants' reports, for water resource investigations throughout the country.

1974 - 1977 **UNIVERSITY OF STRATHCLYDE**
Research Student

SUPPLEMENTARY INFORMATION

Attended a course on Finite Elements in January 1977, by Computational Mechanics, and took part in a workshop on digital simulation in hydrology, run by Hydrocomp International in April 1977.

LANGUAGE CAPABILITY

English : Mother tongue

PUBLICATIONS

'Groundwater modelling within a total system concept'. Presented before the Hydrogeological Group of the Geological Society, June 1976. Dept. of Civil Engineering, University of Strathclyde, HHCD-76-21. Hydrocomp Simulation Newsletters, Vol. 9, No. 2, 1977.

'An integrated surface/subsurface hydrological response model'. Symposium on Optimal Development and Management of Groundwater, Int. Assoc. Hydrogeologists, Birmingham, July 1977. Co-author G Fleming.

'Labuan groundwater study'. Consultant's Report in 1977, Dept. of Civil Engineering, University of Strathclyde, HHCD-77-11. Co-author G Fleming.

'The integrated use of hydrological models in water resource evaluation'. Presented before the AM and S Section of the ICE, Glasgow, 1977. Dept. of Civil Engineering, University of Strathclyde, HHCD-77-25.

'The Strathclyde integrated surface/subsurface hydrological response model'. Internal Report, 1977. Dept. of Civil Engineering, University of Strathclyde, HHCD-77-25.

'A method for calculating the average slope of overland flow in catchments having little relief'. Internal Report 1977. Dept. of Civil Engineering, University of Strathclyde, HHCD-77-28.

DONALD N MOORE — Co-ordinator

Nationality	British
Year of Birth	1948
Profession	Civil Engineer
Specialisation	Water Resources Development
Position in Group	Divisional Director, Bangladesh
Year of joining Group	1971

KEY QUALIFICATIONS

Specialises in the planning of the utilisation and control of water resources primarily for agricultural development. Has extensive experience of multidisciplinary projects encompassing both surface water and groundwater development and also in the use of computer applications.

EDUCATION AND PROFESSIONAL STATUS

Chartered Engineer

BSc, Civil Engineer, University of Newcastle upon Tyne, 1970

MSc, Hydraulics, University of Newcastle upon Tyne, 1971

Member of the Institution of Civil Engineers

EXPERIENCE RECORD

1971 - present **MOTT MACDONALD GROUP**
(formerly Sir M MacDonald & Partners)

1989 - present **Engineer/Planner, Bangladesh**
National Water Sector Master Plan, Phase II

Following his involvement in Phase I (1983-84), responsible for planning and identification of surface water and groundwater projects and flood control measures within the country. An integrated approach was applied which covered agricultural development, water supply, fisheries and navigation together with environmental considerations.

1989 **Water Resources Planner, Philippines**
Sub-basin Master Planning, Bangladesh

Seconded to United Nations Development Programme (UNDP) for the preparation of the project document for US$ 5 million series of studies of water resources in south-west Bangladesh.

1988 - 1989 **Water Resources Engineer, Bangladesh**
Flood Study, World Bank and Flood Policy Study, UNDP

Member of a multidisciplinary team established to review the various reports produced by countries and donors in response to the 1988 floods. A report was produced, for discussion at a major international donor meeting held in London, containing possible multi-billion dollar development programme.

Member of a team of specialists assembled by UNDP to assess the implications of the severe floods experienced in Bangladesh in 1987 and 1988.

1988 **Irrigation and Drainage Engineer, Nepal and UK**
Simulation Model of the Mahakali Irrigation Project

Responsible for the development of a computer-based simulation model of an existing 5 000 ha irrigation scheme. The model is designed to reproduce the hydraulic operation of the main canal and to yield financial costs and benefits associated with user-defined cropping patterns and agricultural/engineering inputs at both farm and operating agency level. The World Bank financed study is part of the strengthening of the Government's Irrigation Department and is intended primarily for training purposes.

1987 - 1988 **Hydraulic Engineer, UK**
Left Bank Outfall Drain Project, Pakistan

Undertook the design of the Jamrao Vortex Tube Structure, a hydraulically operated extractor to remove up to 70% of the sediment load of the Jamrao Canal (150 m^3/s maximum). The structure comprised a series of six vortex tubes of 1.5 m diameter which passed the 20 m^3/s sediment laden discharges into a settlement basin itself kept operational by the use of a permanent dredger.

1987 **Principal Engineer, UK and Indonesia**
Management Training for Local Consultants

Preparation of seminar course notes and aids covering the topics 'Corporate Planning' and 'Management Information Systems' in the context of consulting engineering for presentation to Indonesian participants of courses organised by the Government of Indonesia.

1987 **Planning Engineer, Panama**
Panama Groundwater Study

Undertook the water resource planning, irrigation and engineering costing aspects for a groundwater study at feasibility level for an area of 10 000 km in the 'Arco Seco' of Panama. The objective was to foster small-scale irrigation development based on groundwater resources.

1987 **Principal Engineer, UK**
Computerised Reporting and Monitoring System, Bangladesh

Preparation of a suite of computer programs to be used for scheme monitoring in the local government system. The schemes were rural development projects ranging in type from flood protection and control, and roads and bridges to market developments. The annual development funds comprised both government budgets and donor sources. The software package, designed to run on a 20 MB microcomputer, facilitated data entry from standard forms, modification and analysis. Monthly monitoring of all schemes and annual reviews/assessments was the objective. Aspects covered were physical and financial progress and material quantity usage.

1984 - 1986 **Engineering Adviser/Water Resources Adviser,**
Bangladesh Intensive Rural Works Programme

Member of a team of advisers supporting a US$ 3 million per year rural development programme. In charge of a team of over 60 local engineers and up to four expatriate engineers providing guidance to government engineers and generally supervising the works which comprised surface water resources schemes, rural roads, bridges, market developments, office buildings and houses.

In addition, as an element of support to the Local Government Engineering Bureau the following projects were undertaken:

- Establishment of a cell for the screening, assessment of viability, design and document production for Small Scale Water Resources Schemes comprising in total about 10 000 ha worth of development schemes per year. Most of the schemes were for flood control and drainage, although many made provision for irrigation development. Flood protection and control measures were designed to cope with both localised rainfall events and flooding generated by the major Ganges/Brahmaputra River system.

- Preparation of a national design manual for cross-drainage structures using local consultants and the main engineering university.

- Preparation of a schedule of works document and specification on a microcomputer to enable annual price changes to be accommodated on a regional basis to cover the whole country.

- Implementation of a road trial to investigate the behaviour of various construction techniques and surface performance of rural roads.

- Establishment of a cell for the preparation of 1 : 25 000 maps to cover an area of 6 000 km^2 to be provided for local bodies to facilitate planning. The process entailed the use of aerial photographs, existing smaller scale maps and contour information.

1983 - 1984 **Database Management Specialist/Planning Engineer, Bangladesh**
National Water Sector Master Plan

Collected and processed data relating to all sectors of water use within the country including irrigation, drainage, flood protection, industrial and domestic use, fisheries and navigation. Particular attention was paid to the small-scale irrigation sector, that related to tubewells and low lift pumps. The information was to be used as the benchmark for master planning purposes and as the database for the several proposed conceptual computer models. As part of the initial steps in water resource planning an assessment of the national irrigation planning manual (IMP) was made.

Prepared a computer program to evaluate regional irrigation water requirements for the whole country assuming regional variations of rainfall, evaporation, soil types, planting dates and growing periods for nine major crops. This provided the basis for irrigation planning work and the assessment of potential development using groundwater and surface water resources. Established the basic methodology for catchment area water resource allocation and development exercises.

1983 **Project Manager, People's Republic of Mozambique and UK**
Citrus Development Project, Maputo Province

Predesign topographical and soil surveys for the rehabilitation and development of 1 000 ha of irrigated citrus plantations. Based on the information collected which included both climatological and agronomic data, designs and tender documents were produced.

The project comprised a pumping station on the River Incomati with a capacity of approximately 1 m^3/s and a static lift of 40 m, lined storage reservoirs, two sprinkler pumping stations, 60 km of pressure pipelines, roads, flood protection bunds, project buildings, packing equipment, supply of vehicles and agricultural machinery.

1982 **Irrigation/Hydraulic Engineer, Sudan**
Southern Darfur Development Project

Rapid reconnaissance and re-appraisal of the development potential of spate irrigation from the Wadi Bulbul in South Darfur Province. Irrigated vegetables and transplanted sorghum were planned for several small areas.

1981 - 1982 **Planning Engineer, Bangladesh**
Water Balance Studies Phase I and II

Collection, analysis and processing of irrigation, drainage and flood control data for incorporation in the database used to calibrate a conceptual, computer based model of the water resources of the north of Bangladesh. Further to data collection on existing systems and the processing of existing land use and crop statistics, a projection was made of the planned and likely project development status by the year 1985 and the year 2000. The response of the water resource simulation model to such planned developments was subsequently analysed and development strategies adjusted accordingly.

1981 **Irrigation Engineer, Chile**
Canal Linares Project

Investigation of the technical and economic viability of a large contour canal feeding a predominantly rice growing area. Alternative levels of development were considered, the maximum length of the canal being 120 km, with design capacities of up to 170 m^3/s. Canal alignment alternatives were costed after site visits; several sites entailed major siphons across rivers originating in the Andes. Canal lining was also considered, particularly in the reaches where the canal was to be built on high cross-slopes of up to 15%.

1981 **Water Resources Engineer, Brazil**
NE Brazil Livestock Study

Member of a multi-national, multi-disciplinary team engaged on a reconnaissance/feasibility study to evaluate the potential and select sites for a 500 000 head sheep farm. Groundwater and surface water quality and availability were important factors for both human and animal drinking purposes and for the irrigation supply to a 2 000 ha feedlot area.

1980 - 1981 **Irrigation Engineer, PDR Yemen and UK**
Wadi Tuban Water Management Study
Abyan Delta Irrigation

Initially compiled the planning report for the integrated development of the agricultural and water supply sectors to the year 2000 using both groundwater and spate water. Subsequently worked on a feasibility study of several small-scale groundwater schemes incorporating existing spate irrigation practices together with the investigation into a scheme to develop a 200 ha fodder farm using treated sewage effluent.

Also worked on the rehabilitation of damaged and unsafe structures and the modification of designs associated with a 5 000 ha spate irrigation system in the Abyan Delta under remodelling. The major problem of under seepage was thoroughly investigated. Recommendations for flood protection works were also made.

1979 - 1980 **Design Engineer, UK**
Homboy Irrigated Settlement Project, Somalia
Juba Sugar Project, Somalia

Evaluated infrastructural requirements for the settlement of nomadic refugees resulting from the 1974 drought on a proposed 9 000 ha irrigation and drainage scheme. Most aspects of rural works were covered including housing, water supply and low cost roads.

Responsible for major design modifications and improvements to a 6 000 ha sprinkler irrigation scheme under construction for the Juba Sugar Project.

1977 - 1979 **Chief Design Engineer/Project Manager, Brazil**
Guaira Irrigation Project

Pre-design field investigations and surveys, design and preparation of tender documents for a 13 000 ha irrigation project in the State of Sao Paulo. The irrigation source was a river site, the water being lifted over 30 m to supply an open, compacted earth, channel system. Provision was made for both sprinkler and surface water field applications. An on-the-job training process was undertaken with the Government engineers associated with the project.

1976 - 1977 **Assistant Project Co-ordinator, UK**
Bakolori Project, Nigeria

Design checks on the reports and proposals formulated by the Italian designer/contractor. The project included a concrete gravity dam with hydropower capacity also providing a constant source of irrigation water for a scheme of 27 000 ha of surface irrigation and 5 000 ha of sprinkler.

1974 - 1976 **Resident Engineer and Drainage Engineer, Iraq**
Lower Khalis Irrigation Project

Engineering design and construction of two subsurface drainage trial areas of about 20 ha each. This was followed by the operation and supervision of monitoring to study the effects of various field drain spacings. As Resident Engineer supervised a £100 000 drilling contract for approximately 100 boreholes of between 10 m and 75 m depth over an area of 150 000 ha. The investigation was to locate restrictive layers for the drainage design and also the general feasibility of vertical drainage. Subsequently checked the alignment of the main drainage system and co-ordination of land levelling and field drainage works with the contractor. The project works covered an area of 7 000 ha.

1974 **Planning Engineer, Iraq**
Upper Khalis Irrigation Project

Member of a three man team on the reappraisal of an existing irrigation scheme of 70 000 ha making recommendations for system improvements.

1971 - 1974 **Engineer/Hydrologist, UK**

Development of numerous computer programs and methods for the rapid analysis of hydrological and climatological systems including Penman evapotranspiration and estimates and frequency analyses of monthly rainfall data. Also worked on the design of irrigation and drainage layouts.

SUPPLEMENTARY INFORMATION

Postgraduate research work covered the field of diffusion and turbulence characteristics of water jets.

LANGUAGE CAPABILITY

English	:	Mother tongue
Welsh	:	Spoken - fair; reading - good; written - fair
Portuguese	:	Spoken - fair; reading - good; written - fair

Appendix II

Mott MacDonald

Summary of Project Experience

Project	Flood Plans / Mitigation and Coastal Protection	Water Resources Planning and Development	Agriculture and Rural Development	Institutional Development	Infrastructure Development	Training
National Water Plan Project-Phase II, Bangladesh (1990)	○	○				○
National Water Plan Project, Bangladesh (1986)		○		○		
Support for the First Urban Development Project, Bangladesh (1993)					○	○
South East Region Water Resources Development Programme, Bangladesh (1993)	○	○				
Dhaka Flood Protection, Bangladesh (1993)	○	○				
Flood Policy Study, Bangladesh (1989)	○	○				
Rehabilitation of Water Development Projects, Bangladesh (1988)	○	○				
Rural Employment Sector Programme, Bangladesh (1989)	○	○	○	○	○	○
Intensive Rural Works Programme, Bangladesh (1986)	○	○	○	○	○	○
IDA Deep Tubewells Project II, Training Services, Bangladesh (1988)		○				○
Water Balance Studies, Bangladesh (1982)	○	○		○		○
Flood Damage Reconstruction, PDR Yemen (1986)	○	○	○		○	
Flood Damage Assessment Study, Somalia (1981)	○			○		
Refugee Farms Studies, Somalia (1980)		○	○			
Water Supplies for Somali Refugee Camps, Ethiopia (1988)		○				
Territorial Land Drainage and Flood Control Strategy Study -Phase I Hong Kong (1990)	○	○				
Jurong Lake Tidegate and Jl. A. Ibrahim Culvert, Singapore (1990)	○					
Zamboanga Research Centre Flood Protection Works, Philippines (1979)	○	○				
Hydrometric Network Program, Palawan, Philippines (1985)		○				○
Sukkur Barrage Flood Management Review, Pakistan (1987)	○	○				
Sukkur Barrage Gates Rehablitaton, Pakistan (1992)	○	○		○	○	○
Wadi Landsab Flood Control, Oman (1986)	○	○				

National Water Plan Project - Phase II

Location	Bangladesh - countrywide
Client	World Bank
Financed by	United Nations Development Programme
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners Ltd)
Associated Firms	Engineering and Planning Consultants Ltd Harza Engineering Co International Meta Systems Inc
Services	Master planning
Completion	1990

The objective of this project was to enhance the Government of Bangladesh's capability to plan water resources at a national level. Careful control and development of water resources is required to increase agricultural production, to meet growing demands on the water resources in the domestic and industrial sectors, and to control salinity. Integrated planning of flood control and river training measures is also required following two disastrous floods in 1987 and 1988. The project built on the findings of Phase I of the project, which the Group completed in 1986.

The consultants helped to establish a permanent planning unit in association with local staff.

The Group's role was:

- to define the mandate for a national water resources planning unit;
- to propose a corporate structure for the unit;
- to plan and implement effective training for government staff;
- to provide technical assistance to staff on specific assignments.

The master planning was undertaken at three levels: national, regional and project. At present, the emphasis is on national planning: this is seen as a top priority and will form the basis for long-term water resources development. At a regional level, hydrological units were defined as a basis for water development.

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National Water Plan Project

Location	Bangladesh
Client	World Bank on behalf of Government of Bangladesh Ministry of Irrigation, Water Development and Flood Control
Financed by	United Nations Development Programme Government of Bangladesh
Firm	Harza Engineering Company International (USA)
Associated Firm	Mott MacDonald Group (as Sir M MacDonald & Partners Ltd)
Services	Specialist support and advice
Completion	1986

The Master Plan Organisation (MPO) was established under the Ministry of Irrigation, Water Development and Flood Control and its assignments include the following:

(a) the preparation of a comprehensive water resource assessment;

(b) the preparation of an agriculturally centred investment portfolio for the 1985-1990 Five Year Plan.

(c) the preparation of a long-term plan for water resources development.

Mott MacDonald had specific responsibility for the development of both ground and surface water modelling, broadening the base of previous water balance studies and thus providing a rapid means of evaluating the impact on resources of various developments. Considerable effort was also put into strengthening the institutional framework of the MPO to ensure there was an adequate structure to support the work's continuation.

The Group also had responsibility for certain aspects of engineering planning, particularly in relation to irrigation, and set up database systems for maintenance and cropping inventories.

Support for the First Urban Development Project

Location	Dhaka and Chittagong, Bangladesh
Client	United Nations Centre for Human Settlements (Habitat)
Cost	£21 million (at 1990 prices)
Financed by	Client
Firm	Mott MacDonald Group
Associated Firms	Culpin Planning Ltd Engineering and Planning Consultants
Services	Advisory, training and supervisory
Completion	1993

The project provides technical and managerial assistance to the Project Design and Implementation Units (PDIUs) established by the Dhaka and Chittagong City Councils to implement the First Urban Development Project funded by the World Bank. Teams established in each city provide overall support to the PDIU in completing a wide ranging programme of urban improvement works encompassing design and construction works, urban management improvements, establishment of planning criteria, social welfare, community and planning and development work.

In Dhaka three low income areas were identified for improvements across drainage, sanitation, water supply, solid waste sectors, as well as in roads and footpaths and community facilities. Road levels are being raised wherever practical to limit the incidence of flooding to a 1 in 25 years event and access routes reconstructed to an all-weather standard. The construction of community centres will provide social welfare, education and primary health care facilities and become centres for community programmes. Sanitary landfill sites have been identified which will create more settlement land and by infilling such low lying and undrained areas reduce the incidence of nuisance and health hazards.

Improvements to the systems of solid waste collection and disposal are also to be instituted. A major drainage culvert the Dholai Khal, draining 675 ha, about one third of the city, is also to be improved.

In Chittagong, a complete review of systems of solid waste management identified the need to procure new vehicles and equipment and construct new maintenance workshops. In addition a programme of improvements to the public sanitation systems is to be implemented together with major improvements to surface water drainage.

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South East Region Water Resources Development Programme

Location	Bangladesh
Client	World Bank
Financed by	United Nations Development Programme
Firm	Mott MacDonald Group
Associated Firm	Nippon Koei Co Ltd Resources Development Consultants Ltd House of Consultants Ltd Desh Upodesh Ltd
Services	Study
Completion	1993

The project consists of two major parts, a Regional Study and a Feasibility Study. The project area is almost one million hectares and includes some of the most densely populated and intensively cultivable areas of Bangladesh. The regional study will identify projects for flood control, drainage and irrigated agricultural development and make recommendations for the phasing of the development programme.

The project area is part of the most extensive river delta in the world, and the studies will examine the problem of flooding from three great rivers, from local rainfall, and from cyclones in the Bay of Bengal. As part of these studies a comprehensive river simulation model will be used. Other components include sedimentation, groundwater, fisheries, navigation and salinity studies. A major river basin transfer will be examined.

After the regional study has been completed the consultants will proceed to a feasibility study of a selected area.

The study is being carried out on behalf of the Bangladesh Development Board whose staff will participate in the project.

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Dhaka Flood Protection

Location	Dhaka, Bangladesh
Client	Ministry of Local Government Rural Development and Co-operatives Flood Plan Co-ordination Organisation
Financed by	Japanese International Co-operation Agency
Firm	Mott MacDonald Group
Associated Firm	Pacific Consultants International (Japan) Engineering and Planning Consultants (EPC) (Local)
Services	Study
Completion	1993

As a consequence of the major floods in Bangladesh in the years 1987 and 1988 a series of studies and implementation programmes was instigated to address the problems. Dhaka Flood Protection Project comprises one element of the plan.

The study involves the formulation of a master plan on a comprehensive flood control and stormwater drainage programme for Dhaka Metropolitan Area (850 km^2). The plan extends to year 2010 and will include comprehensive structural and non-structural measures such as:

- flood protection works including embankments, flood walls and road raising;
- stormwater drainage systems for existing urbanised areas including drainage channels, pipes and pumps;
- stormwater drainage systems for future urban development areas including trunk drainage channels, drainage pumps, flood retarding ponds and floodplain management;
- provision of guidelines for floodplain management and for urban developments.

Subsequently, a feasibility study with respect to drainage will be carried out on a flood control and stormwater drainage scheme for the priority area identified in the master plan.

In carrying out these studies, close liaison and co-ordination is to be maintained with the Dhaka Integrated Flood Protection Project and other components of the Flood Action Plan.

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Flood Policy Study

Location Bangladesh - countrywide

Client United Nations Development Programme

Financed by Client

Firm Various consultants including specialists from the Mott MacDonald Group

Services Planning mission

Completion 1989

Almost 30 severe floods have affected the region now comprising Bangladesh in the past 35 years. Extensive damage has been caused to property and misery inflicted on numerous lives. As a consequence of floods in 1987 and 1988 a significant amount of the country's wealth and annual output was lost and its regular development programmes severely disrupted.

The objective of the mission was to propose a plan of action to address flood problems in the Ganges and Brahmaputra river basins. Mott MacDonald provided specialist consultants for the mission including the team leader. The plan will help the Government of Bangladesh to address all aspects of flood preparedness and control, focusing on:

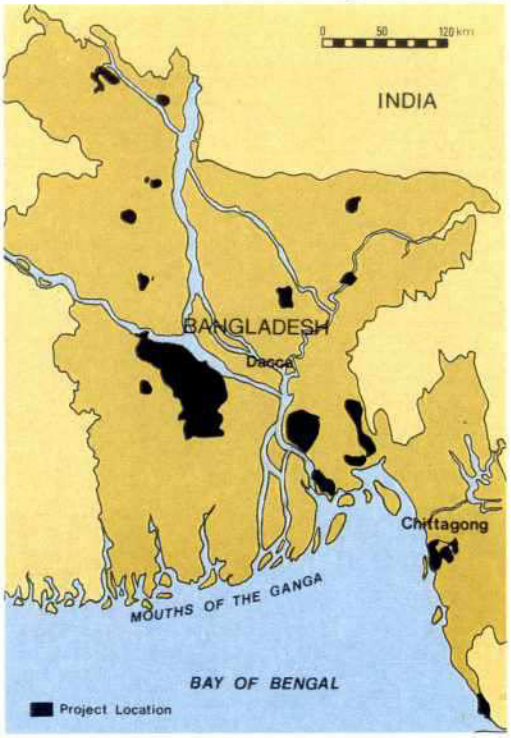
- causes of floods, both natural and man-made. Attention will be paid to changes in flooding patterns and occurrences, including return periods for major floods;
- short-term measures to improve flood preparedness. Emphasis will be placed on national flood warning and regional flood forecasting systems;
- medium- and long-term measures to improve flood control. Regional co-operation for planning and management on a basin-wide scale will be considered;
- specific steps to bring the concerned riparian countries together in a joint action programme.

Although the mission focused on the lower Ganges and Brahmaputra river basins, the inevitable linkage between flood problems and overall regional water resources planning and management was considered.

The mission advised government on developing a comprehensive flood strategy and commented on the local flood policy study.

Rehabilitation of Water Development Projects

Location	Bangladesh
Client	United Nations Development Programme
Cost	US$ 6 million (at 1986 prices)
Financed by	Client
Firm	Engineering and Planning Consultants Limited
Associated Firms	Harza Engineering Company Sir M. MacDonald & Partners Limited
Services	Feasibility studies and preparation of detailed designs, tender documents and operation and maintenance manual
Completion	1988



Project location map.

On the basis of reconnaissance surveys completed in 1984, twenty-one existing drainage, flood control and irrigation projects were identified for priority rehabilitation. The projects range in area from 1 600 ha to 243 000 ha and will benefit a total area of 0.5 million ha.

During this assignment detailed feasibility studies will be prepared for the twenty-one projects. Following review by the client and the Bangladesh Water Development Board, the detailed design and preparation of tender documents for viable projects will be undertaken.

Sir M. MacDonald & Partners is responsible for specialist inputs on hydraulic structures and sea river revetments. Rehabilitation works included in the assignment are additional water regulating structures, strengthening of embankments, replacement of gates and bank protection measures.

The reconnaissance studies indicated that many projects required rehabilitation as management, operation and maintenance (MOM) practices were not adequate. Appropriate MOM studies will be carried out and detailed procedures prepared.

Rural Employment Sector Programme

Location	Bangladesh
Client	Swedish International Development Authority
Cost	US$ 20 million (at 1987 prices)
Financed by	Norwegian Agency for International Development Client
Firms	Sir M MacDonald & Partners Ltd Hifab International, Sweden
Services	Technical assistance and programme administration
Completion	1989

Landless labourers receive training to cast concrete pipes

The Rural Employment Sector Programme (RESP) is a continuation of the Intensive Rural Works Programme for which the Firm provided technical assistance from 1980 until 1986. The objective of RESP is to improve the economic and social conditions of a total population of some six million, located in four districts and involving 22 upazilas.

The Firm is responsible for programme administration and for providing technical assistance staff in civil and water resources engineering. The programme has three units:

- Central Planning and Monitoring Unit.

- Infrastructure Development Project. Improvements to infrastructure, training programmes and institution building are aimed mainly at benefiting the rural poor. For example, the project has created an earth road maintenance programme employing destitute women who receive training in functional literacy and protection against exploitation. Water resources projects for flood control, irrigation and drainage have been identified, designed and constructed during the programme. Participation of beneficiaries is encouraged by the formation of a water user group on each scheme. Rural feeder roads, totalling 60 km in length and involving some 150 cross-drainage and other structures, are being constructed using labour intensive construction techniques and low cost technology.

- Production and Employment Project. The main components of this unit are the formation of groups among the rural poor to undertake productive work; the effective use of group funds; implementation of a credit programme; and strengthening of the Bangladesh Rural Development Board.

Rural feeder road: herring-bone brickwork

Small-scale water resource development: Noldanga Sluice

The earth road maintenance programme

Rural Employment Sector Programme - Training Services

Location	Bangladesh
Client	Swedish International Development Authority
Cost	US$ 20 million (at 1987 prices)
Financed by	Client Norwegian Agency for International Development
Firms	Mott MacDonald Group (as Sir M MacDonald & Partners Limited) Hifab International, Sweden
Services	Technical assistance and programme administration, training
Completion	1989

The Rural Employment Sector Programme (RESP) has the objective of improving the economic and social conditions of some six million people. The programme has three units:

- Central Planning and Monitoring Unit.
- Infrastructure Development Project. This unit includes training programmes aimed at benefiting the rural poor: destitute women receive training to maintain earth roads; staff from the Local Government Engineering Bureau (LGEB) receive instruction in water resources development; and landless labourers are trained to construct low-cost feeder roads.
- Production and Employment Project.

Mott MacDonald has provided a wide range of training inputs:

- assistance with developing a Training and Manpower Development Policy for LGEB;
- support to the LGEB Training Unit including its institutionalisation within government;
- developing and running field courses for LGEB technical and administrative staff;
- developing in-house trainers by courses and on-the-job training;
- designing and delivering an overseas course and study tour on employment generation;
- arranging overseas study for project staff;
- skills training and consciousness raising for landless labourers;
- skills, procedures and management training for project staff of LGEB and the Bangladesh Rural Development Board.

Intensive Rural Works Programme

Location	Bangladesh
Client	Swedish International Development Authority
Cost	£13 million (at 1982 prices)
Financed by	Client, Norwegian Agency for International Development and (until mid 1985) Danish International Development Agency
Firm	Sir M. MacDonald & Partners
Services	Planning, implementation of programme, training and, until mid-1984, management
Completion	1986

Training local engineers in road construction

The Intensive Rural Works Programme was designed to improve the social and economic conditions of people living in famine and flood prone areas. The programme was active in eleven districts with a total population of 8 million people.

The Firm was engaged to assist the Ministry of Local Government, Rural Development and Cooperatives, implement the programme and was responsible for identifying and planning all aspects of the development to conform with the donors and government's objectives. This required sociological and economic appraisals as well as identifying deficiencies in local infrastructure. The Firm also advised on the technical aspects of the selected engineering and agricultural developments. The programme placed a strong emphasis on labour intensive works including development of water resources and constructing fish ponds, roads, bridges, administration buildings and housing. Maintenance regimes for earth roads, as well as post-monsoon rehabilitation of earthworks, bridges and housing were developed.

Developing skills by on-the-job training and vocational courses has included extending literacy and explaining workers' rights and responsibilities. The creation of small income generating schemes was also encouraged through provision of advice. Local officials, administrative and engineering staff received appropriate training with a few senior staff attending courses abroad. Study tours of neighbouring countries were arranged to complement the training programmes.

The programme has special employment schemes for women

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Intensive Rural Works Programme - Training Services

Location	Bangladesh
Client	Swedish International Development Authority
Cost	£13 million (at 1982 prices)
Financed by	Client Norwegian Agency for International Development Danish International Development Agency (until mid-1985)
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners)
Services	Planning, programme implementation, management and training
Completion	1986

The programme aimed to improve the social and economic conditions of the landless in 100 flood and famine prone upazilas (local government areas):

- by creating both short-term and long-term employment;
- by constructing and maintaining useful infrastructure;
- by developing the implementation capability of the Local Government Engineering Bureau (LGEB).

Projects components included:

- investment in specific schemes (ultimate implementation capital costs may be US$ 250 million over 10 years);
- development and implementation of new planning procedures;
- improved design and construction by equipping and training LGEB staff;
- introduction of maintenance and rehabilitation of infrastructure;
- introduction of new management systems into LGEB; management information, maintenance, contracts and specifications, training, equipment management, water resource schemes, use of landless groups for construction.

The training component was countrywide and co-ordinated inputs from many other donors. It included:

- skills training for landless labourers, literacy for destitute women, skills and management for engineering staff, procedures for accounts staff and training of trainers;
- review of training needs and evaluation of the training programme;
- setting up a Training Unit of 4 specialists and 13 field-based district training engineers;
- running field courses for project preparation, implementation and accounts;
- study tours and overseas courses for LGEB engineers;
- use of in-house trainers, academic institutions, private training firms and other government institutions.

The project provided over 21 000 trainee days in 1985/86 with a budget of US$ 420 000 and 15 different courses.

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IDA Deep Tubewells Project II
Training Services

Location	Bangladesh
Clients	Bangladesh Agricultural Development Corporation Overseas Development Administration
Cost	US$ 44 million (at 1982 prices)
Financed by	Clients World Bank Australian Development Assistance Bureau European Economic Community
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners)
Associated Firms	Hunting Technical Services Ltd Engineering and Planning Consultants, Dhaka
Services	Training
Completion	1988

A total of 4 000 deep tubewells is being installed for irrigation. The training component has four main aspects:

- training of farmers in the procedures of the Irrigation Management Programme and co-operative management;
- training of pump operators and mechanics in operation and maintenance;
- training of co-operative inspectors and village accountants in financial procedures;
- training of sub-assistant engineers in survey, mapping, irrigation design and construction.

The training was carried out in collaboration with the Bangladesh Rural Development Board (BRDB) and the Bangladesh Agricultural Development Corporation: the Training Materials Production Specialist of BRDB prepared materials. Training was implemented by the government staff as well as technical assistance personnel, and much of the material was in Bengali.

Mott MacDonald provided several specialist inputs to:

- prepare a training needs assessment and a training plan;
- set up the training course format, with course material for participants, instructor's manuals and training of trainers courses;
- evaluate progress and propose further development for each type of course.

Water Balance Studies

Location	Bangladesh
Client	United Nations
Financed by	United Nations Development Programme
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners)
Associated Firm	Hunting Technical Services Ltd
Services	Water balance analyses and setting up local water balance unit
Completion	1982

A detailed water resources investigation was carried out over an area of 70 000 km^2 in the North West and North East regions, much of which is subject to extensive annual flooding. The study was conducted in association with the Bangladesh Water Development Board (BWDB).

The work involved identification and quantification of water balance components; ground and surface water hydrology; present and projected water development activities including wells, low lift pumps, gravity irrigation schemes and flood protection works; and specific analyses for the years 1980, 1984 and 2000.

The overall objective of the study was to provide a planning tool for national developers concerned with the optimum utilisation of water resources. Assistance was provided in setting up a water balance unit within BWDB by training and institutional recommendations. A water balance model was developed which was subsequently transferred to a microcomputer system in Bangladesh. Formal training was carried out at the model transfer stage. The model has subsequently been developed and used for national water planning.

Traditional surface water irrigation

Groundwater Irrigation

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Flood Damage Reconstruction

Location	People's Democratic Republic of Yemen
Client	Commission of the European Communities
Cost	£1.2 million (at 1985 prices)
Financed by	European Development Fund
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners Ltd)
Services	Appraisal mission, provision of implementation team
Completion	1986

Exceptionally heavy rainfall in March 1982 caused extensive destruction of agricultural land, structures and property throughout the country. The Group was appointed to carry out an appraisal mission to identify possible projects to be financed from EEC funds to restore and rehabilitate the affected regions. The study considered the supply of construction equipment, borehole pumps, agricultural machinery, fertilisers and pesticides. Reconstruction of barrages and supply canals, installation of flood warning stations and evaluation of groundwater development potential were also studied. The Flood Damage Reconstruction Project at Dhalla was selected for implementation.

Subsequently the Group provided supervisory and management staff for this project. The scheme, which relied on voluntary labour but provided skilled tradesmen and equipment, included reconstruction and development of 80 open wells and restoration of 50 pumpsets. Productive land was protected and reclamation instituted of 2 300 ha of land damaged by sheet erosion and changes in the wadi channel alignment. Wadi training works which included constructing weirs and groynes from gabions were provided. The procurement of construction equipment was also included in the project.

A flood warning system was installed on the upper wadi Bana to give advanced warning of floods so that emergency measures to protect lives and property could be initiated.

Flood Damage Assessment Study

Location	Somalia
Client	FAO/Ministry of Agriculture
Financed by	Food and Agriculture Organisation
Firm	Sir M. MacDonald & Partners
Extent of Services	Study and report
Completed	1981
Associated Firm	Hunting Technical Services Ltd.

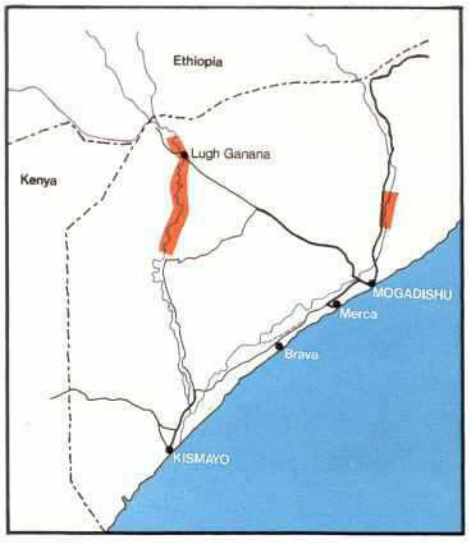
Description

Following serious flooding in April/May 1981 the Firm was commissioned to carry out a study of the flood damage. A gross area of 350 000 ha had been flooded of which some 90 000 ha was cropped land. A total of 274 homes had been damaged or completely destroyed and 125 villages had been evacuated. Many kilometres of road had been damaged along with culverts, bridges, canals, irrigation pumps and vehicles.

The study included recommendations for immediate assistance to farms affected by the floods and preliminary recommendations to reduce damage from future floods. These recommendations included immediate financial aid to those most in need, an improved flood warning system and the setting up of institutions to plan and manage the use of water resources. The report was submitted in September 1981.

Refugee Farms Studies

Location	Shebelle and Juba Rivers, Somalia
Client	National Refugee Commission, Somali Democratic Republic
Financed by	United Nations High Commissioner for Refugees
Firm	Sir M. MacDonald & Partners
Extent of Services	Reconnaisance and pre-feasibility studies for two refugee farms
Completed	1980
Associated Firm	Hunting Technical Services Ltd (for soil survey and agriculture)



Description

Since 1978 substantial numbers of refugees have arrived in the Somali Democratic Republic from the Ogaden region. Most of these refugees were originally nomadic and because of the loss of their livestock and most of their possessions they became totally dependant on the host government. To provide for these refugees, the Government of Somalia set up camps in the Jalalagsie and Jowhar and the Gedo regions of the country and commissioned the Firm to investigate the feasibility of developing irrigated agriculture in the two regions so that some degree of self sufficiency could be achieved. The Studies included the selection of two irrigable areas of 1000 ha and 400 ha, a current situation report, soils surveys and advice on irrigation methods and cropping. Outline drawings and estimates of capital and recurring costs were produced for each site.

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Water Supplies for Somali Refugee Camps in South East Ethiopia

Location	Hararghe Region, Ethiopia
Client	Oxfam for United Nations High Commissioner for Refugees
Financed by	Client
Firms	Oxfam Mott MacDonald Group (as Sir M MacDonald & Partners)
Services	Supervision of construction and use of water facilities, general advice on engineering
Completion	1988

An engineer was provided at short notice to assist Oxfam in its work in two refugee camps in south-east Ethiopia. The camps contained almost 200 000 refugees in total and were located 70 km and 105 km from the nearest reliable water source.

All water was transported by road tanker to the camps. The water source was improved by replacing borehole pumps and rising mains, installing a standby generator and constructing additional tanker filling points. In the camps Oxfam emergency water kits were used to construct water storage tanks and distribution points using refugee labour. A monitoring and control system was set up to keep track of all water deliveries and distribution. This enabled the scarce supplies to be shared equitably.

Advice and assistance were also given to the staff of the Ethiopian Relief and Rehabilitation Commission and the United Nations High Commissioner for Refugees on:

- layouts for new areas of the camps;
- distribution of relief supplies;
- construction and maintenance of access roads.

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Territorial Land Drainage and Flood Control Strategy Study - Phase 1

Location	Hong Kong
Client	Drainage Services Department Government of Hong Kong
Firm	Mott MacDonald Group
Associated Firm	Shankland Cox
Services	Study
Completion	1990

Mott MacDonald undertook this study with the objective of formulating a strategy for land drainage and flood control for the Territory. Attention was given to non-structural measures as well as conventional structural measures.

The study assessed the socio-economic consequences of flooding and considered other development pressures, identifying the need for certain standards of flood alleviation. General technical considerations for the evaluation and design of flood mitigation measures and drainage systems were reviewed and revised. Subsequently an approach was recommended for inter-tidal and tidal backwater reaches to account for the combined influences of tidal surge and extreme rainfall. By integrating the results of hydrological run-off synthesis with the computational hydraulic model HYDRO, a matrix approach was elaborated.

The development of the strategy was demonstrated in three study basins, comprising structural and non-structural measures, and including firm and optional structural components. Preparation of basin management plans, the introduction of legislation and a planned approach to maintenance and management were central to the non-structural components.

Flooding during Typhoon Warren at Sheung Shui, 1988. Courtesy of Director of Buildings and Lands, Government of Hong Kong

Jurong Lake Tidegate and Jalan Ahmad Ibrahim Culvert

Location	Singapore
Client	Drainage Department, Singapore
Cost	£5 million (at 1989 prices)
Financed by	Client
Firm	Mott MacDonald Group (as Mott Hay & Anderson Asia and Sir M MacDonald & Partners Asia)
Services	Preliminary designs, detailed design, preparation of tender documents and supervision of construction
Completion	1990

Mott MacDonald is providing consultancy services to reconstruct the Jalan Ahmad Ibrahim culvert and Jurong Lake tidegate. The structures are located at the southern end of Jurong Lake, an important area for recreation and tourism.

The project is part of a scheme to accommodate increased storm runoff generated by extensive urbanisation and industrial development in the Jurong catchment. The tidegate will also ensure that saline water from the tidal Jurong river does not enter the lake which will be used as a source of domestic water. The 30 m wide structure will have five lifting gates and will incorporate an automatic control and remote monitoring system. The culvert, immediately downstream of the tidegate, will be 10 m deep and have six 5 m wide cells. The capacity of the structure has been confirmed by assessing available hydrological data and by extensive use of the Mott MacDonald simulation model 'HYDRO'.

Two important objectives of the project are to minimise the impact on the environment and to maintain road, rail and services across the Jurong Lake outlet.

Artist's impression of the tidegate

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Zamboanga Research Centre Flood Protection Works

Location	Mindanao, Philippines
Client	Philippine Coconut Authority
Cost	US$ 1.6 million (at 1979 prices)
Financed by	Food and Agriculture Organization
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners)
Services	Study
Completion	1979

A torrential flood on the San Ramon River caused the channel to change course and destroyed valuable records in the Philippine Coconut Authority.

The Group carried out on-site inspections and surveys and collected climatic data in order to estimate the return period flood peak discharges in the San Ramon and Talisayan rivers.

Assessments were made of the factors leading to the channel shift. Preliminary designs and cost estimates were prepared for river training works and flood embankments on the San Ramon River for a design flood of 350 m^3/s. Remedial works which could be carried out immediately with the facilities available at the centre were also identified.

Hydrometric Network Program, Palawan

Location	Philippines
Client	Government of the Philippines Palawan Integrated Area Development Project
Cost	£250 000 for equipment and £150 000 for civil works (at 1985 prices)
Financed by	European Economic Community
Firm	Sir M MacDonald & Partners Limited
Services	Installation of hydrometric equipment and training of local personnel

The Hydrometric Network Program is one component of an integrated area development scheme for the island of Palawan. The Firm was responsible for installation of hydrometric equipment and for training staff to operate the network.

The Firm arranged for the procurement of hydrometric equipment valued at £250 000. The equipment included 5 automatic meteorological stations, 15 automatic water level recorders, 42 automatic raingauges, current meters, sediment samplers, water quality testing equipment, groundwater level probes and neutron probe soil moisture sensors. The automatic gauges record onto solid state data loggers which then input to a microcomputer for processing and analysis.

The Firm was also involved in training of local staff to install and operate the complete system. All computer software for processing and analysing data was developed by the Firm

together with a suite of programs for data transfer, quality control, processing and analysis. The aim was to compile a hydrometric database to enable optimal planning of water resources development for the whole province of Palawan.

Automatic recorders log river water levels every 15 minutes.

Automatic climate station: measures solar radiation, net all-wave radiation, wind speed and direction, temperature, humidity and rainfall intensity.

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Sukkur Barrage Flood Management Review

Location	Pakistan
Client	Government of Sind Federal Flood Commission
Financed by	Overseas Development Administration
Firm	Mott MacDonald Group (as Sir M MacDonald & Partners)
Services	Hydrological and river engineering study, recommendations for modifications to barrage
Completion	1987

Sukkur Barrage was complete in 1932 and is a major structure controlling irrigation of 3.24 million ha, the largest single irrigation system in the world. At present all 66 barrage gates are being replaced. Over the 56 year period of operation problems have developed due to siltation, breaking of bunds and scour of the barrage. Early solutions included deliberate closure of 10 of the 66 gates to minimise sediment entry to the canals. This intensified discharge through the active gates and may have been responsible for exacerbating scour and upstream flooding.

The Group was engaged to study the problem and make recommendations for modifications to the barrage in order to improve flow conditions. The study included a review of the design flood, the operating rules and the influence of reservoir and flood bund development in the Indus Basin.

Sukkur Barrage Gates Rehabilitation

Location	Pakistan
Client	Government of Sind, Irrigation and Power Department
Cost	£20 million at 1985 prices
Financed by	Client and Overseas Development Administration (UK)
Firm	Sir M. MacDonald & Partners Limited
Services	Study, design, preparation of tender documents, supervision of construction and training of local personnel
Completion	1992

Model of the pontoon and caisson gate

The mile-long barrage across the river Indus together with seven canal head-regulators form part of the largest single irrigation system in the world (3 million ha). After 50 years of service one of the 66 barrage gates failed prompting an appraisal of the condition of the other gates.

The lattice bow girdered, vertical barrage gates, each 60 ft wide and 20 ft high, suffer from severe corrosion. Interim strengthening work has enabled their progressive replacement, whilst safeguarding the barrage's integrity.

As there is no provision for isolating the barrage gates to permit their removal during normal operation, the Firm designed caisson gates to span the barrage piers while the gates are replaced. Ground probing radar aided the determination of masonry strengthening required to withstand the loads transferred from the caisson gates through specially designed pier nose adapters. A pontoon complete with fully instrumented controls, winches and on-board cranes was designed to transport the 60 t caisson gates.

The rehabilitation includes replacement of 55 head-regulator gate leaves (each spanning 25 ft), refurbishment of all gate hoist equipment and electrical systems and provision of new workshop facilities.

Training in management, maintenance procedures and providing an overview of relevant modern technology forms an important part of the Firm's brief. It also includes training the operating staff in the use of the micro-computer which will be provided to assist in barrage operation, monitoring and rehabilitation planning.

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Wadi Lansab Flood Control

Location Capital Area, Muscat, Sultanate of Oman

Client Supreme Committee for Town Planning

Financed by Ministry of Finance and Economy
Government of the Sultanate of Oman

Firm Mott MacDonald Group
(as Sir M MacDonald & Partners)

Services Investigation of existing flood hazard, estimation of design floods, appraisal of flood control measures and outline costing

Completion 1986

A severe storm in 1981 caused widespread flooding in the Muscat area. Flooding of Wadi Lansab caused loss of life and extensive damage to domestic and commercial properties as well as inundation of the road system.

The study included an assessment of the hydraulic impact of recent gravel excavations and commercial developments in the braided alluvial fan of the wadi. The hydraulic capacities of the contemporary channels and highway cross-drainage structures were reviewed.

Design floods with return periods up to 200 years and also the probable maximum flood, were produced using a synthetic unit hydrograph technique. Various engineering options for safely discharging them to the ocean were examined and costed. These included:

- a major 5.5 km floodway costing Omani Riyals 3.8 million, with hydraulic drops, supercritical flumes and highway bridge construction;
- a flood detention barrage with a minor downstream floodway costing Omani Riyals 0.8 million;
- temporary detention of flood waters in abandoned gravel excavations.

Appendix III

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Mott MacDonald

Annex I

TERMS OF REFERENCE

International consultancy services for BGD/91/021:
"Assistance to Ministry of Relief in Coordination of Rehabilitation".

I. PROJECT'S BACKGROUND AND OUTLINES

Bangladesh has been stricken by number of natural disasters in recent years. On 30 April 1991, a devastating cyclone and tidal wave lashed the southern coastline of this country. The death toll is estimated at approximately 150,000 people. Over 850,000 acres of harvest-ready cropland was damaged, 790,000 homes were destroyed and 11 million people were affected. Damage to infrastructure includes 9,033 schools and about 500 km of roads and 496 bridges.

Each time a disaster strikes, relief and rehabilitation efforts drain large amounts of internal and external resources which would have otherwise been available for development purposes. While Bangladesh has established institutions and procedures for managing natural disasters and post-disaster recovery, these are in need of updating and strengthening to take into account institutional and infrastructural changes that have taken place in recent years. Also, external aid given to Bangladesh for disaster relief operations needs to be coordinated in a more streamlined manner.

The project was designed to address three interrelated tasks currently on the agenda of the Bangladesh Government which are the following:

a) To increase managerial and administrative capacity of the Ministry of Relief (MOR) as the focal point in monitoring and coordinating disaster relief and rehabilitation by establishing a Disaster Coordination and Monitoring Unit (DCMU) with the capacity to collect, consolidate and analyze data on disaster related activities;

b) To review the operation of existing Government and non-government emergency procedures, standing orders, forecasting and warning systems and assess improvement needs, to prepare, on this basis, proposals on a future disaster preparedness strategy for the government and other organizations involved in disaster preparedness activities;

c) In the light of existing requirements for professional training to design and implement in-country training programme in disaster preparedness and management;

d) To prepare feasibility studies on disaster-related projects with emphasis on establishing priorities for investment in repair and rehabilitation, particularly in coastal protection and infrastructure. This will result in the preparation of the Cyclone Action Plan.

II. STARTING DATE

15 December 1991.

III. SCOPE OF SERVICES

1. Under the contract with the Office for Project Services of the United Nations Development Programme a consulting firm will require to provide for a total duration of 21 working months a group of highly qualified and experienced specialists whose job descriptions and required qualifications are given in Appendix I.

2. The consulting firm will prepare detailed TOR for local consultancy services and upon endorsement by OPS, subcontract or enter into a joint venture with a local company from among those given in Appendix II for the service of national professionals to assist in the activities described below. Draft job description of the personnel to be recruited are given in Appendix II.

3. Additional short-term international consultants may be required to assist the full-time team and concerned agencies to carry out the project activities for a total of 5 months. In consultation with the Government counterpart the Team Leader will propose on discipline and subject of the required specialists.

4. The project objectives and outputs expected to be produced as a result of the contract are as follows:

Immediate Objective 1

To strengthen the Ministry of Relief's capability in monitoring and coordination in ensuring that short term repair activities are carried out to the maximum extent in the most effective and consistent manner and to assist MOR in carrying out its role as the focal point for the co-ordination of short-term repair and rehabilitation activities resulting from the April 1991 cyclone.

Output 1.1

An effective organization in MOR with the capability for managing the monitoring, coordination and disaster preparedness programmes and with the requisite hardware, software, trained personnel and management systems.

Activities for Output 1.1

1.1.1 Establishing a unit in MOR which will be the precursor to the Disaster Coordination Office to be established under Flood Action Plan (FAP) Disaster Preparedness project. The unit to be called the Disaster Coordination and Monitoring Unit (DCMU).

1.1.2 Setting-up a Management Information System with appropriate hardware and software and training MOR staff in its use and application.

1.1.3 Establishing an effective system for gathering, consolidating and analyzing information on disasters and disaster related activities.

1.1.4 Establishing unified data format and reporting systems.

1.1.5 Training in all the above.

Output 1.2

Effective coordination, monitoring and planning of disaster related activities.

Activities for Output 1.2

1.2.1 Collecting and analyzing data on pre, during and post disaster situations and activities.

1.2.2 Preparing timely and accurate reports for government to assist in its decision making and for dissemination to the concerned agencies and to the media as may be appropriate.

1.2.3 Identifying and mobilizing further relief or short-term investment requirements.

1.2.4 General planning of disaster related activities where a coordinated and consistent approach is indicated.

1.2.5 Assessing the long term requirements of an integrated coastal protection system and make recommendations for planning and implementation.

1.2.6. Training in all the above.

Output 1.3

Effectively prepared disaster related projects and programmes.

Activities for Output 1.3

1.3.1 Identifying gaps in damage assessments and proposing assistance to carry out surveys and to identify rehabilitation projects and programmes.

1.3.2 Providing inputs, where required, to assist in the formulation and preparation of documents for investment projects.

Output 1.4

Effective coordination of short-term repair and rehabilitation efforts, accurate and concise reports and assistance in the cyclone damage assessment.

Activities for output 1.4

1.4.1 Assist in the coordination of implementing agencies' relief, short-term repair and rehabilitation efforts in the aftermath of April 1991 cyclone.

1.4.2 Assist MOR in the preparation of reports on progress and impacts of these efforts.

1.4.3 Provide advice and when necessary propose assistance to the concerned agencies in setting-up surveys, undertaking damage assessments and formulating remedial works or activities.

Immediate Objective 2

To review operation of existing Government and non-government procedures for disaster management with a view to integrating, reinforcing or expanding these procedures, assess the training needs in disaster management and initiate training programmes.

Output 2.1

Evaluation on status of existing procedures for disaster management giving recommendations for up-dating and strengthening and for setting-up an office on disaster management.

Activities for output 2.1

2.1.1 Review and assess status of existing standing orders, codes, emergency procedures, forecasting and warning systems etc for disaster management for cyclone, floods and earthquakes in the various concerned agencies.

2.1.2 In light of the above review of existing procedures, make recommendations on the modifications or revisions required to update them.

2.1.3 Assess the training needs and identify suitable institutions for providing training in disaster management.

2.1.4 Design and initiate implementation of an in-country training programme in disaster preparedness and management which will be the precursor of the main training programmes to be undertaken under FAP Disaster Preparedness Programme.

Immediate Objective 3

In conjunction with the Flood Action Plan, to prepare a comprehensive project document and other related documents for Flood Disaster Preparedness.

Output 3.1

A project document and draft terms of reference for FAP Disaster Preparedness.

Activities for Output 3.1

3.1.1 In the light of the findings of the Evaluation report (output 2.1) establish the technical assistance requirements for setting-up an office of Disaster Management, implementing proposed revisions to procedures and design schedule of recruitment and placement of Government and non-government staff.

3.1.2 Establish the functions of the proposed office of Disaster Management and an appropriate staffing pattern.

3.1.3 In consultation with MOR, the local UNDP office and the Flood Plan Coordination Organization (FPCO) prepare a Project Document for FAP Disaster Preparedness.

3.1.4 In consultation with FPCO, assist in the preparation of a Technical Assistance Plan and a Project Concept Paper.

Immediate Objective 4

In conjunction with the Flood Action Plan, to prepare a concept plan for integration measures to protect coastal areas from the effects of cyclones and tidal surges into the overall disaster preparedness system and into the Flood Action Plan.

Output 4.1

A concept plan which would outline an integrated approach to coastal protection and indicate how long term measures can be implemented in a coordinated and consistent manner, taking due account of the need to emphasize priority investments.

Activities for Output 4.1

4.1.1 In consultation with the current implementation agencies, establish the concept for an integrated approach to coastal protection which would cover normal tidal as well as cyclone events.

4.1.2 Prepare a structure for the programme which would group the various elements by function, phase and sector and establish the linkages.

4.1.3 Identify priorities and suggest the multi-sectoral responsibilities for implementation.

4.1.4 Review ongoing relevant Flood Action Plan activities and determine the modifications, extensions or additions that may be required.

5. Progress report should be prepared and submitted to OPS/UNDP every three month of services. Terminal report outlining activities performed, conclusions and recommendations within two weeks upon completion of the mission in four copies to be submitted to the following address:

Att: Mr. Daan Everts
Assistant Administrator and Director
Office for Project Services
220 East, 42 Street, Room - 1547
New-York, N.Y. 10017. Ref: BGD/91/021

6. Preliminary workplan is attached. The workplan is to be up-dated and adjusted by the company upon arrival in Bangladesh. Agreed upon by all parties concerned, a copy of the workplan is to be submitted to OPS/UNDP.

IV. LOCATION

Dhaka, Bangladesh, with intensive travel to provinces, disaster-pron zones.

VI. LANGUAGES

English

Appendix I

International Consultants Team

Title: Team Leader

Duration: 10 months

Duties:

With consultations with OPS and the UNDP office in Dhaka the incumbent will organize, administer, coordinate and monitor the work of the team of the consultants. He/she will have the overall responsibility for the production of the outputs and the achievement of objectives of the project. In particular the team leader will:

- ensure implementation of the related components of the project workplan;

- advise on, and participate in establishing DCMU in MOR, in training programmes for national counterparts and preparation of the feasibility study, project document and other related documents in accordance with the Flood Action Plan;

- supervise the work of the team of international consultants and ensure that their work contributes to the production of the project outputs as planned;

- Finalize preparation of TOR for services of local contractors/individual consultants and conclude service contracts upon endorsement by OPS;

- Supervise and guide the work of a co-team leader who will be in charge for coordination of the national consultants;

- maintain communication and coordination with the Ministry of Relief, UNDP and with the participating agencies;

- produce of the progress/terminal reports as/when required.

The team leader will have at least five years experience in the field of the institutional and rural infrastructural development with emphasizes on disaster risk preparedness and mitigation, preferably in the South Asia region.

Title: Information Systems Management Specialist

Duration: 6 months

Duties:

Under the overall guidelines by the Team Leader the incumbent will contribute to the project implementation by assisting to establish reliable communication network hereby improving the efficiency of the existing system of transmitting, storing and

analysis data related to disaster preparedness and disaster risk mitigation. In particular the incumbent will:

- design and set-up a Management Information System in a newly establishing DCMU/MOR with appropriate hardware and software equipment;

- work out a list of equipment to be supplied from different sources and arrange installation;

- train MOR staff in utilizing computer and other communication equipment facilities;

- establish an effective system for gathering, consolidating and analyzing information on disasters and related activities;

- introduce and establish unified data format and reporting system;

- advise on the production of reports, manuals, documents and other publications issued by DCMU.

- prepare a final report upon completion of the assignment.

The information system management specialist will have at least five years experience covering the development of management information systems, media applications and training. Prior experience in the South Asia region would be an advantage.

Title: Disaster management specialist

Duration: 3 month

Duties:

Under the overall guidelines by the Team Leader the incumbent will be responsible for designing and advising on the plan aimed at strengthening the national disaster preparedness and management system with particular reference to the April 1991 cyclone and the lessons to be learnt from the preparedness, relief and rehabilitation activities. In particular, the incumbent will:

- review and assess status of existing standing orders, codes, emergency procedures, forecasting and warning systems etc for disaster management for cyclones, flood and earthquakes in the various concerned agencies, and make recommendations on the
modifications or revisions required to update them;

- advise on functions of DCMU and of the office of Disaster Management and an appropriate staffing pattern;

- assess the training needs and identify suitable institutions for providing training in disaster management;

- advise to the agencies concerned on setting-up surveys, undertaking damage assessments and formulating remedial works or activities;

- contribute to the strengthening the national disaster management system by participating in preparation of the Flood Action Plan and a project document and draft terms of reference for the technical assistance.

The disaster management specialist will have at least five years experience in disaster management and disaster risk preparedness and mitigation activities. Experience in the Asia-Pacific region would an advantage.

Title: Coastal and River Engineering Specialist

Duration: 2 months

Duties:

The incumbent, in conjunction with his colleagues on the Professional Panel, will advise and supervise the full-time team and the part-time consultants. He/she will have the responsibility for the effective implementation of the relative components of the workplan and in particular:

- assessing the need for strengthening of river coasts and advising on resettlements as appropriate;

- contributing to the preparation of the reports and documents stipulated by the project.

Three-four missions to be undertaken by this specialist to Bangladesh during the course of the project.

The specialist will be a high level professional with at least 10 years broad-based experience in the field of coastal protection, flood control and general water resource development and planning - including disaster related aspects, institutional development and training. Previous experience in the South Asia region is essential, preferably in Bangladesh.

Appendix II

List of Preselected Local Consulting Firms:

1. Development Design Consultants LTD.
2. House of Consultants Limited.
3. Engineering and Planning Consultants Limited (EPC).
4. Desh Upodesh Limited in association with Resources Planning and Management Consultants.
5. Development Planners and Consultants in association with Sheltech and CDRB.

Draft TOR for Local Consultancy Services

Title: Co-Team Leader

Duration: 9 Months

Duties:

The incumbent will assist the Team Leader in the management of the project and in the production of the outputs and the achievements of the objectives of the project. In particular the Co-Team Leader will:

Contribute to the establishment of DCMU and to the proper training of local officials;

Assist in data collection and processing, reporting, planning, identifying investment opportunities for repair and rehabilitation activities;

Supervise the work of the team of local consultants and ensure that their work contributes to the production of the project outputs as planned;

arrange production of the progress/terminal reports as/when required.

He/She will also have a special responsibility for establishing effective coordination systems and will ensure that the desired linkages are set-up with concerned agencies.

The Co-Team Leader will have at least five years experience of institution building, social programmes and be familiar with the workings of Government, particularly on disaster risk preparedness and related activities.

Title: Disaster Preparedness Specialist

Duration 9 Months

Duties:

Under the overall guidelines by the Co-Team Leader the incumbent will contribute to the project implementation, will be responsible for the outputs involving disaster preparedness and management aspects, in data collection and processing, reporting and planning.

He/She will be concerned with the monitoring and coordinating activities and particularly establishing an effective system for gathering, consolidating and analyzing information on disaster related activities.

An evaluation report will be prepared on the status of existing procedures for disaster management giving recommendations for up-dating and strengthening and for setting-up an office of Disaster Management.

He/She will review and assess status of existing standing orders, codes, emergency procedures, forecasting and warning systems etc, for disaster management for cyclones, floods and earthquakes in the various concerned agencies.

He/She will design and initiate implementation of an in-country training programme in disaster preparedness and management which will be the precursor of the main training programmes to be undertaken under Disaster Preparedness programme.

The disaster preparedness specialist will have at least 5 years experience in disaster management and related activities.

Title: Rural Infrastructure Specialist

Duration: 9 Months

Duties:

The incumbent will be responsible for advising on measures to be taken to improve storm/cyclone resistance structure of the rural area. In particular the rural infrastructure Specialist will contribute to achieving outputs as described in paragraph 1.1.3, 1.2.1, 1.2.5, 1.4.3, 2.1.4 of TOR above.
The Specialist will have at least five years relevant experience in rural area structuring.

Title: Natural Resources and Environmental Specialist

Duration: 9 Months

Duties:

The Natural Resources and Environmental Specialist will be responsible for the monitoring and coordination aspects involving natural resources and the environment.

He/She will have a special role in identifying and coordinating rehabilitation activities involving agriculture, fisheries, forestry and livestock and in ensuring that, where appropriate, environmental impact analyses are carried out.

The natural resources and environmental specialist will have at least five years relevant experience in natural resources and the environment.

Title: Professional Panel Specialists

Duration: 24 Months

Duties:

The six specialists:

- Water resources specialist;
- Natural resources specialist
- Social institutions specialist
- Communication specialist
- Economist
- Hydraulic engineering specialist

Will be recruited for 4 man-month each to contribute in implementation the project activities at the desired professional standards. They will provide inputs at key stages, probably about three or four times during the course of the project and at other times when necessary.

Each specialist will be a high level professional with at least 10 years broad-based experience in their respective disciplines (water resources, natural resources, social institutions, rural infrastructure, economics and hydraulic engineering) including disaster related aspects and government and non-government institutions.

The project will require inputs of visiting consultants as and when necessary of total 30 man-months. They will be subject matter specialists (disaster management, flood control, environment, socio-economics, hydrology, meteorology, mass communications, etc) and will assist the full-time team and concerned agencies to carry out the project activities.

The various disciplines will become known as the project proceeds.