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ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT

USAID PROJECT NUMBER 388-0056

PROJECT INTERIM REPORT - SUMMARY

WILBUR SMITH AND ASSOCIATES
BANGLADESH CONSULTANTS, LTD.
PUBLIC ADMINISTRATION SERVICE

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MARCH 1987

ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT

USAID PROJECT NUMBER 388-0056

PROJECT INTERIM REPORT - SUMMARY

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ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT
USAID PROJECT NUMBER 388-0056

PROJECT INTERIM REPORT - SUMMARY

I - INTRODUCTION

A. GENERAL

It is axiomatic that a country whose domestic economy is basically agriculturally oriented must maintain a well planned and integrated internal transportation system if that economy is to flourish and expand to meet the nation's ever-growing requirements for agricultural production. In Bangladesh, the fluvial transportation system is adequately utilized, as is the rail network, but both systems are limited in their ability to expand to fully serve the growing transportation needs of the rural sector. On the other hand, the existing feeder road system is quite inadequate and, therefore, serves as a major constraint to meaningful rural development.

The extent of the existing feeder road system is quite inadequate, but the root problem is the lack of proper maintenance and/or reconstruction of those roads and appurtenant structures that now exist. However, proper maintenance and reconstruction cannot be achieved on a hit-or-miss basis. To be economically and technically sound and to maximize the use of scarce resource, such activities must be planned and managed which implies improvement of existing institutions, or the creation of new ones to promote the development of an effective program of feeder road maintenance and improvement.

In the late 1970's, the Bangladesh Government, in addition to its other activities for promoting the development of farm-to-market roads, entered into an agreement with the United States Agency for International Development to further the activities directed towards improving the feeder road system.

The initial results of this cooperative venture was the Rural Roads Study, produced by Louis Berger, International, Inc., whose pertinent conclusions were as follows:

1. Roads are a critically needed facility in the rural areas of Bangladesh.

2. The capability of Bangladesh rural road construction contractors at present is very limited. Therefore, any sizable road construction project must utilize an expatriate construction firm and certain capital intensive techniques in order to achieve an effective program with an appropriate construction time frame. (At a unit cost 5 to 8 times greater than that achieved by local contractors under this Project).

3. At present there is no program whatsoever of regular annual/seasonal rural road maintenance which would ensure the durability of a costly investment in rural road construction.

The extremely high construction cost estimates precluded the possibility that USAID could finance such a program. However, the complete absence of annual/seasonal maintenance procedures suggested a highly viable alternative -- the development of institutional/management capability to effectively undertake a program of appropriate annual/seasonal maintenance and improvement on existing feeder roads. Thus, following in-depth studies of existing feeder road institutions and political sub-divisions, in August 1981, the Zila Roads Maintenance and Improvement (ZRMI) Project came into being. As shown on Exhibit I, the three (old) districts included in this project were Sylhet, Rangpur, and Faridpur.

B. BACKGROUND

1. ZRMI Project Goals and Purposes

a. Project Goals

The goal of the ZRMI Project is increased agricultural production - particularly foodgrains.

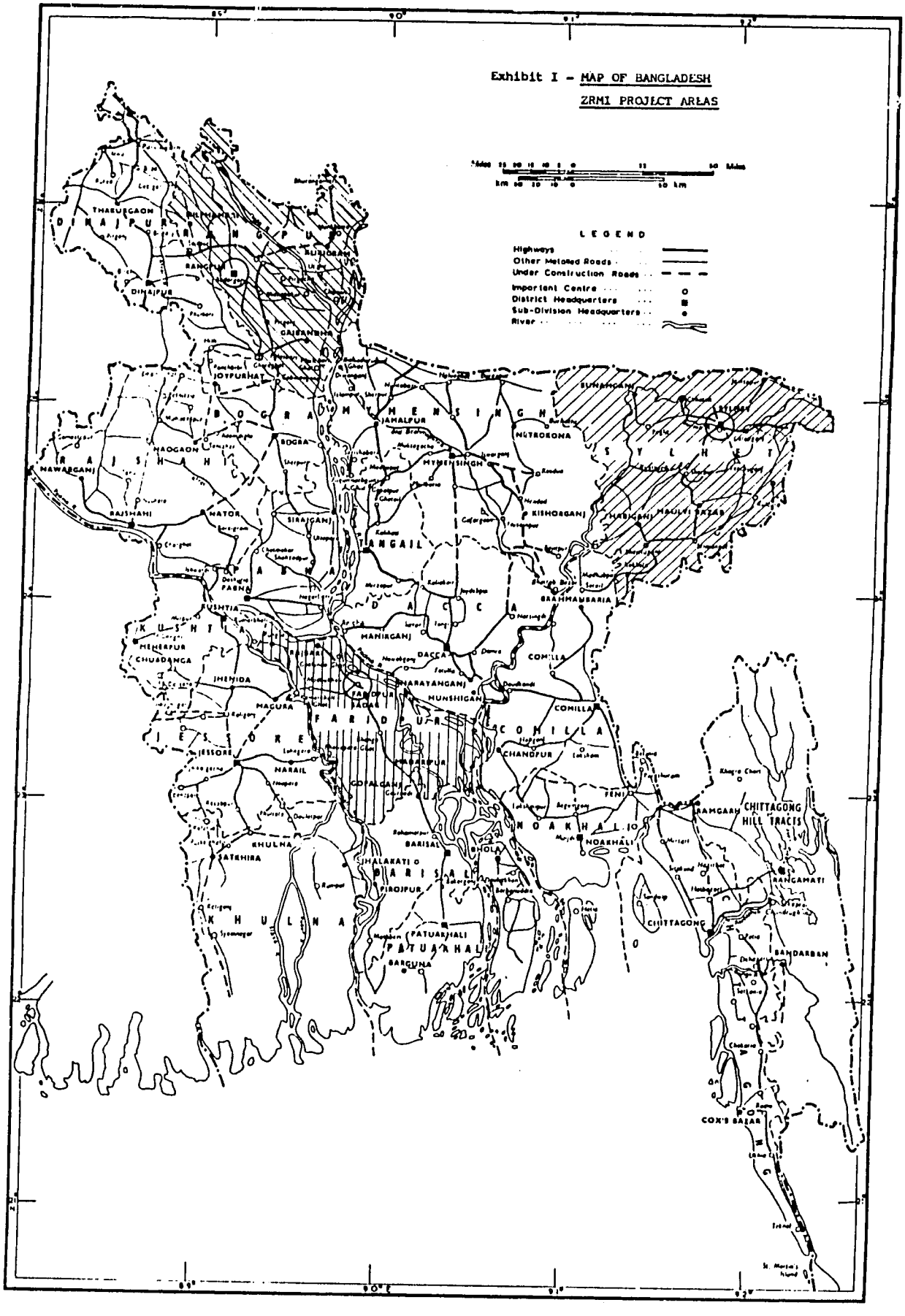


Exhibit I - MAP OF BANGLADESH
ZRMI PROJECT AREAS
LEGEND
Highways
Other Metalled Roads
Under Construction Roads
Important Centre
District Headquarters
Sub-Division Headquarters
River
THAKURGAON
DINAJPUR
RANGPUR
GAIBANDHA
JOYPURHAT
BOGRA
JAMALPUR
MYMENSINGH
NETROKONA
SUNAMGANJ
SYLHET
MOULVI BAZAR
HABIGANJ
KISHOREGANJ
NAOGAON
NAWABGANJ
RAJSHAHI
NATOR
SIRAJGANJ
TANGAIL
PABNA
BRAHMANBARIA
KUSHTIA
MEHERPUR
CHUADANGA
MANIKGANJ
DACCA
COMILLA
JHENIDA
NARAYANGANJ
MUNSHIGANJ
MAGURA
FARIDPUR
JESSORE
CHANDPUR
NARAIL
GOPALGANJ
FENI
RANGAMATI
CHITTAGONG HILL TRACTS
KHULNA
BARISAL
NOAKHALI
SATKHIRA
JHALAKATI
PIROJPUR
PATUAKHALI
BARGUNA
CHITTAGONG
BANDARBAN
COX'S BAZAR

b. Project Purpose

The purpose of this project is to improve rural access by institutionalizing an effective program of annual/seasonal maintenance and increasing the pace of development of roads under the jurisdiction of Zila Parishads (subsequently, the revised rural administrative system has changed the emphasis to the Upazila concept).

2. Project Features

a. Technical Assistance

This feature, included as a part of a contract awarded to Wilbur Smith and Associates, Inc. (WSA), is discussed further in the Personnel Section of Part II - Contract Features.

b. Equipment Procurement

Since the WSA Contract included the obligation that the Consultant would act as the procurement agent for acquiring construction and maintenance equipment, details of procurement activities will be found in the Equipment Procurement Section of Part II.

c. Training

From the outset of the Contract, the Consultant was charged with the responsibility for an on-going program of on-the-job training as well as centralized in-country training sessions and short-term training in the USA/third countries. However, the original budget included funds for only the USA/third countries programs, while separate funds were provided for the in-country training sessions. By Amendment No. 1, funds for the in-country training segment were added to the Consultant's budget.

d. Local Government Finance Analyses

These services were provided under an agreement with Syracuse University.

e. Road Development Fund

USAID funds totaling some US$ 4,000 would be allocated to the three Project (old) districts over the 3-year life of the Project. These annual allocations would supplement BDG funds received from various sources. However, the use of USAID funds would be limited to the following types of work:

- Box culverts, ring culverts, and storm drainage structures,
- Earthwork/paving at bridge approaches,
- Installation of brick liner, herringbone, or crushed bricks on existing earthen embankments,
- Seal coat or bituminous pavement on appropriate existing herringbone, crushed brick, or dirt road surface,
- Construction of bridges less than 75 feet in length, and
- Embankment protection such as sodding, afforestation, and retaining walls.

f. Socio-Economic Impact Assessment

These services were to be provided by a local consultant.

3. Authority For and Purpose of This Report

a. Authority for this Report

The authority for this report is vested in the following basic documents:

- Project Grant Agreement between BDG and WSA and Amendments 1,2,3, and
- The Contract between BDG and WSA and Amendments 1,2,3,4, and 5.

b. Purpose of this Report

The purpose of this report is to review and evaluate the several features of the ZRMI Project for which the Consultant was responsible, to try to formulate, as much as possible, an unbiased and clear picture of accomplishments relative to the goals of the individual features, to present the costs of these accomplishments, and to recommend further courses of action to maintain the momentum of this critical developmental effort.

II - CONTRACT FEATURES

A. GENERAL

1. Basic Contract

On 07/10/82, the BGD, represented by MLG/LG Division, and the Consultants, WSA/BCL/PAS, entered into a Contract for the supply of technical assistance to the ZRMI Project.

2. Subsequent Amendments

a. No. 1 - On 08/04/84, the same two parties signed Amendment No. 1, which increased the Bangladesh staff man-months from 1,427 to 1,841 and reduced the expatriate man-months from 183 to 182. The Training segment was added to the Consultant's responsibilities and the total budget was increased from US$ 3,890,436 to US$ 3,973,665.

b. No. 2 - On 28/07/85, the same two parties signed Amendment No. 2. This NO-COST AMENDMENT extended the Contract completion date from August 1985 to 33/11/85, decreased the Bangladesh staff man-months from 1,841 to 1,809, and increased the expatriate man-months from 182 to 202.

c. No. 3 - On 13/02/86, the same two parties signed Amendment No. 3, which increased the Bangladesh staff man-months from 202 to 228.9. The Contract budget was increased from US$ 3,973,665 to US$ 4,469,438 and the Contract completion date was extended from 30/11/85 to 30/04/86.

d. No. 4 - On 29/11/86, the same two parties signed Amendment No. 4. This NO-COST AMENDMENT extended the Contract completion date from 30/04/86 to 31/08/86 and increased the Bangladesh staff man-months from 2,137 to 2,309.5 and the expatriate man-months from 228.9 to 231.2.

e. No. 5 - On 23/11/86, the same two parties signed Amendment No. 5. This NO-COST AMENDMENT extended the Contract completion date from 31/08/86 to 31/10/86. The Bangladesh staff man-months were increased from 2,309.5 to 2,406.7 and the expatriate man-months from 231.2 to 233.3. This was really the "completion" of Phase 1 of the Project, for Amendment No. 3 to the PGA has extended the Project Completion Date to 30/06/90. Amendment No. 6 to the Consultant's Contract is now being prepared.

3. USAID Letter of Commitment

USAID LC No. 388-005601 was issued on 14/10/82. Amendment No. 1, issued 19/07/84, increased the value for the Technical Assistance segment from US$ 3,890,436 to US$ 3,973,665. Amendment No. 2 issued 06/03/86, increased the TA funds to a total of US$ 4,469,438.

B. TERMS OF REFERENCE

Under the terms of the Contract and its Amendments, four of the six principal segments of the ZRMI Project became the responsibility of the Consultant:

- Technical Assistance,
- Equipment Procurement,
- Training, and
- Road Development Funds.

1. Technical Assistance

a. Organization and Management

The Consultant with existing organization, procedures and staff related to maintenance of feeder roads under the jurisdiction of the Zila Parishads in the Project (old) districts, make recommendation for improvement, and formulate and implement training to implement the recommendations.

b. Establishment of a Road Maintenance and Construction System

The Consultant will develop an effective annual road maintenance program for the establishment of a road maintenance and construction system which categorizes existing roads according to their physical condition and provides the basis for organizational arrangements and annual budget requirements (supported by a written manual). Following a review of existing conditions, the Consultant will develop an appropriate annual/seasonal road maintenance program in each of the three project (old) districts which utilizes to the maximum local resources.

c. Preparation of Technical Specifications

The Consultant will prepare road construction technical specifications for feeder roads. The institutional development of maintenance procedures requires their introduction and acceptance. The preparation of these specifications by the Consultant for use throughout Bangladesh must allow for certain flexibility without endangering quality control of construction. Aspects of road construction that will require particular attention in the preparation of specifications are the following:

1. Drainage

The absence of adequate road drainage is a serious problem. A USAID-financed document entitled "Design Manual For the Construction of Culverts, Small Bridges, and Sluiceways", published in 1979, contains practical and economic solutions to certain types of drainage problems encountered in feeder roads. The Consultant should review this and related design manual for increased field use and to advise on their contents.

2. Earth Compaction

The Consultant will advise as to how compaction can be most effectively accomplished and how it will vary with physical environment. The use of labor-intensive measures must be maximized.

3. All Weather Surfacing

The Consultant should put high priority on methods of water-proofing earth surfaces of feeder roads. Particular attention should be paid to uses and applications of locally available asphaltic materials.

4. Concrete Bridge Construction

The Consultant will review the local capabilities for the design and construction of small bridges. Such components as foundation exploration, economic design, quality control during construction, and bridge maintenance should be included as subjects in the training program.

5. Access Aprons

The Consultant should study the viability of reducing the deterioration of earth access ramps to surfaced roads by extending the surfacing an appropriate distance.

6. Quality Control

Quality control in the maintenance, improvement, and reconstruction activities of feeder roads is essential in order to realize full benefits from the resources expended. Inclusion of quality control into the training program and the establishment of a small testing unit in each Project (old) district are key tasks to be undertaken by the Consultant.

2. Road Development Fund/Construction Supervision

USAID funds placed with the respective Zila Parishads, while provided in addition to BDG road funds from other sources, will be limited to the following uses:

a. Installation of box and ring culverts and storm drainage structures.

b. Earthwork/paving of bridge approaches.

c. Installation of brick liner, herringbone, or crushed bricks on existing earth embankments that are appropriate for paving per standards set by the BDG Planning Commission.

d. Seal coat or bituminous pavement on appropriate WBM surface of feeder roads as specified by the BDG Planning Commission.

e. Construction of small bridges less than 75 feet in length.

f. Embankment protection such as sodding, afforestation, and retaining walls.

During and prior to construction, the Consultant will be responsible for the following:

- Advise and assist the DE and the XEN (WPW) in instituting appropriate construction/maintenance management practices,
- Review the construction/maintenance works and report achievements and shortfalls on a monthly basis to the Z.P., MLGRD&C, and USAID,
- Check all designs, estimates, and tenders and endorse a copy to the PM and USAID, and
- Observe and monitor daily all construction work financed by USAID and certify that it conforms with related plans and specifications.

3. Equipment Procurement

The Consultant will evaluate the existing equipment and repair shops in each of the Project (old) districts. The Consultant will review the total Project equipment needs and prepare a final commodity list, including specifications, for approval by MLGRD&C and USAID. Following approval, Consultant will act as procurement agent.

4. Training

The immediate purpose of the training sessions would be the introduction of the specific technical specifications and solutions to common types of maintenance and construction problems encountered in Bangladesh. In addition, particular emphasis would be placed on the philosophy of preventive maintenance and the long-range monetary advantages of making repair promptly. To accomplish this, the Consultant will organize and conduct technical training exercises which include practical on-the-job experience. In addition, the Consultant will arrange for all U.S.A. and third country training.

The Consultant should plan on conducting on-the-job training continually throughout the Project, and will organize the special training sessions in such a way that approximately 100 members of the three Zila Parishad engineering staffs will have attended training sessions each Project year. It would be preferable if all training could be conducted by "Bangla" -speaking local experts under supervision by the Consultant.

5. Reports

a. Inception Report

Ten copies of the Inception Report shall be submitted to the MLGRD&C and six copies to USAID within sixty (60) calendar days after the effective date of the Contract.

b. Monthly Report

Fifteen copies of the Monthly Report shall be submitted to the MLGRD&C and six copies to USAID within ten (10) days after the end of the reporting period.

c. Final Report

Twenty copies of the Final Report will be submitted to the MLGRD&C and eight copies to USAID before the termination date of the Contract.

6. Progress Review Meetings

The designated representatives of the Consultant and the officials of MLGRD&C shall meet as often as is reasonably required to evaluate progress of the services as per the detailed work schedule. Immediately following commencement of services, the Consultant shall submit such a detailed work schedule.

C. PERSONNEL

1. Basic Contract

The level of manpower effort for this Contract was originally estimated to be a total of 1,610 person-months of direct labor, and the composition of that direct labor is shown in the comparative tabulation included in Section C.3.

2. Amendments 1, 2, 3, and 4

Amendment 1 increases the total person-months of the Contract, Amendment 2 decreased the person-months, while Amendments 3 and 4 again increased the person-months of the Contract. However, for purposes of comparison, only the initial and the current (Amendment 5) rosters and schedules need to be examined.

The revised level of manpower currently in effect for this Contract is 2,640 person-months of direct labor. The composition of that direct labor, as well as that for the Basic Contract, is shown in the following tabulation:

Personnel Category	Person-Months Basic Contract	Amendment 5
Expatriate Staff Professionals	183.0	233.3
Bangladesh Staff Professionals	183.0	345.8
Bangladesh Technical Staff	110.0	735.5
Bangladesh Administrative/Clerical	944.0	1,325.4
Total Person-Months	1,610.0	2,640.0

It can be observed that the net increase in person-months was about 63 percent, with the expatriate portion posting an increase of about 27 percent and the Bengali segment an increase of about 68 percent. These increases were due principally to the desire for more training cycles and the need for more project monitoring and quality control, both during the original 3-year life of the Project as well as in the extended fourth year.

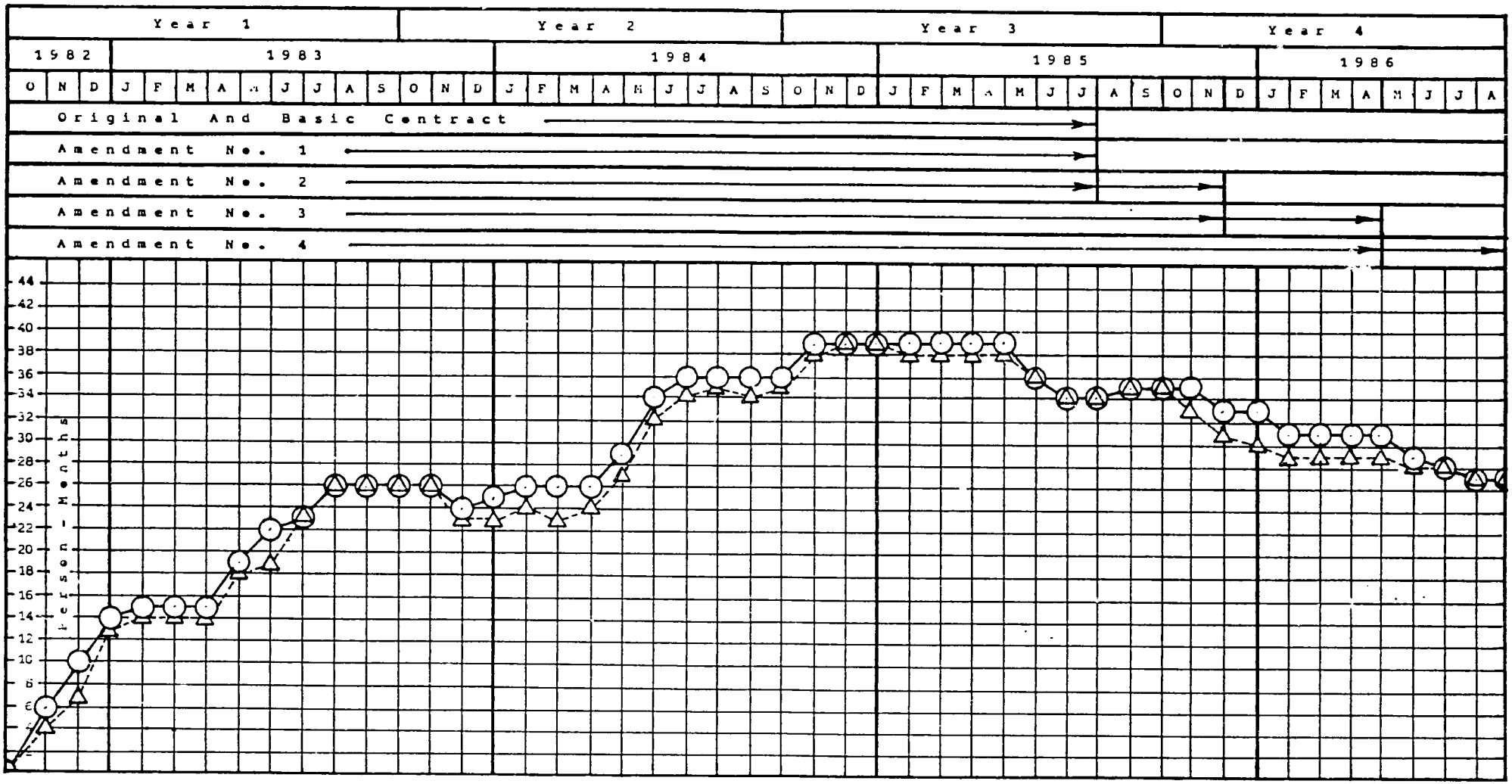
Exhibit IV depicts graphically both the proposed and the actual scheduling of technical personnel by months. The circles represent total personnel per month as proposed, while the triangles represent actual technical personnel present each month. Thus, the circles reflect the manpower planning of the original Contract and each of the five Amendments, while the triangles are a measure of the accuracy and the viability of that planning. The line connecting the circles represents 1,314.6 person-months, as taken from Amendment 5. The line connecting the triangles represents about 1,231 person-months, as taken from the monthly progress reports. The short-fall in person-months over a period of 49 Project-months was about 83 person-months, or about 6 percent. Considering the several adjustments in manpower during the life of the Contract, this is almost negligible.

D. BUDGET

1. General

The entire Contract budget story, from the basic Contract through Amendment No. 5 and including total estimated expenditures through 31/10/86,

Exhibit IV - PROFESSIONAL/TECHNICAL PERSON-MONTHS (SCHEDULED/ACTUAL)



LEGEND

Scheduled Professional/Technical Personnel Level, Per Basic Contract And Amendments 1, 2, 3, And 4 -

Actual Professional/Technical Personnel Level, Per Monthly Progress Reports -

is shown in tabular form in Exhibit V. It can be seen that practically all funds required for logistic support were provided in the basic Contract. The principal adjustments in all amendments were for the purpose of revising personnel requirements to reflect the changing needs of the Project.

2. Amendment No. 1

Amendment No. 1 was formulated to provide funds to enable BCL to increase quality control activities at the field level, as well as to transfer in-country training funds to the Consultant's Contract budget.

3. Amendment No. 2

The principal purpose of this NO-COST AMENDMENT was to provide internal adjustments in the Consultant's Contract budget to allow for a four-month extension in Contract termination date.

4. Amendment No. 3

The main purpose of this amendment was to provide additional funding for a five-month extension in Contract termination date.

5. Amendment No. 4

The principal purpose of this NO-COST AMENDMENT was to provide internal adjustments in the Consultant's Contract budget to allow for a four-month extension in Contract termination date.

6. Amendment No. 5

The principal purpose of this NO-COST AMENDMENT was to provide internal adjustments in the Consultant's Contract budget for a two-month extension. Amendment 3 to the PGA, signed on 31/08/86, contained provisions to extend the Consultant's Contract to 30/06/90. However, it was deemed

Exhibit V – SUMMARY OF ORIGINAL AND AMENDED CONTRACT BUDGETS AND ESTIMATED TOTAL EXPENDITURES TO 31/10/86

Budget Table Number	Budget Line Item	Total Amount Budgeted												Total Expenditures (Estimated) To 31/10/86	
		Original Contract		Amendment No. 1		Amendment No. 2		Amendment No. 3		Amendment No. 4		Amendment No. 5			
		(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)
1 – 2	Salary, Expatriate And Bangladesh Personnel	628,712	4,487,420	628,712	5,602,916	723,838	5,494,911	806,138	6,982,122	821,594	7,588,521	832,074	7,795,541	831,903	7,745,806
3	Fringe Benefits	198,069	1,480,850	198,069	1,849,963	259,736	1,813,320	293,452	2,313,333) 90,767*)	299,755	1,768,125) 622,259*)	290,663	2,026,061 (*)	290,560	2,013,135
4	Overhead	595,621	2,351,400	595,621	2,935,928	705,859	2,879,333	861.515	3.435,204) 223,428*)	836,536	2,117,197) 1,297,637*)	853,308	3,001,283 (*)	853,245	2,982,135
5	Travel/Transportation	282,740	433,700	282,740	1,109,135	154,012	1,460,341	182,729	1,844,443	175,837	1,633,912	165,184	1,550,915	159,061	1,543,521
6	Allowances	462,738	1,079,800	462,738	1,337,900	470,980	1,400,256	507,480	2,487,439	501,687	2,652,439	515,954	2,696,775	512,830	2,695,775
7	Other Direct Costs	32,690	3,636,560	32,690	3,636,560	35,884	3,632,233	59,183	4,553,311	51,760	5,013,651	53,156	5,106,849	52,413	5,098,964
8	Equipment, Materials, Supplies, Vehicles	93,420	4,761,200	93,420	4,815,200	84,119	3,499,180	83,084	3,864,635	83,084	3,969,174	83,095	4,018,690	83,107	4,027,766
	Sub-Total, Consultant	2,293,990	18,230,930	2,293,990	21,286,602	2,4[illegible]4,428	2[illegible],[illegible]17.	2,793,581	25,694,682	2,770,253	26,663,115	2,793,434	26,196,114	2,783,119	26,107,102
9	Special Equipment	145,040	—	145,040	—	119,720	—	117,643	—	117,740	48,989	117,740	48,989	117,740	48,989
10	Training	300,000	—	300,000	1,110,850	284,000	1,704,800	185,188	1,043,856	177,579	1,036,429	164,082	1,036,429	164,340	1,036,429
	Sub-Total	2,739,030	18,230,930	2,739,030	22,397,452	2,838,148	21,884,974	3,096,412	26,787,527	3,065,572	27,748,533	3,075,256	27,281,532	3,065,199	27,192,520
11	Fixed Fee	270,000	1,160,000	270,000	1,429,032	270,000	1,429,032	305,229	1,761,080	305,229	1,761,080	305,229	1,761,080	305,229	1,761,080
	Totals	3,009,030	19,390,930	3,009,030	23,826,484	3,108,148	23,314,006	3,401,641	28,548,607	3,370,801	29,509,513	3,380,485	29,042,612	3,370,428	28,953,600
	Exchange Rate Used		US$=Tk22		US$=Tk24.70		US$=Tk26.94		US$=Tk26.74		US$=Tk26.86		US$=Tk26.67		US$=Tk26.67
	Equivalent US Dollars	881,406		964,635		865,517		1,067,797		1.098,637		1,088,953		1,085,616	
	Total US Dollars	1,890,436		3,973,665		3,973,665		4,469,438		4,469,438		4,469,438		4,456,044	

* Caused by certain audit objections. To be paid if objections removed by subsequent audit. Carried over from Amendment No. 4 to future Amendment No. 6.

desirable to provide interim funding for the completion of Project Phase 1 activities while details of Phase II were being negotiated.

7. Total Expenditures to 31/10/86

Although the total of all Project expenditures through 31/10/86, shown on Exhibit V, is not precise, it is considered to be a reasonably accurate estimate. Thus, it is estimated that there should be a savings of some US$ 13,000 from the funds provided by Amendment No. 2 to LOOM No. 388-005601.

III - CHRONOLOGY AND ACCOMPLISHMENTS

A. INCEPTION REPORT

1. General

The Inception Report for the ZRMI Project was presented in revised and final form in May 1983. The objective of the report was to indicate the plan and detailed methodology to be followed in attaining the stated objectives of the ZRMI Project. While the plans and methodology as outlined were based on careful considerations of the most viable uses of the available resources within the imposed time limitations, it was never intended to be a document "written in stone." Rather, it was considered to be a dynamic working document subject to revisions as the Project progressed, and improved ways and means of attaining Project goals could be identified.

During the course of the Project, several adjustments were indeed made in the scope of work, time schedule, and methodology. Minor changes were initiated by signed approvals on the part of LGEB and the concurrence of USAID, while major changes were formalized by negotiations of amendments to the Contract. Of course, the change in BDG rural administrative patterns from the old District concept to the current Upazila concept introduced changes in planning and methodology, to varying degrees, in all elements of the Contract.

2. Scope of The Report

Other than routine mobilization, housekeeping, and administrative responsibilities, the Inception Report covered the following general categories of activities and how the Consultant proposed to handle them:

- Technical Assistance
  + Organization and Management
  + Establishment of Road Maintenance and Construction Systems
  + Preparation of Technical Specifications
  + Expatriate/Local Staffing Schedule

- Training
- Construction Supervision
- Procurement of Equipment

B. ORGANIZATION AND MANAGEMENT

1. General

The program for this element, as outlined in the Inception Report, provided for three separate functions, as follows:

- An organizational and management study of the operational aspects of feeder road construction and maintenance,

- An organizational and management study of the fiscal and logistical aspects of feeder road construction and maintenance, and

- A study of equipment and shop facilities for road improvement in each Project (old) district.

For both the first two studies, the work, as originally planned and scheduled, was based on the then-existing rural administration concept of district/sub-division/thana. Under this concept, there were 21 districts. The three Project (old) district of Sylhet, Rangpur, and Faridpur were further sub-divided as shown on Exhibit VI and Exhibit VII. One of the biggest problems encountered here was the apparent duplication of responsibilities between two governmental organizations; one of very long standing and one of recent vintage.

In October 1984, the BDG effectively eliminated this duplication when it replaced the existing rural administration concept with one oriented around the concept of greater decentralization of rural administrative functions. As shown on Exhibit IX and Exhibit X, the old districts were

Exhibit VI - ORIGINAL PROJECT DISTRICTS/SUBDIVISIONS/THANAS

DISTRICT	SUBDIVISIONS	THANAS
Faridpur	Gopalganj	Maksudpur
		Kasiana
		Gopalganj
		Kotwalipara
		Tungipara
	Madaripur	Sibchar
		Rajaoir
		Madaripur
		Kalkini
		Palong
		Janijira
		Naria
		Bhedarganj
		Goshairhat
	Sadar	Kotwali
		Boalmari
		Alfadanga
		Nagarkanda
		Bhanga
		Sadarpur
		Char Bhadrasan
	Goalunda	Panasa
		Baliakandi
		Rajbari
		Goalundaghat

DISTRICT	SUBDIVISIONS	THANAS
Rangpur	Nilpharmi	Domar
		Nilphamari
		Saidpur
		Kishoreganj
		Jaldhaka
		Dimla
	Sadar	Patgram
		Hatibandha
		Kaliganj
		Gangachara
		Badarganj
		Kotwali
		Kaunia
		Pirgacha
		Mithapukur
		Pirganj
	Kurigram	Bhurungamari
		Nageswari
		Fulbari
		Lalmonirhat
		Kurigram
		Ulipur
		Chilmari
		Rahumari
	Gaibandha	Sundarganj
		Sadullapur
		Palashbari
		Gobindaganj
		Saghatta
		Fulchari
		Gaibandha

DISTRICT	SUBDIVISIONS	THANAS
Sylhet	Sunamganj	Dharmapasha
		Tahirpur
		Jamalganj
		Derai
		Sulla
		Jagannathpur
		Sunamganj
		Chhatak
	Sadar	Gowainghat
		Kotwali
		Biswanath
		Balaganj
		Fenchuganj
		Golapganj
		Beanibazar
		Zakiganj
		Kanaighat
		Jaintaipur
	Moulvi Bazar	Moulvi Bazar
		Screemangal
		Kamalganj
		Rajnagar
		Kulaura
		Bariekha
	Habiganj	Azmiriganj
		Baniachang
		Lakhai
		Madhabpur
		Chunarughar
		Habiganj
		Bahubal
		Nabiganj

Exhibit VII

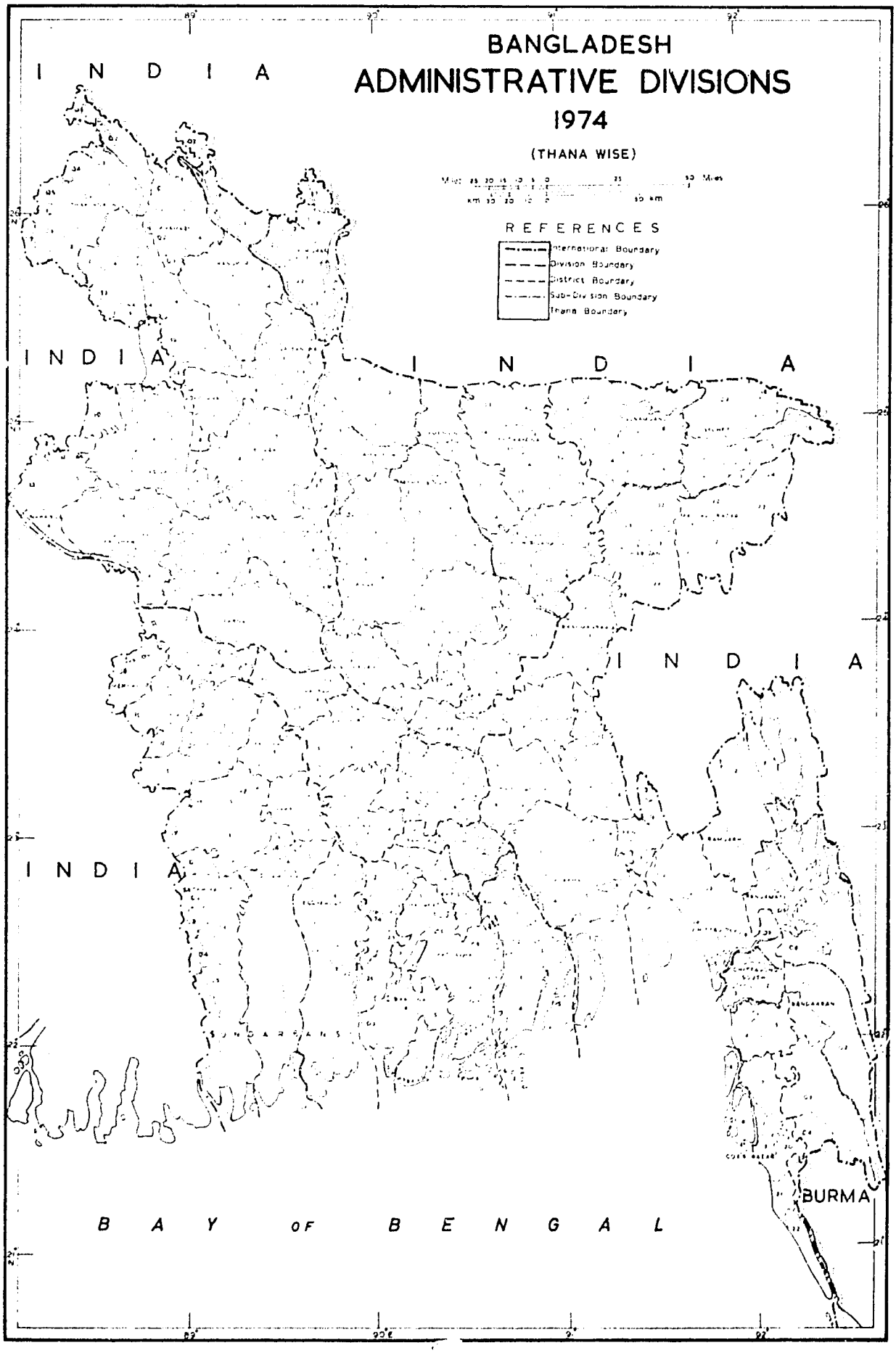
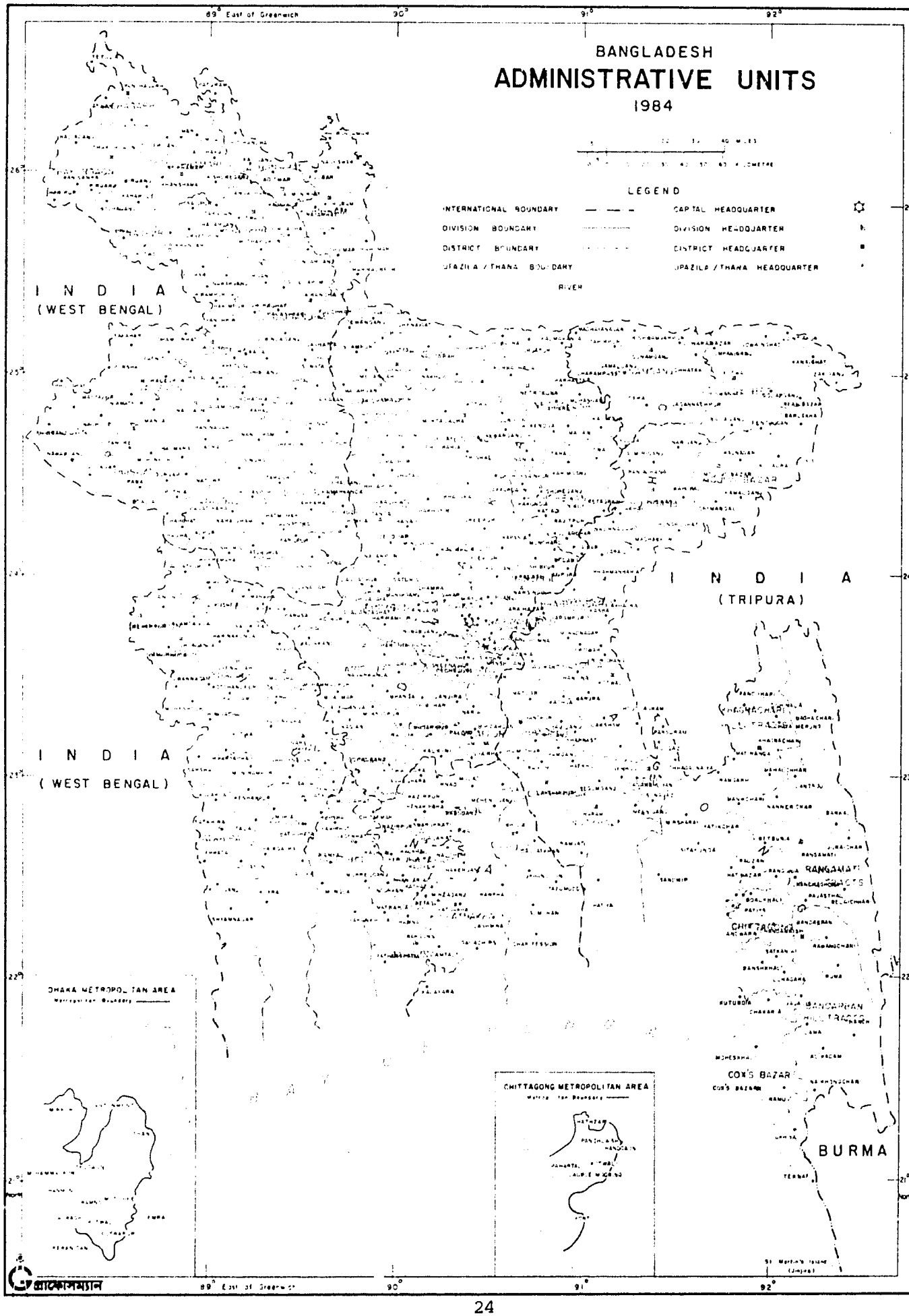

BANGLADESH
ADMINISTRATIVE DIVISIONS
1974
(THANA WISE)
REFERENCES
International Boundary
Division Boundary
District Boundary
Sub-Division Boundary
Thana Boundary
INDIA
INDIA
INDIA
INDIA
BURMA
BAY OF BENGAL

Exhibit IX

REVISED PROJECT DISTRICTS AND CORRESPONDING UPAZILAS

Old District	New Districts	No. of Upazilas	Total Upazilas
Faridpur	Faridpur	8	27
	Rajbari	4	
	Madaripur	4	
	Gopalganj	5	
	Shariatpur	6	
Rangpur	Rangpur	8	35
	Lalmonirhat	5	
	Gaibandha	7	
	Kurigram	9	
	Nilphamari	6	
Sylher	Sylhet	11	35
	Sunamganj	10	
	Moulavibazar	6	
	Habiganj	8	

Exhibit X


BANGLADESH
ADMINISTRATIVE UNITS
1984
LEGEND
INTERNATIONAL BOUNDARY
DIVISION BOUNDARY
DISTRICT BOUNDARY
UPAZILA / THANA BOUNDARY
RIVER
CAPITAL HEADQUARTER
DIVISION HEADQUARTER
DISTRICT HEADQUARTER
UPAZILA / THANA HEADQUARTER
INDIA
(WEST BENGAL)
INDIA
(TRIPURA)
INDIA
(WEST BENGAL)
BURMA
DHAKA METROPOLITAN AREA
CHITTAGONG METROPOLITAN AREA
COX'S BAZAR
RANGAMATI
89° East of Greenwich
90°
91°
92°

sub-divided into new and smaller districts, with the next subordinate administrative unit being the Upazila. This dramatic change in rural administration concept introduced the possibility that further evaluations might be desirable to ensure compatibility of the studies' recommendations with such factors as revised definition of feeder roads, assessed capabilities of new administrative units to handle feeder road construction and maintenance, and short- and long-term equipment management capabilities of the new units.

2. An Organizational and Management Study of the Operational Aspects of Feeder Road Construction and Management

a. The Report

"An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur, and Sylhet Districts" was issued in October 1983.

b. District Organization for Construction and Maintenance

This section compared the advantages and disadvantages of construction and maintenance by the DE and by the XEN under the old District concept. The new Upazila concept, while eliminating many of the problems inherent in the old system, has introduced several new management problems which now must be faced. The terms of reference for Phase II of this Project (FRMI) contain three provisions aimed at finding solutions to alleviate the new operational problems; they include:

- During the period September to December 1986, an independent study will be conducted to determine the capabilities of Upazilas to be involved in feeder roads improvement. Depending on the results of the study, the Consultant will be responsible for the development of pilot road improvement projects compatible with the capabilities of the Upazilas.

- During Phase II, the Consultant will develop a five-year maintenance program which will define the organizational structure required to conduct the program at the district level, as well as the equipment and financial requirements of same.

- During Phase II, three new districts (one in each old district) will be selected and the included Upazilas (total of 19) will be organized to handle the maintenance of the included feeder roads.

c. Planning, Conducting, and Financing the District Road Program

1. General

The report establishes that BDG policy gave top priority to maintenance of completed works and specified that a significant part of the (old) district budget was to be allocated to feeder roads maintenance. Now it will need to be determined if the decrees establishing the Upazila system contain provisions to supersede all previous decrees concerning feeder road maintenance practice and funding.

2. Planning the Construction and Maintenance Program

Long-range planning was not practiced by either of the two old district-level organizations.

3. Conducting the Construction and Maintenance Program

A register of prequalified contractors was maintained, and it was usually divided into 3 or 4 groups according to the upper cost limits for which they were permitted to tender. Quality control was found to be virtually non-existent. Record keeping was limited to two systems maintained for each contract; one a field book for remarks relating to work quality or progress and the second a measurement book maintained by the project supervisor.

4. Financing the Construction and Maintenance Program

It was noted that (old) district funds available for feeder road maintenance seemed to be on the decline, while foreign assistance funds

seemed to be increasing. This trend does not encourage institutionalization of normal feeder roads management and administration.

d. Maintenance Definition, Need, and Organization Concepts

1. Definition of Maintenance and Construction

Worldwide, there are slight differences of opinion regarding which activities should be defined as maintenance and which should be defined as construction. The main point is that an activity be defined as construction or maintenance by the nature of work accomplished irrespective of what organizational unit accomplishes the work, who pays for the work, or whether it is accomplished by contract or by force account.

2. Need for Maintenance

In 1982, within the three old Project districts, there were a total of 3,290 miles of district roads, of which 265 miles were classed as being paved, while 3,025 miles were classed as being unpaved. Within 92 percent of the rural roads classed as unpaved, and the problem further aggrevated by heavy rainfall and surface flooding and the general presence of poor soils for construction purposes, the magnitude of maintenance requirements becomes apparent. However, little or no maintenance work was being done except by contract, and that work should have been properly classified as construction. Lack of funds was the universal excuse for no maintenance, even though the economic fallacy of this policy has been demonstrated by the Consultant.

3. Organizing for Road Maintenance and Construction

Organizational arrangements for construction and maintenance of feeder roads may vary, but the basic tenets associated with effective public administration are applicable at any stage of development. These tenets include:

- Individual responsibility clearly defined and understood,
- The chain of command firmly established,
- Number of people supervised should not exceed reasonable limits, and
- Responsibilities for like activities assigned to one group with well defined duties to assure no overlap, duplication, or gaps.

Other organizational concepts a viable and adaptable to any administrative organization would include:

- Source of financing concept,
- Contract versus in-house staff concept, and
- Construction versus maintenance concept.

a. Source of Financing

The present practice of assigning maintenance and construction responsibilities on the basis of funding source results in a waste of resources and is a contradiction of the proposed definitions for maintenance and construction.

b. Contract Versus In-House Staff Concept

Normally, contract is superior for construction purposes, while maintenance can best be done by in-house or force account. This is one of the issues which must be resolved during Phase II of this Project.

c. Construction Versus Maintenance Concept

This issue, complicated by the fact that construction requires much more equipment than normal maintenance operations, will need to be resolved early in Phase II so that efficient equipment management practices can be institutionalized.

e. Recommended Assignment of Responsibilities for Maintenance and Construction

If the anomalies and contradictions concerning organizational responsibility for feeder road maintenance that existed during Phase I are to be avoided in Phase II, then firm agreements concerning the definition of construction and maintenance and the constituent activities to be assigned to each classification will be necessary. The report's recommendations were based on three assumptions:

- That WPW would gain permanent status,
- That the Ministry would ensure the performance of assigned tasks, and
- That feeder road maintenance and construction, as herein defined, would each be budgeted and accounted for separately, irrespective of whether they are accomplished by contract or by in-house staff.

Circumstances have since altered these assumptions considerably; witness the following:

- The WPW has become LGED, but it is not yet an operational branch of BDG; it is still functioning at the (old) district level, but at a greatly reduced scope,
- The office of DE has been completely abolished, and division of its previous functions has not yet been clearly defined, and
- Feeder road construction and maintenance management concepts have not yet been clearly defined for the new rural organization.

f. Organization and Staffing Adjustments for Maintenance and Construction

Basically, an organization should be staffed in a manner appropriate for its assigned work, while another basic decision will be the proportion of maintenance work to be done by contract, by force account by permanent staff, and by force account by temporary or seasonal staff. There are also certain local factors which must be considered, and they include:

- Feeder road maintenance in Bangladesh is labor-oriented,
- The geographic dispersal of work creates transportation problems,
- Specialized skills are required for some maintenance work, and
- Road maintenance can be performed most effectively during the dry season.

Functions to be performed by any feeder road contruction and maintenance organization would include the following:

- Feeder road maintenance by a full-time staff,
- Feeder road maintenance by temporary or seasonal labor,
- Feeder road maintenance by contract,
- Equipment maintenance, and
- Feeder road construction by contract.

g. Managing the Construction and Maintenance Process

1. Managing the Construction Process

The annual planning process could be improved by developing the program as a single document not dependent on the source of funding and by standardization of design, specifications, and quality-control criteria.

- Inventorying the regional road system,
- Determining the required service levels,
- Identifying deficiencies and preventive maintenance needs,
- Selecting maintenance methods,
- Developing the maintenance budget,
- Staffing and supplying regions for road maintenance work,
- Conducting maintenance work, and
- Reporting maintenance activities.

h. Personnel Administration

Elements of personnel administration that are basic to a viable rural administrative organization include:

- Institutionalization of the contruction and maintenance systems to provide staff with a sense of permanency,
- Allocation of similar work assignments to positions with similar titles and job descriptions, and
- Strict adherence to the basic tenets of public administration.

i. Implementing Actions and Schedules

The general management goals set forth in this report, supplemented by the goals and schedules to be produced by the Upazila capability studies in construction and maintenance, must be met if this Project is to achieve its ultimate objective within the time period allocated.

3. An Organization and Management Study of the Fiscal and Logistical Aspects of Feeder Road Construction and Maintenance

a. The Report

"A Review of Budgeting, Accounting, and Procurement - Sylhet, Rangpur, and Faridpur Districts" was issued in October 1983.

b. General

Rationalization of the present accounting system is of particular importance since this system must support both budgeting and procurement systems. The present accounting system is an elementary single-entry, cash basis system designed for the purpose of providing budgetary accounting for revenue and expenditures. It will not support a cost-finding sub-system directed to the measurement of volume through the processes of assigning all costs, direct and indirect, to measurable activities.

c. Budgeting

Many recommendations for changes and improvements were presented, but to rationalize, through updating of forms and procedures, budgeting

procedures that were established more than 25 years ago would require considerable time and manpower for system analysis and design, preparation of forms, procedures, and a procedures manual, and training and implementation. Meanwhile, the following recommendations could be implemented without clearly completely disrupting present procedures:

- Expenditures should be classified by function and by organizational unit. For use of this system for road maintenance and improvement, there are three important considerations.

  + Budget preparation at the activity level will require that an estimated cost be determined for the personnel time, the materials and supplies required, and the equipment cost for each activity.

  + The classification system can be used to determine either current costs, or total costs which includes all costs elements.

  + The system is applicable regardless of the rural organization unit responsible for performing feeder road maintenance and improvement.

- Contractors, or any other creditors, have a right to expect payment of approved expenditure documents within a reasonable period of time.

d. Accounting

Again, in the absence of a new, overall budgeting and accounting systems design, the following recommendations can be implemented and are compatible with, and necessary for, effective implementation of the recommended budget classification improvement.

- The proposed expenditure ledger for feeder road maintenance and improvement. This ledger, designed for use with the proposed classification of expenditures, provides a system for:

  + Maintaining a record of actual expenditures incurred for feeder road maintenance and improvement work done by in-house staff, contract, or both.

+ Controlling budgets through the comparison of estimated and actual expenditures.

+ Determining activity unit cost for management information.

+ Verifying compliance with legal requirements.

+ Preparing monthly expenditure reports.

- The proposed monthly expenditure report — designed to provide management information in terms of accumulated expenditures and budgetary status for each activity, the work units completed for each activity, and the cost of each work unit.

- The proposed classification of expenditures system which must also be used for accounting and reporting purposes to obtain comparative information.

e. Procurement

Procurement procedures in Bangladesh are governed by rules and regulations that prevail throughout the country and all governmental organizations. The present procedures are reasonable and capable of supporting major recommendations relating to budgeting and accounting. If there is a decision to rationalize the budget and accounting systems, then the system analysis and design recommendations would apply to procurement as well to make sure that all systems are compatible.

f. Implementation Plan

Of the total recommendations, three were considered to be highly important and interdependent to the extent that all three should be implemented simultaneously. Included were the following:

- Budgeting - Classification of expenditures and budget format.
- Accounting - Proposed expenditure ledger.
- Accounting - Proposed monthly expenditures report.

4. Conclusions and Recommendations

a. The fundamentals of organization and management, both operational as well as fiscal and logistical, as presented here, are valid for any

form of rural administrative organization. The two operational capability studies planned as a part of Phase II of the FRMI Project will both serve to indicate any adjustments required to achieve compatibility with the Upazila organizational concept.

b. In the early stages of Phase II of the FRMI Project, great emphasis must be placed on the development of feeder road construction and maintenance organization and management capability.

c. A strong organization and management capability (operational, fiscal, and logistical) is a basic prerequisite for institutionalization of sound feeder road construction and maintenance programs.

C. TRAINING

1. Background

Although the PGA considered training to be one of the four basic elements of the FRMI Project for which the Consultant was responsible, funds for the in-country training program were not included in the Consultant's budget until Amendement No. 1 was approved in April 1984. However, the FRMI Project Training Program got underway in May 1983 with the arrival of the Training Advisor.

During the needs and requirements survey accomplished to determine the scope of the proposed FRMI Training Program, it developed that there were already six other programs involved in rural infrastructure development, two of which included training elements as a part of their overall program, and with each program there was a partial overlap with areas included in the FRMI Project. The existence of the other rural development programs was a vital consideration in the development and implementation of a sound FRMI Project Training Program.

2. Policy

As shown graphically on Exhibit XI, the ZRMI Project Training Program was geared to the physical and social environment prevailing in Bangladesh, programs and subject matter were prepared to meet the requirements of all levels of maintenance and/or rehabilitation employees, and so far as was practical, courses were taught by nationals in the Bengali language.

3. Program

a. General

The ZRMI Project Training Program was composed of the following elements:

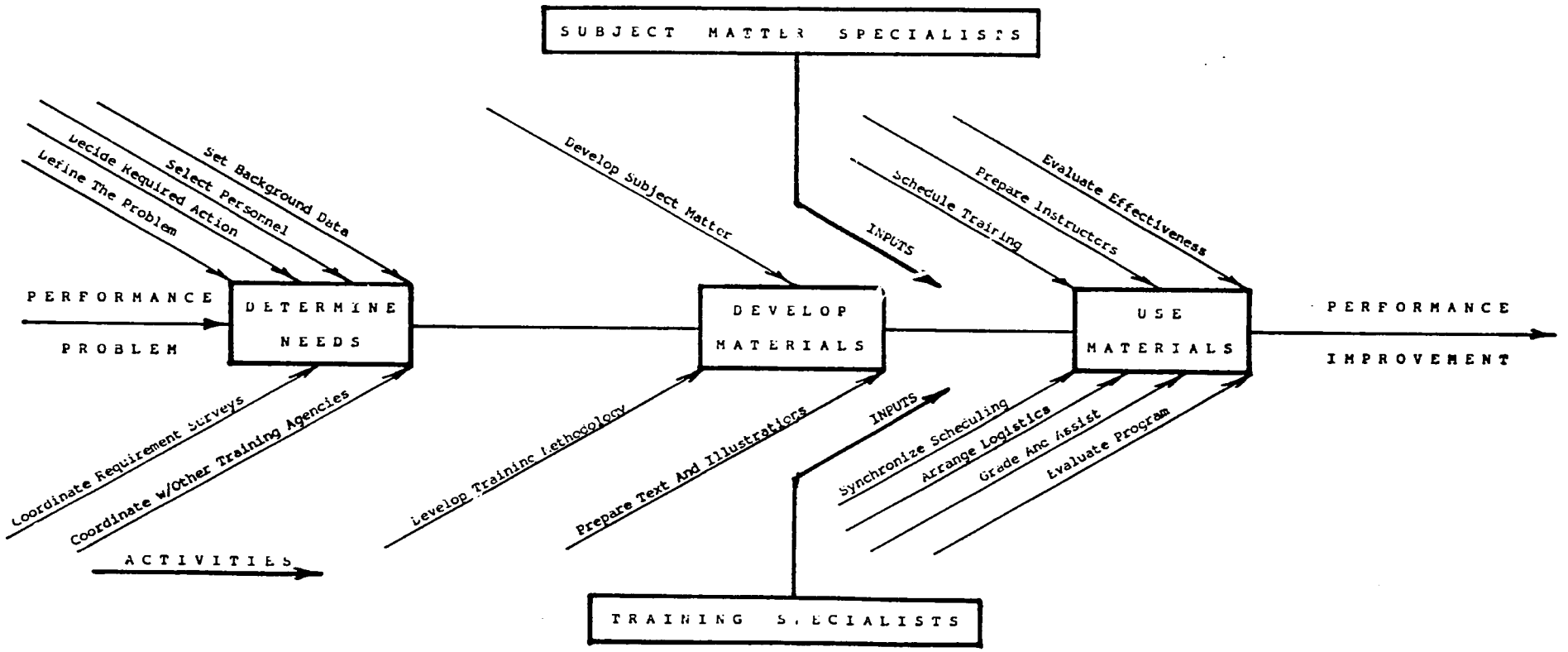
- In-Country (Domestic) Training Sessions,
- On-The-Job Training,
- Third-Country Training Programs, and
- USA Observation/Training Programs

In order to create a management tool for scheduling and monitoring program progress, and "S" curve of scheduled progress was superimposed on the traditional bar chart as shown on Exhibit XIII. Since this revised chart was plotted "after the fact" in March 1986, achieved progress coincides with scheduled progress, which seldom occurs in actual practice.

Final achieved progress was actually about 95 percent of scheduled progress. The basic reason for this lag was the change in scope of the USA Observation/Training Program, which was a minor change effected for the good of the Project. Therefore, it is considered that the nominal program completion rate was 100 percent.

Exhibit XI - TRAINING PROGRAM ORGANIZATION (SCHEMATIC)

Training is the teaching of work methods, techniques, and skills necessary for the satisfactory performance of specific work assignments. Maintenance and/or rehabilitation training is carried on to improve performance. Therefore, it is not a "one-time" operation, but rather it is on-going in character. The development of training materials, and their subsequent use, requires contributions from technical specialists as well as training specialists.

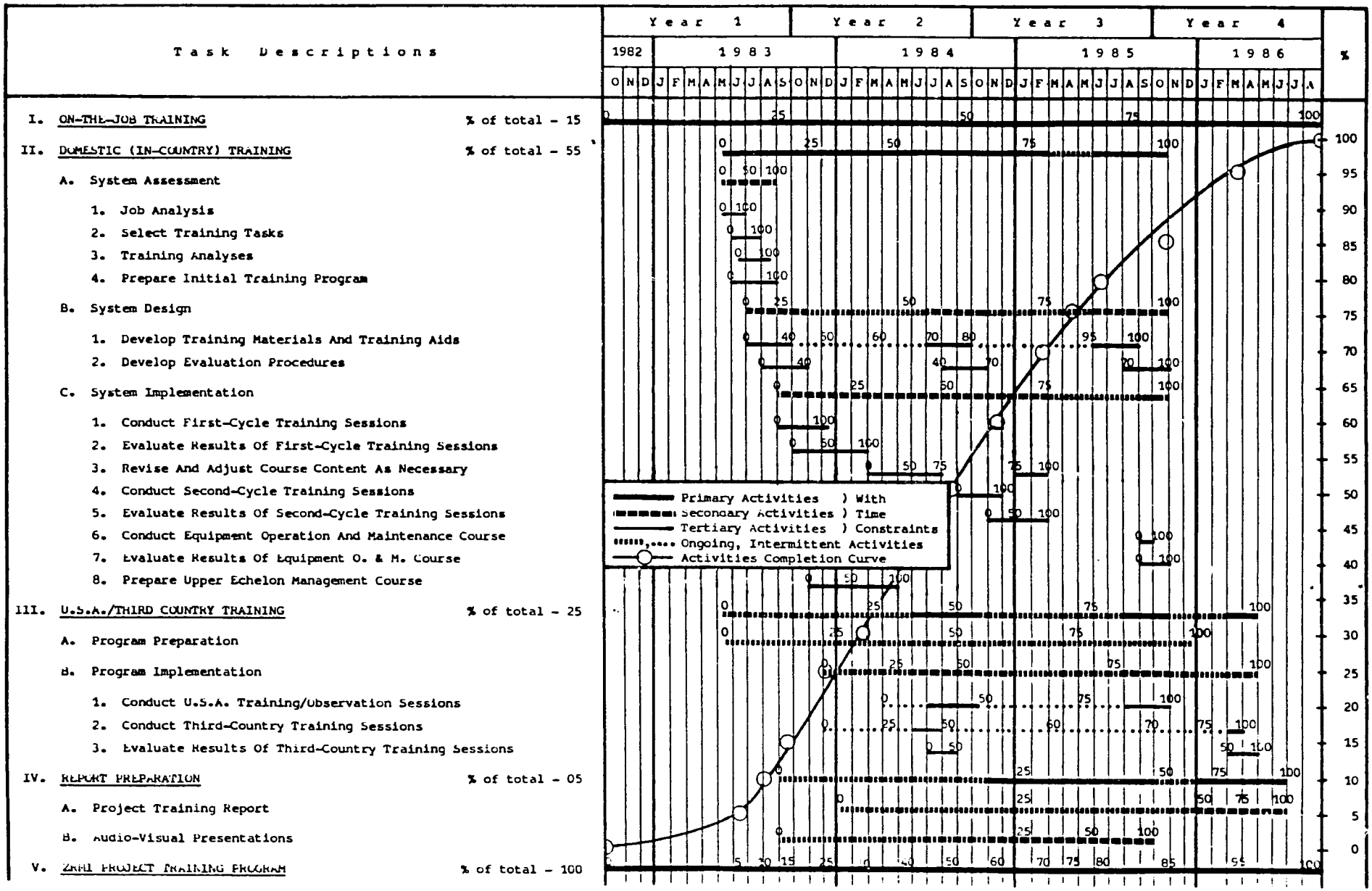


Note : In the initial phases of the training program, both categories of specialists were composed primarily of consultant personnel, either expatriate, or local. However, with regard to the in-country training element, this was considered to be an evolutionary process whereby LGEB professionals ultimately replace all expatriates. Ideally, the training unit of LGEB would assume all responsibility for the on-going training program.

: Adapted from Transportation Technology Support For Developing Countries, Compendium 14, Training, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1980 (AID/CTR-C-1591, Project 931-1116).

Exhibit XIII

ZRMI PROJECT TRAINING PROGRAM SCHEDULE (REVISED, MARCH 1986)



b. In-Country (Domestic) Training Sessions

1. Basic Approach

The modular approach was selected as being the most appropriate for the preparation and presentation of on-site training sessions. The eight basic modules developed included the following:

- Plane surveying;
- Soil Sampling and Testing;
- Feeder Roads Maintenance Practices;
- Basic Hydrology and Design of Hydraulic Structures;
- Maintenance Management;
- Project Management
- Basic Embankment Design
- Basic Pavement Design

The methodology employed in the in-country training sessions can best be illustrated by the circular percentage graph (or "pie chart") of Exhibit XIV.

2. Venue

As shown by appropriate symbols on Exhibit XV, all of the on-site training sessions were held in, or near, the towns of Sylhet, Rangpur or Faridpur.

3. Schedule

The schedules for the first and second cycle training sessions and the equipment operation and maintenance sessions are shown graphically on Exhibit XVI, which consists of three sheets.

4. Participants

Each of the three sheets of Exhibit XVI also shows the distribution of the participants according to the module attended. If the net totals

Exhibit XIV

ZRMI PROJECT TRAINING PROGRAM

CIRCULAR PERCENTAGE GRAPH

IN-COUNTRY TRAINING METHODOLOGY

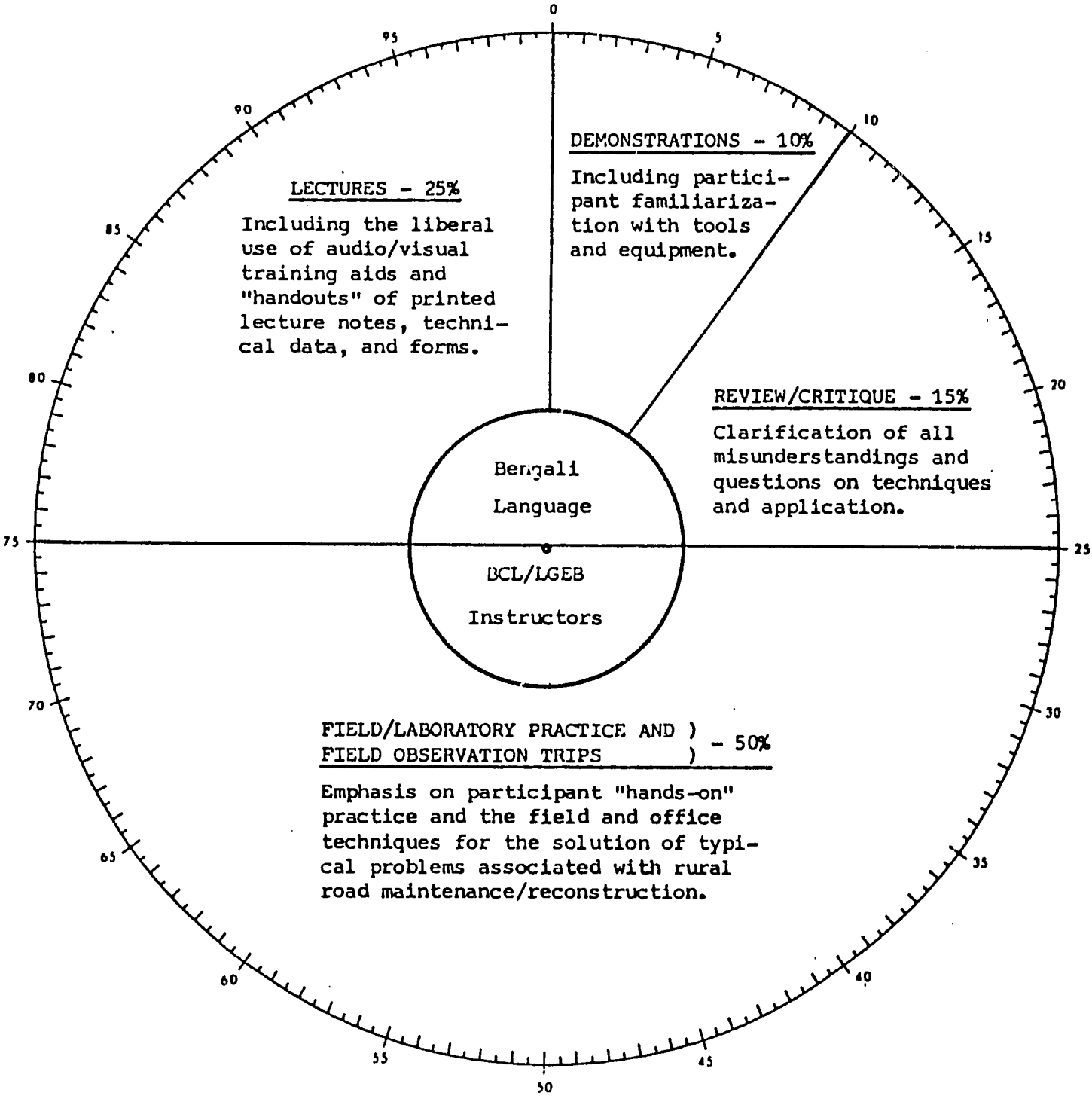


Exhibit XV - VENUE, FIRST- AND SECOND-CYCLE TRAINING SESSIONS

EQUIPMENT O. & M. TRAINING SESSIONS

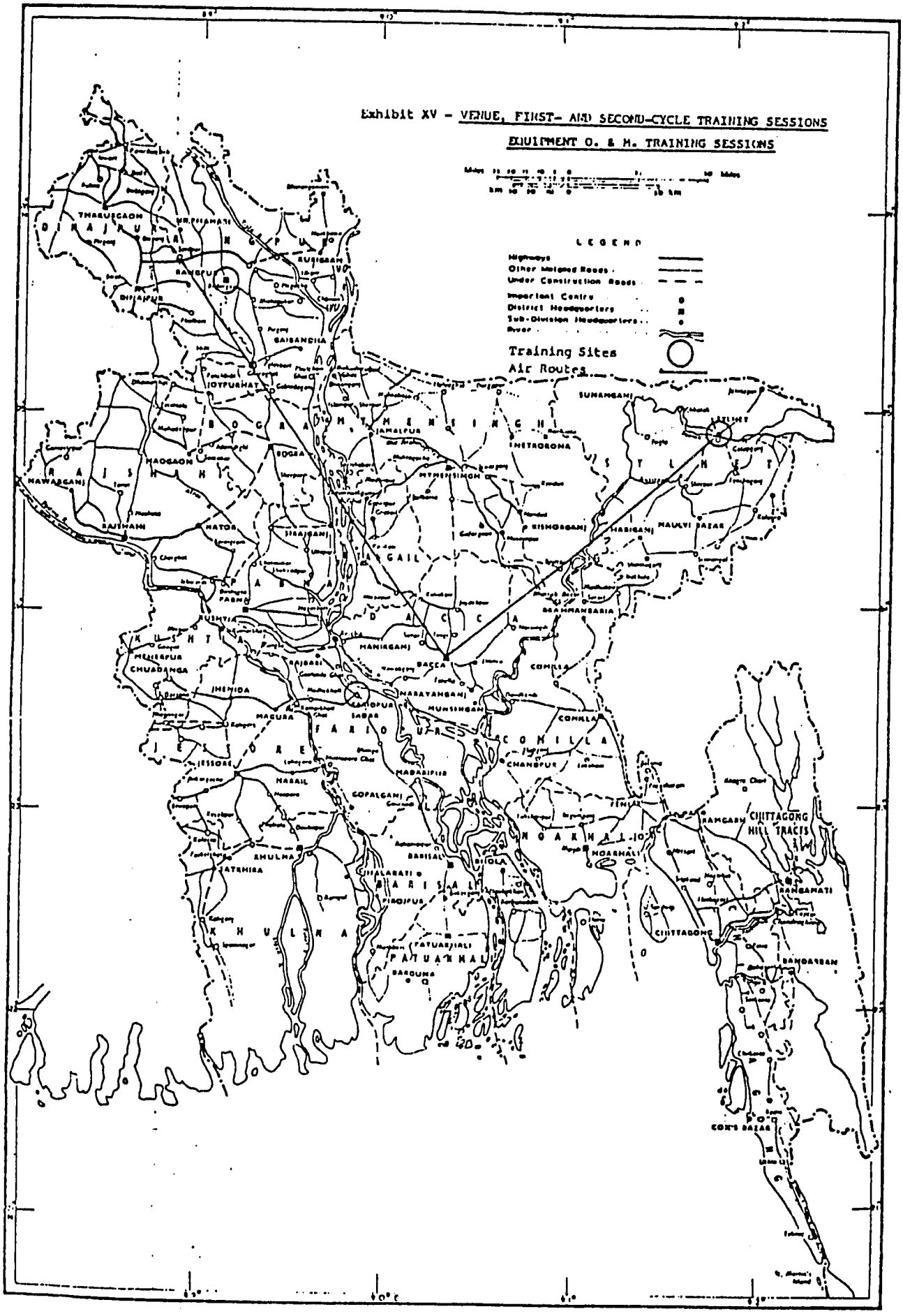
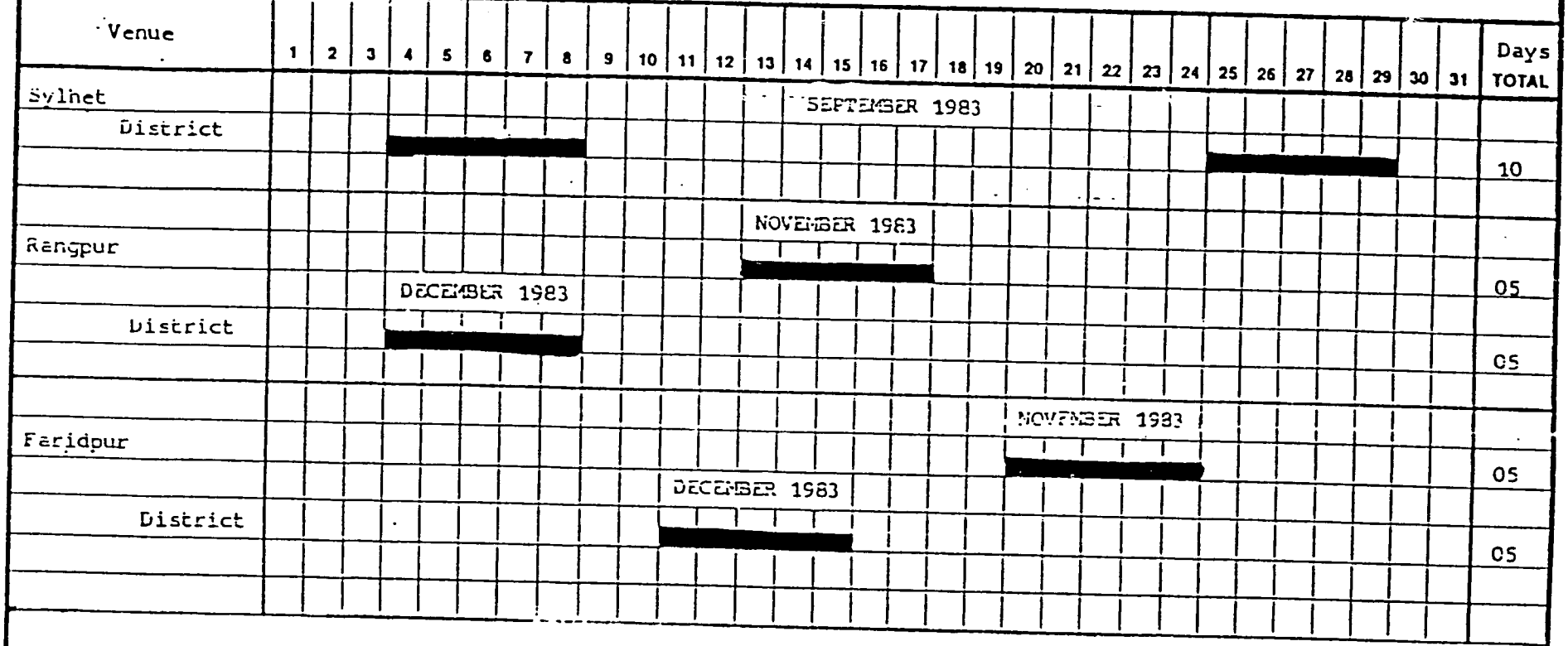


Exhibit XVI - ZRMI IN-COUNTRY TRAINING SESSIONS
VENUE, SCHEDULE, PARTICIPANTS

SCHEDULE, FIRST-CYCLE TRAINING SESSIONS, 1983

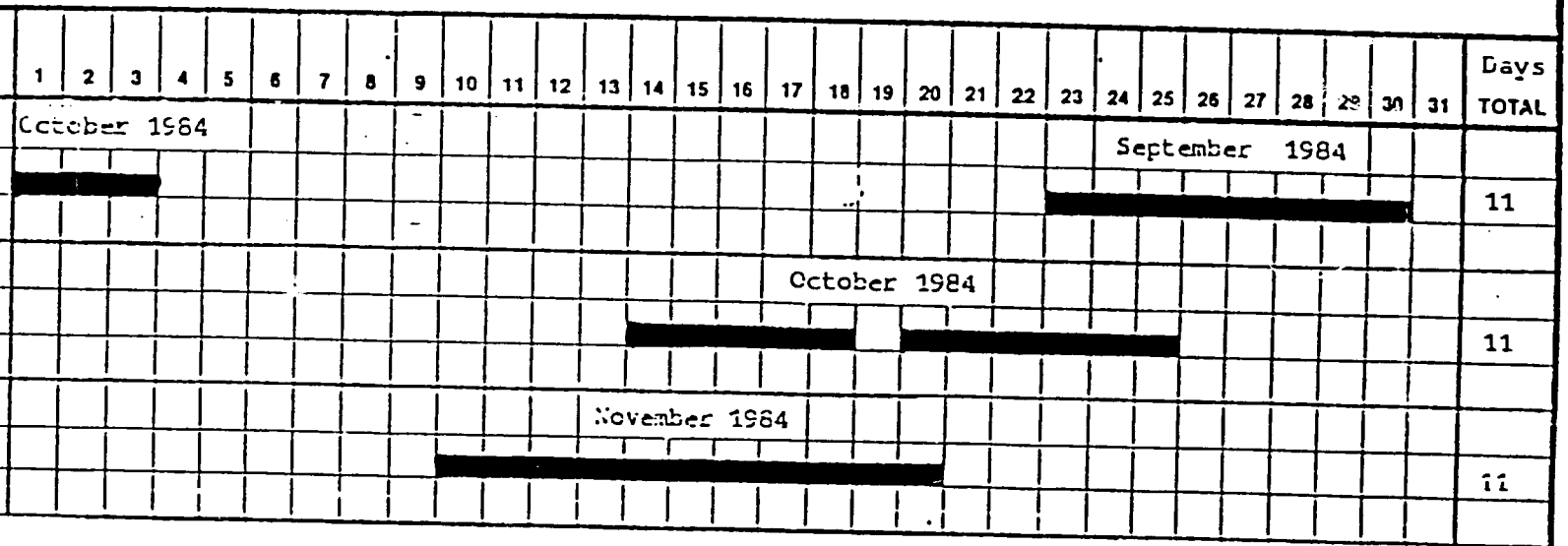


TRAINING MODULES AND RESPECTIVE TOTAL PARTICIPANTS

Module Description	Total Number Of Participants			
	Sylhet	Rangpur	Faridpur	Total
Plane Surveying	13	21	23	57
Rural Roads Maintenance Practices	31	21	24	76
Material Sampling And Testing (Soils)	11	11	15	37
Total Number Of Participants	55	53	62	170

Exhibit XVI - ZRMI IN-COUNTRY TRAINING SESSIONS
VENUE, SCHEDULE, PARTICIPANTS

SCHEDULE, SECOND-CYCLE TRAINING SESSIONS, 1984



PARTICIPANT DISTRIBUTION BY TRAINING MODULE AND UNIT

Module Description	Unit Designation	Total Number Of Participants			
		Sylhet	Rangpur	Faridpur	Total
Basic Plane Surveying	I	7	13	9	44
Advanced Plane Surveying	II	6		9	
Rural Roads Maintenance Practice (Basic)	III	12	15	8	48
Rural Roads Maintenance Practice (Advanced)	IV	6		7	
Material Sampling And Testing (Soils) (Basic)	V	10	12	9	40
Material Sampling And Testing (Soils) (Advanced)	VI			9	
Total Number Of Participants		41	40	51	132

Exhibit XVI - ZRMI IN-COUNTRY TRAINING SESSIONS
VENUE, SCHEDULE, PARTICIPANTS

SCHEDULE - EQUIPMENT O. & M. TRAINING SESSIONS

Venue	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Days TOTAL
Sylhet								September 1985																								
District																																
(Old)																																3

PARTICIPANTS BY ORGANIZATION AND OCCUPATION

Organization	Mechanical Foreman (SAE)	Sub-Overseer Mechanical (SAE)	Roller Driver	Mechanic	Workshop Helper	Total
LGEB, Faridpur	1	—	4	—	—	5
LGEB, Rangpur	1	—	4	—	—	5
LGEB, Sylhet	1	1	2	1	1	6
Totals	3	1	10	1	1	16

from the first-cycle sessions are used, then the total number of professionals and technicians receiving benefits from the in-country training sessions was 125 for the first-cycle sessions, 132 for the second-cycle sessions, and 16 for the equipment operation and maintenance sessions, or a grand total of 273. The Project goal of 200 participants in the in-country training program during this same period has been more than attained.

5. Training Staff

In the first-cycle sessions, the instructors were all recruited from the Consultant's staff. Since the second-cycle sessions were considered to constitute a transitional phase, LGEB and DE staff personnel were encouraged to participate as trainers to the maximum extent possible.

6. Training Schedule and Syllabi

Exhibit XVII illustrates how the relationships of course module and units, expected number of participants, subject matter to be covered, and the optimum use of available qualified trainers were all coordinated. A detailed bar-chart schedule and accompanying syllabus was then prepared for each training session.

7. Logistics

For all sessions, each participant was paid a Per Diem of Tk100, and tea was provided twice each day. For the second cycle sessions, two meals per day were added to the amenities. All training staff received a per diem of Tk300.

Travel to and from home base to the training site was at the participants' own expense. Training staff traveled by Jeep, minibus, and Biman. Travel at the site was provided by two Jeeps and a Coaster bus.

Exhibit XVII

ZRMI Project In-Country Training Program — Second-Cycle Sessions

RELATIONSHIP OF COURSE GROUPS, CONTENTS, TRAINING HOURS, AND STAFF

Training Staff Participation																Training Course Contents (By Group*)	Training Effort Distribution By Groups * And By Hours						
																	1	2	3	4	5	6	Total
P			M								E	D			A	OPENING/CLOSING, GENERAL ORIENTATION	13	13	13	13	13	13	78
			M								E			B	A	SURVEYING (I & II)							
							I	H						B		Review Of Fundamentals	2	2	-	-	-	-	4
							I	H								Measurements And Errors	4	2	-	-	-	-	6
							I	H								Differential Levels	7	2	-	-	-	-	9
							I	H								Profiles And Cross Sections	14	4	-	-	-	-	18
							I	H								Hand Level, Compass, Rangefinder	7	3	-	-	-	-	10
							I	H								Planetable And Its Use	2	4	-	-	-	-	6
							I	H								Theodolite And Its Use	2	3	-	-	-	-	5
							I	H								Traverse (Open And Closed)	-	4	-	-	-	-	4
							I	H								Topography	-	3	-	-	-	-	3
							I	H		F	E			B	A	Field Problems/Site Mapping	20	20	-	-	-	-	40
							I	H		F				B		Notes And Note Reduction	7	10	-	-	-	-	17
								H		F				B		Quantity Calculations	3	6	-	-	-	-	9
																Total, Surveying	68	63	-	-	-	-	131
			M								E	D		B	A	MAINTENANCE/RECONSTRUCTION MANAGEMENT (III & IV)							
											E	D		B		Review Of Fundamentals	-	-	2	2	-	-	4
										F	E	D			A	Planning							
	O	N		L						F	E	D	C	B	A	Program Priorities	-	-	5	12	-	-	17
				L						F	E	D	C			Site Investigation	-	-	7	7	-	-	14
	O	N	M							F	E	D	C	B		Structure Siting/Sizing	-	-	-	7	-	-	7
																Standard Specifications	-	-	4	4	-	-	8
	O		M		K					F	E	D		B		Implementation							
	O		M		K					F	E	D		B		Contract Procedures	-	-	-	4	-	-	4
							I	H		F	E		C	B		Contract Administration	-	-	-	4	-	-	4
	O	N	M							F	E	D		B		Construction Surveys	-	5	5	5	-	-	15
			M							F	E	D		B		Supervision/Control							
			M							F	E	D		B		Program Control	-	-	-	4	-	-	4
		N				J			G	F	E		C	B		Project Supervision	-	-	6	6	-	-	12
			M						G	F	E			B		Program/Project Monitoring	-	-	7	4	-	-	11
																Quality Control	-	-	10	4	4	4	22
																Completion Reports	-	-	4	4	-	-	8
																Total, Maint./Recon. Management	-	5	50	67	4	4	130
			M											B	A	SOILS (V & VI)							
													C	B		Review Of Fundamentals	1	1	3	-	3	3	11
						J			G		E		C	B		Field Identification	1	1	4	-	4	4	14
						J			G		E		C	B		Field Sampling	2	2	3	-	3	3	13
						J			G							Sample Preparation	-	-	1	-	2	2	5
						J			G				C	B		Specific Gravity	-	-	2	-	5	5	12
						J			G							Grain-Size Analyses	1	1	4	-	14	7	27
						J			G							Atterberg Limits	2	2	4	-	14	7	29
						J			G		E		C	B		Unified Classification System	-	-	4	4	4	4	16
						J			G				C	B		Proctor Optimums	-	-	-	-	7	7	14
						J			G		E		C	B		California Bearing Ratio (CBR)	-	-	-	-	8	8	16
						J			G		E		C	B		Field Density Testing	-	-	-	-	7	7	14
	O	N				J			G		E		C	B		Field Exploration (Deep Borings)	-	-	-	4	4	-	8
	O	N							G				C	B		Application Of Data To Design	-	-	-	-	-	10	10
																Total, Soils	7	7	25	8	71	71	189
																Total, All Training Groups	88	88	88	88	88	88	528

Composition Of Training Staff

A - Training Advisor	PAS
B - Training Coordinator	BCL
C - Advisor, Soils/Structures	BCL
D - Management Advisor	WSA
E - RE, Maintenance/Soils (3)	PAS/WSA
F - ARE, Maintenance (3)	BCL
G - Soils Laboratory Engineer	BCL
H - Chief Surveyor	BCL
I - Surveyor (3)	BCL
J - Soils Laboratory Technician (3)	BCL
K - Implementation Advisor	WPW
L - Site Hydrology Advisor	WPW
M - Training Administrator (3)	WPW
N - Other Advisors	WSA/BCL/PAS
O - Other Advisors	WPW
P - Guest Speakers, USAID, Etc.	

* Group Designation	Students
1 - Group I - Basic Surveying	8
2 - Group II - Advanced Surveying	8
3 - Group III - Basic Maintenance Pract.	8
4 - Group IV - Advanced Maint. Management	8
5 - Group V - Basic Soil Mechanics	6
6 - Group VI - Advanced Soil Mechanics	6
Total Participants (Each District)	42

To encourage LGEB and DE staff to participate as trainers, a special stipend of Tk300 was paid for each day of duty as a trainer.

Local officials were encouraged to be present for at least all opening and closing sessions and to award diplomas.

8. Participants' Course Evaluation

A course evaluation questionnaire was supplied to each participant in each series of training sessions. The individual responses to these questionnaires were tabulated and evaluated and the results compiled for each of the two training cycles. First-cycle responses were used to orient improvements for the Second-cycle, and second-cycle responses will be used for improving future sessions. In general, the individual responses were positive and indicated that the training sessions were well received by all participants.

9. Cost of In-Country Training Sessions

The current status of the in-country training budget is shown on Table IX. It will be noted that the average cost of TK 329/participant-day for the first cycle sessions rose to Tk415 for the second cycle sessions, and to Tk771 for the equipment operation and maintenance training sessions. This resulted in an overall average of Tk 336/participants-day, or US$12.70. A unit cost (not including salary costs of the training staff) of less than US$20/participant-day is well within the range of other similar type training programs.

10. Conclusions and Recommendations

a. Survey Module

1. Plane surveying is such a fundamental engineering operation that demonstrated competence in the basic techniques should be a prerequisite for directing field work and utilizing survey data in design work.

Table IX - CURRENT STATUS, IN-COUNTRY TRAINING BUDGET

	Budget Item	Total Expenditures (Tk)				Totals (US$)		
		1st Cycle	2nd Cycle	O. & M.	Total	Expended	Budgeted	Remaining
01	PER DIEM							
	A. Participants	85,700	160,000	6,400	252,100	9,400	8,100	
	B. Staff	48,499	58,188	1,475	108,162	4,100	2,400	
02	AMENITIES (LUNCH, TEA, CLOSING DINNER)	33,041	95,444	3,350	131,835	5,000	5,500	
03	TRAINING FACILITIES	—	8,260	4,300	12,560	500	300	
04	TRANSPORTATION							
	A. Training	25,067	50,077	3,700	78,844	3,000	2,400	
	B. Staff	15,500	28,400	1,390	45,290	1,700	2,000	
05	PRINTING AND REPRODUCTION (FILMS AND PHOTO PROCESSING)	26,273	157,388	10,800	194,461	7,300	8,000	
06	TRAINING MATERIALS AND SUPPLIES	35,832	60,062	4,000	99,894	3,800	4,000	
07	TRAINING EQUIPMENT	10,000	15,814	1,000	26,814	1,000	1,500	
08	CONTINGENCIES/MISCELLANEOUS	—	—	585	585	100	10,773	
	TOTALS	279,912	633,633	37,000	950,545	35,900	44,973	9,073
	COST/PARTICIPANT-DAY	Tk 329	Tk 415	Tk 771	Tk 336	US$ 12.70	US$ 16.35	

Note: This accounting does not include the US$ expended for training aids, materials, equipment.

This accounting does not include salaries of the training staff.

For conversion from Tk to US$, an average conversion rate of Tk 26.82 was used.

To ensure that all are exposed to the fundamentals, future survey training modules should be divided into two or more units; one or more units for full-time surveying participation, and one or more units for participants from the other principal training modules. If all participants are to have ample opportunity for "hands-on" experience, more survey equipment will have to be provided.

2. Each of the subordinate offices within each of the rural administrative units should be supplied with rudimentary surveying tools so that the assigned staff can adequately perform their duties. The more sophisticated equipment should be retained in the higher echelon offices to be sent out on a loan basis as required for specific tasks.

b. Feeder Roads Maintenance and Improvement Module

1. Full and complete use of the maintenance organization and management manuals prepared by the Consultant would promote standardization in the teaching of this module.

2. The importance of a reliable and current road inventory should continue to be a high priority item in future presentations of this module. The interrelationship of road inventory and the prioritization and rationalization of scheduling of feeder road maintenance and/or improvement must be fully emphasized.

3. This module has received such an enthusiastic response that it is suggested that future sessions be held in some more centralized location whose facilities would permit a greatly expanded number of participants.

c. Material Sampling and Testing Module (Soils)

1. Like surveying, this is one of the basic concepts that everyone involved in feeder road construction/maintenance should have a fundamental familiarity. But everyone does not have the academic background

required to cope with a full course. Therefore, future training modules should be divided into two or more units; one or more units for participants in full material testing participation, and one or more units for participants from the other principal training modules.

2. This module also lends itself to the centralized site concept, but more elementary sampling and laboratory equipment would be required.

d. Equipment Operation and Maintenance Management

1. Field observations indicate that this type of training must be repeated on an annual basis.

2. To be fully meaningful, all printed "hand-outs" should be in the Bengali language.

e. General

1. Consecutive six-day sessions, broken by one day of rest seem to be the best way to schedule training sessions.

2. Training sessions must be scheduled to avoid taking the participants from their normal work at a time when they are most needed. Conflicts in scheduling and the use of resources by other training efforts must be avoided.

3. By holding future training sessions at a centralized site, more students could be taught by the same number of instructors, and there would be a reduction in the possibility of duplication of schedules, misuse of resources, and other problems noted to date.

4. BDG personnel should be encouraged to assume more and more of the responsibilities for the training sessions. The creation of the LGEB centralized training unit is a positive development in this respect and

the FRMI Project should enthusiastically cooperate with this organization and seek ways and means to interface with it.

5. The bound reference manuals distributed to each participant should be continuously upgraded and improved for future training sessions.

6. The Project minibus should be procured as quickly as possible for use in future training sessions.

7. The preparation of 35 mm slides and other audiovisual materials for training purposes should be continued.

8. Future training sessions should emphasize construction and maintenance management. Included in this effort should be complete orientation of USAID rules and regulations concerning compliance with specifications and reimbursement procedures.

c. On-the-Job Training

This was an ongoing activity that did not lend itself to formal programming, but rather it was the responsibility of all concerned to encourage the transfer of knowledge at every opportunity. Specific examples include:

- The use of the three (old) district soils laboratories,
- Informal discussion of work requirements with the Contractors,
- Consultant assistance in preconstruction and construction surveys,
- Regular joint site inspection trips by the RE's and the XEN's,
- Consultant construction-site monitoring, and
- Consultant assistance in drainage structure design.

Production activities which reflect the beneficial impact of on-the-job training includes:

- Improvement of contractor performance through an improvement in the level of quality control and works supervision,
- Enthusiastic manner in which participants in overseas training courses assumed responsibility as trainers, and
- The excellent cooperation of the ARE's in the preparation of the "hand-out" materials and in the acceptance of responsibilities as trainers.

d. Third-Country Training Courses

1. General

There are several countries in Southeast Asia and the Sub-Continent that have physical and social environments similar to those that prevail in Bangladesh. However, Thailand, with its Asian Institute of Technology was selected as the third country with more advantages and fewer disadvantages than the others of this region.

2. AIT Feeder Roads Construction and Maintenance Courses

There were two such courses of this type; one held from 20/06 to 10/07/84 for 15 participants, and one held from 02-23/03/86 for 16 participants. In each case, the course consisted of two weeks of classroom and laboratory work on the AIT campus just north of Bangkok, Thailand, and one week of field observations in northeast and northern Thailand. For both cases, the participating organizations were:

- Executing Agency - AIT, Continuing Education Center, Bangkok
- Sponsoring Agency - LGEB (formerly WPW), LGD, MLGRD&C, BDG
- Monitoring Organization - WSA/BCL/PAS Consultants

The long-term objective of these courses was to strengthen the human resource element of the ZRMI Project by providing short-term specialized training to a group of selected Bangladeshi engineers and technicians. The immediate objective was to strengthen the professional capabilities of the group of engineers and technicians to plan and undertake the maintenance and improvement of feeder roads.

Each participant was given a per diem of US$45. However, lodging was provided at the AIT Center during the on-campus portion and at selected hotels and motels during the field trip. The cost of this lodging was US$25/day for double occupancy, so that each participant was charged US$12.50/day for lodging. This left each one a net of US$32.50/day to cover board and personal expenditures. Transportation to and from the campus and during the extended field trip was provided by AIT. On campus, all facilities were within walking distance of the AIT Center.

At the end of each course, the participants were asked to complete a personal evaluation questionnaire concerning all aspects of the course. The responses were then compiled and evaluated. For the most part, the responses were positive and enthusiastic. In general, it was felt that both courses were highly successful and merit repetition in the future.

3. Conclusions and Recommendations

a. Both courses were well organized and the logistics efficiently handled.

b. Practically all of the subjects included in the second course were timely and appropriate for the participants' requirements, which was an improvement over the subject matter offered in the first course.

c. In both courses there was some difficulty in communication between lecturers and students, but there was a marked improvement in the second over the first.

d. In a course of this type, on-the-job training is impractical. However, a hypothetical problem to be solved independently by groups of students might be a viable alternative.

e. A testing and grading system to determine participant absorption of course material would be helpful.

f. Pre-course orientation sessions should receive more stress.

g. A way must be found to accelerate the approval/ clearance process of BDG.

h. It is recommended that steps be taken to organize in Bangladesh a combination in-country/third country training program similar to the AIT programs.

i. While a third AIT program would continue to yield good benefits for Bangladesh, the possibilities of short-term training programs in other third countries should not be completely overlooked.

e. USA Observation/Training Programs

1. General

This element of the overseas training program proved to be the most difficult to arrange. In the first place, the only area of the USA that has a physical environment resembling that of Bangladesh is the southeastern portion, particularly the Gulf States area. Secondly, the requirements for participant selection are much more stringent, both on the part of the BDG, as well as the USA. Finally, it is difficult to find an organization willing to delegate the manpower and other resources required to take care of the needs of a relatively short-term training-observation program. In all cases, restrictions imposed by accident and liability insurance severely limit any "hands-on" type training.

2. The Training Courses

There were two training courses, each of a duration of about two months; the first in July/August 1984; and the second in September/October 1985. The itineraries and schedules were practically identical for both courses - one week in orientation sessions in Washington, DC, more than five weeks at the Jefferson County Public Works Department in Birmingham, Alabama, one week at the South Carolina State Highway Department and the WSA home office, and less than one week in transit.

All of the participants were enthusiastic about their exposure to the full spectrum of road construction and maintenance management and operations and were confident that many of the techniques seen and learned were adaptable to conditions in Bangladesh. The Jefferson County officials were also pleased with the positive impact of the course and have indicated that they are ready to give it again.

3. General Conclusion and Recommendation

An introduction to advanced technology is a positive experience and it is recommended that more high-level FRMIP officials be sent to the USA.

f. Cost of Overseas Training

The final status of the overseas training budget, including total expenditures (by years), funds budgeted, and funds remaining, is shown on Exhibit XX. A total expenditure of US$171,300 is indicated, which was only 57 percent of the total budget of US$300,000. The reduction in scope of the overseas training program is the principal reason for this rather drastic underexpenditure.

Exhibit XXI shows the distribution of overseas training funds. The first AIT course cost US$50,300, giving a unit cost of US$152/

Exhibit XX - FINAL STATUS, OVERSEAS TRAINING BUDGET

	Budget Item	Total Expenditures (US$)					Total (US$)	
		1983	1984	1985	1986	Total	Budgeted	Remaining
01	TRAINING AIDS, MATERIALS, EQUIPMENT	4,000	5,000	500	500	10,000	13,000	3,000
02	INTERNATIONAL TRAVEL	--	10,500	10,300	7,200	28,000	27,000	(1,000)
03	DOMESTIC TRAVEL	--	7,000	3,000	3,000	13,000	14,000	1,000
04	PER DIEM/DAILY ALLOWANCE	--	28,900	13,200	17,200	59,300	55,000	(4,300)
05	TUITION/FEES	--	16,300	1,700	14,000	32,000	33,000	1,000
06	BOOKS, SUPPLIES, MATERIALS, MISCELLANEOUS	--	9,000	2,000	3,500	14,500	18,000	3,500
07	DIRECT COSTS	2,000	5,000	7,200	300	14,500	15,000	500
08	SUB-TOTALS	6,000	81,700	37,900	45,700	171,300	175,000	3,700
09	UNALLOCATED FUNDS						125,000	125,000
10	TOTAL US$						300,000	128,700

Exhibit XXI - DISTRIBUTION OF OVERSEAS TRAINING FUNDS

	Budget Item	Total Expenditures (US$)					
		Domestic 1/	1st AIT	2nd AIT	1st USA	2nd USA	Total
01	TRAINING AIDS, MATERIALS, EQUIPMENT	8,000	200	300	1,000	500	10,000
02	INTERNATIONAL TRAVEL	—	6,800	7,200	6,500	7,500	28,000
03	DOMESTIC TRAVEL	—	4,000	3,000	3,000	3,000	13,000
04	PER DIEM/DAILY ALLOWANCE	—	16,100	17,200	12,800	13,200	59,300
05	TUITION/FEES	—	15,000	14,000	1,300	1,700	32,000
06	BOOKS, SUPPLIES, MATERIALS, MISCELLANEOUS	—	8,000	3,500	1,000	2,000	14,500
07	DIRECT COSTS	—	200	300	6,800	7,200	14,500
08	TOTALS	8,000	50,300	45,500	32,400	35,100	171,300
09	COST/PARTICIPANT-DAY		US$ 152	US$ 130	US$ 180 2/	US$ 195 2/	

1/ These funds were expended for equipment and supplies used primarily for in-country training purposes.

2/ This does not include any expenditures made by LGEB from their BDG funds.

participant day. The second AIT course cost US$45,500, giving a unit cost of US$130 participant day.

The total cost of the first USA training/observation course was US$32,400, which gave a unit cost of US$180/participant day. The total cost of the second USA course was US$35,100, which gave a unit cost of US$195/ participant day.

D. MAINTENANCE SYSTEM AND SUPERVISION

1. General

Since the activities involved in the institutionalization of a maintenance system are quite distinct from maintenance supervision, this maintenance section has been divided into two segments: maintenance systems and maintenance supervision.

2. Maintenance Systems

a. The Reports

1. "An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur and Sylhet Districts," issued in October 1983, has already been discussed in Section B, but some pertinent discussion has been included in this section.

2. "Maintenance Management for Zila Roads," issued in draft form in November 1983, was issued in final form in June 1985.

b. Definition of Maintenance

Simply defined, roadway maintenance is the preserving and keeping of each type of roadway, roadside, structure, and facility as nearly as possible in its original condition as constructed, or as subsequently improved, and the operation of roadway facilities and services to provide

satisfactory and safe transportation. Maintenance may be further defined according to timing, scale, or purpose. The definitions vary, and the lines between the categories are not sharp, but this separation of the work into classes is useful for management purposes. Table X illustrates the difference between maintenance and construction activities.

c. Organization of Maintenance

An organized force to maintain the existing and future feeder roads will require the standard levels for such operations, and they are:

- General Administration
- Program Management
- Engineering Advice and Control
- Field Supervision by Maintenance Areas
- Work Crews with Participating Foremen

Road maintenance work consists almost entirely of simple tasks repeated often, but all efforts will benefit from the basic elements of organization; that is:

- Planning and scheduling
- Controlled execution, and
- Evaluation of results

It does not matter what structure is chosen for this chain of command, accomplishment, and reporting, or the titles given to the different positions, so long as all of the elements are provided and there are clear lines of authority.

d. The Development of Maintenance Management

Maintenance management is a process which predicts maintenance requirements by generalizing road characteristics, probable road conditions, and standard maintenance responses; predicting annual maintenance programs which are approximate, but nevertheless closely related to field conditions. The process is direct and easily understood, permits annual updating, and becomes more accurate with time. Maintenance management systems, however,

Table X - CATEGORIZATION OF ROAD MAINTENANCE AND CONSTRUCTION ACTIVITIES[3/]

Work Items	Maintenance		Construction
	Routine	Preventive	
Installing permanent bridges and culverts	-	-	x
Cleaning of culverts or deposits at bridges	x	-	-
Reshaping upstream/downstream channels	x	-	-
Minor slope treatment to protect structures	x	-	-
Replacing guard rails	x	-	-
Replacing bridge deck and structural members	-	-	x
Installing new headwall	-	-	x
Adding minor ditches/culverts to existing road	x	-	-
Cleaning/reshaping of ditches	x	-	-
Placing original embankment	-	-	x
Widening existing embankment	-	-	x
Filling in or reshaping earth roadway, shoulders, or side slopes	x	-	-
Installing or widening soling or HBB	-	-	x
Replacing patches of soling or relaying to original cross section	x	-	-
Removing soling and replacing with WBM	-	-	x
Installing original bituminous carpet over base course	-	-	x
Seal coating or bituminous surface	-	x	-
Thin bituminous carpet over existing carpet or other permanent pavement	-	x	-
Installing WBM and bituminous carpeting over HBB or soling	-	-	x
Patching existing pavement	x	-	-
Removing and replacing extensive segments of soling, base course, or wearing surface	-	-	x
Surfacing or replacing bridge deck, but not structural members	-	x	-
Vegetation control	x	-	-

3/ An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur and Sylhet Districts, WSA in association with BCL and PAS, Dhaka, Bnagladesh, October 1983.

general in nature, must be tailored for a given set of environmental conditions, but all have certain elements in common, and these common elements include those outlined in Table XI.

e. The Network of Roads and Kinds of Work

Early in 1983, lists of Zila roads were prepared for each of the three Project (old) districts. This inventory is summarized in the following tabulation:

District (old)	No. of Active Roads	Total Length (Miles)
Faridpur	38	277.95
Rangpur	60	641.36
Sylhet	39	175.03
Totals	137	1,094.35

Subsequently, the lists have been changed by additions, deletions, and transfers, which is a normal activity. The individual roads were grouped by geographic areas into what are now referred to as "Maintenance Areas." At that time, there were four maintenance areas in each of the old districts of Rangpur and Sylhet, while Faridpur (old) District had five. However, the purpose of the maintenance areas is to determine resource needs for maintenance work, so this concept is valid for any political administrative arrangement. Also, a route numbering system was established so that terminal place names would not have to be called out whenever reference was made to the road.

Components of the feeder road network were then classified by features affective maintenance. Table XII is a summary of the classifications recommended for the three Project (old) districts. To facilitate the identification of kinds of maintenance work to be done, the elements comprising feeder roads, as they now exist, were summarized as shown in Table XIII.

Table XI - ELEMENTS COMMON TO ANY MAINTENANCE MANAGEMENT SYSTEM 4/

Systems for managing road maintenance may be developed for freeway networks, rural access roads, and any road systems between these two extremes. However, all maintenance systems have certain common elements, and these include:

- Definition of the network of roads to be maintained
- Collection of information on the separate road sections — road inventory
- Classification of the roads to be maintained
- Identification of the types of maintenance work which will be required for each type of classification
- Decision on the best way of performing each maintenance activity — a performance standard
- Establishment of maintenance levels to be achieved
- Determination of crew-days required for each activity on each road in an annual cycle
- Calculation of the resources needed, including amounts required for non-routine costs
- Establishment of unit prices and conversion of resource needs to a monetary budget
- Budget approval routine
- Development of work program based on previously determined crew-day caculations
- Development of work sschedule according to priorities and seasons
- Assignemnt of work responsibilities and allocation of resources
- Execution of work with appropriate inspection and control
- Preparation of results-obtained reports in the same terms and units as the performance standards
- Analysis of reports and adjustments, if any, in subsequent phases of the maintenance management program

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4/ Maintenance Management for Zila Roads; WSA in association with BCL and PAS, Dhaka, Bangladesh, June 1985.

TABLE XII - ZILA ROADS CLASSIFICATIONS FOR MAINTENANCE [4/]

TYPE	CODE	DESCRIPTION OF SURFACE
		Surface Classification
21	RP	Portland Cement Concrete Pavement
22A	BIT	Bituminous Pavement, Good Condition
22B	BIT	Bituminous Pavement, Poor Condition
25	HBB	Herringbone Brick Pavement
26A	SOL	Single-layer Cobble Pavement
26B	SOL	Single-layer Brick Pavement
41	WBM	Water-bound Macadam
43	GRV	Gravel or Other Selected Material Surface
45A	EA	Earth, All Vehicles, All Seasons
45B	EA	Earth, All Vehicles, 7 Months per Year
45C	EA	Earth, Jeep Only (No Trucks)
45D	EA	Earth, Cart and Pedestrian Only
		Shoulder Classifications
25	HBB	Herringbone Brick
26A	SOL	Soling Only, Brick or Other
30	EA	Earth

4/ op. cit.

Table XIII - ELEMENTS OF ZILA ROADS [4]

PAVEMENTS

Portland cement concrete

Bituminous (asphalt)

Herringbone brick

Single-layer cobble or brick

SHOULDERS ALONG PAVEMENTS

Herringbone brick

Soling only, brick or other

Earth

UNPAVED ROADWAYS

Waterbound Macadam

Gravel, or other selected material

Earth

DRAINAGE

Primary Ditches (longitudinal)

Secondary ditches

(crown, intercept, bleeder)

Culverts

(ring, box, arch, multiple box)

Culvert channels

Bridge channels

RIGHT-OF-WAY

Travelway

Embankment slopes

Cut slopes

Borrow areas

STRUCTURES

Bridges

Retaining walls and bank protection

TRAFFIC CONTROL AND ASSISTANCE

Signs (controls, warning, information)

Signals (electric or manual)

Railroad crossing protection

Pavement markings

Guard rail (not on bridge)

Edge and curve markers, mileposts

4/ op. cit.

f. Quantify Maintenance

Once maintenance activities have been identified, performance standards were developed for basic repeated activities. Performance standards are meant to be flexible because they are used as average statistical units in planning maintenance. A total of 22 standards were prepared for Project feeder roads, but they should not be considered as final, but rather they must be verified by field experience and very probably adjusted. Each standard assumes an 8-hour payroll day with about 7 hours of effective working time and a reasonable travel distance for working crews.

Maintenance levels for the individual maintenance tasks identified for feeder roads are shown on Exhibit XXII. The initial levels have been kept modest for the following reasons:

- BDG will have to find new funds to initiate a program of work not previously performed, and
- The roads are local by definition, and most of them have only modest volumes of traffic.

The workload, then, is the combined annual work program for a given maintenance area. From this can be calculated the resources (labor and equipment hours and material quantities) needed for an annual program can be calculated. To facilitate the tabulation of these requirements, the Consultant developed identification codes for each resource item. From a review of the total resource requirements, some general conclusions can be drawn:

- Some of the maintenance areas are not really large enough to be independent entities; 5 of the MA's do not have enough maintenance work to employ one WA full time. Five MA's have very little work for roller drivers or truck drivers, or the associated equipment, and the justification for allocating any type of equipment is doubtful.
- The amount of equipment specified in the recommendations exceeds the total number of machines. There is a projected deficit of 9 haul units and 7 roller units.

Exhibit XXII
MAINTENANCE LEVELS, ANNUAL AMOUNTS

Shown as Percent of Road Surface Area,
Amount per Mile, Repetitions per Year or
Cycle of Years Between Repetitions

ACTIVITY	UNIT	21 PCC Pavement	22A Bit. Pavement Good Condition	22B Bit. Pavement Poor Condition	25 HBB Pavement	26A Single Pavement	26B Cobble Soling	41 WB Macadam Surface	43 Gravel Surfacing	45A Earth-All Vehicles, All Seasons	45B Earth-All Vehicles, 7 Months per Year	45C Earth-Jeep Only (No Trucks)	45D Earth Cart and Pedestrian Only
		QUANTITY											
21.03 Repair PCC with Bit. Mix	% Surface	0.75											
22.02 Patch Bit. Surface	% Surface		0.75	1.50									
22.03 Repair Base and Surface	% Surface	0.25	0.25	0.50									
22.04 Bituminous Overlay	% Surface			0.25									
22.05 Seal Small Areas	% Surface	1.25	1.25	2.50									
22.06 Seal Coat (Periodic)	Cycle Years		5	3									
25.01 Patch Surface HBB	% Surface				0.25								
25.02 Patch Base and Surface HBB	% Surface				0.25								
26.01 Patch Soling or Cobble Pavement	% Surface					0.50							
30.01 Regrade Earth Shoulders	% Surface	75	75	75	75	75		75	75				
41.01 Patch WB Macadam Surface	% Surface							0.50					
41.02 Replace WBM Surface (Periodic)	Cycle Years							8					
43.01 Patch Gravel Surface	% Surface								0.80				
43.02 Replace Gravel Surface (Periodic)	Cycle Years								5				
43.03 Regrade Gravel Surface	% Surface								10				
45.01 Patch Earth Surface	% Surface									1.00	1.00	0.50	0.25
45.02 Regrade Earth Surface - Sylhet	% Surface									20	20	10	5
45.02 Regrade Earth Surface - Other Districts	% Surface									50	50	25	10
50.01 Clean Ditches	rft/mile	40	40	40	40	40	40	40	40	40	40	40	20
50.02 Clean Culverts	cft/mile	10	10	10	10	10	10	10	10	10	10	10	5
60.01 Trim Weeds or Brush	Repetitions	1	1	1	1	1	1	1	1	1	1	1	1

- For the feeder roads system, recommended maintenance methods are highly labor oriented with equipment use kept to a minimum. Nevertheless, some power machines are needed and warranted, but equipment needs exceed current procurement. However, before any new pieces of equipment are ordered, there should be a careful review of maintenance equipment needs, taking into consideration the nature of the activities and the relatively low standards of the roads to be maintained.

g. Budgeting

Material costs based on prevailing rates in the three Project (old) districts and locally accepted labor and equipment unit costs were applied to the quantified resource needs in order to arrive at an annual maintenance operations budget.

h. Programming

The program card system was recommended for programming annual feeder roads maintenance - one card for each repetition of each activity in the program. The number of cards issued represents the number of days the work is expected to be done during the year. The same card is used to record the work done and to report back the information needed for control and evaluation. However, maintenance is not completely suited to close and rigid scheduling, there must be room for flexibility and adjustment.

i. Execution

In general, in the execution of maintenance work, workers should be assigned to each sub-task so that each man will be busy all the time and doing productive, efficient work. This flexibility is really not in conflict with performance standards, which appear to show fixed resource needs for each activity. A performance standard is intended to be a guide to the best method under the most common conditions, several years of records, evaluations, and balancing are needed to set satisfactory numbers on a performance standard.

j. Reporting Back

If a program card such as the one recommended is used, then the reporting of work accomplished is almost automatic. Two kinds of report information are usually compiled : fiscal data to account for expenditures and work data to keep track of program accomplishments. All WA's should have sets of performance standards so that they can check often for the recommended crew sizes, methods and materials to be employed, and the units in which materials and work are to be reported.

k. Evaluation

An evaluation of a maintenance management system would include an analysis of the adequacy of the component parts of the system and the efficiency with which it is being executed. An analysis of the adequacy of the component parts might include the following activities:

- Classification of surface types should be reviewed periodically.
- Road inventories revised to reflect changing conditions.
- Activities list changed whenever indicated.
- Performance standards compared with results obtained.
- Assumptions on maintenance levels must be reviewed.
- Annual updates in the mechanics of computing workloads.

In the evaluation of efficiency, the "Yield Rate" value is useful for measuring productivity. It is derived by dividing the total labor-hours of the crew-day into the daily production, and the result is shown as man-hours per unit of work.

l. Conclusion

The maintenance management plan proposed for Bangladesh will work for any network or jurisdiction which might be established. The bulk of the preparation is done only once, after that an annual update is required to note any changes that have occurred. Successful use requires only a recognition of the need for road maintenance, funding at a level which is demonstrated to be rational, and a steady effort in carrying out the program.

3. Maintenance Supervision

Because of the pressure to prepare construction programs for implementation during the 1983-1984 construction season, the districts paid scant attention to the development of an acceptable maintenance program until August 1983. That work which was reported as being maintenance was really construction when viewed in light of the definitions presented in Table X.

In March 1984, the Consultant reported that no routine or preventive maintenance, as defined in the O&M Report, had been observed in any of the three (old) districts. To correct this situation, the PM issued Memo No. S-IV/28-8/83/109(3), dated 02/04/84, which set forth a new set of guidelines, based on the Consultant's O&M Report, to be followed for routine and preventive maintenance on the Project roads. It also specified that, for the proposed Pilot Maintenance Scheme, there should be two projects in each (old) district, 70 percent of the required funds would come from Project funds and the balance from BDG, and established a revolving fund of Tk25,000 for each (old) district to get the programs operational. The Pilot Maintenance Project did indeed get underway in May 1984, with work being reported on the following roads:

- Sylhet District - Hatimganj-Dhakadakshin Road-Earth
- Rangpur District - Rangpur-Mahiganj Road-Bituminous Pavement
  Rangpur-Badarganj Road-Bituminous Pavement
- Faridpur District - Rajbari-Baliakandi Road-Bituminous Pavement
  Talma-Nagarkandi Road-Bituminous Pavement

In subsequent months, work progress in all three (old) districts was slow and intermittent, with delays reported for a variety of reasons - shortage of funds in the revolving funds, heavy rainfall, and shortage of materials. In September 1984, the heavy rains effectively halted all meaningful maintenance work in all three (old) districts. However, by January 1985, progress on maintenance work was still erratic, in spite of the steps taken to eliminate one of the major programs by first increasing the revolving fund to Tk50,000, and then to Tk100,000. In July 1985, the Consultant wrote the following comment:

"From the very outset, the ZRMI Project was known as a maintenance and improvement project. However, major emphasis has increasingly been on the improvement aspects of the Project, and maintenance has been relegated to a secondary position. Maintenance Pilot Programs have been organized in each district, but there has been little effort devoted to the creation of a system of maintenance in an organized and managed program. Full benefit from improved roads will not be realized unless there is a maintenance system to keep the condition of the roads at the improved level. For the balance of this Project, there should be greater emphasis on maintenance. The report, "Maintenance Management for Zila Roads," issued by the Consultant in June 1985, should be followed closely."

From mid-1985 to mid-1986, the level of maintenance work continued to diminish. This leaves but one conclusion - that the maintenance never was institutionalized to the extent that it could perpetuate itself. Once it began to appear that international financial assistance might not be available, the entire concept of maintenance was pushed aside. This is a self-defeating attitude, for if the rehabilitation projects are not accorded the benefits of maintenance from the day that each project is completed, then all the money spent to rehabilitate the roads will soon be lost.

Exhibit XXIII is a graphic compilation of the Pilot Maintenance Project activities for all projects. Here the erratic pattern of maintenance activities becomes readily apparent.

a. Cost of Maintenance Program

Cost of the Pilot Maintenance Projects for both 1983-1984 and 1984-1985 is shown on Table XX. For the 1983-1984 Projects, the total amount spent is about 65 percent of that budgeted. Since final cost versus estimated cost is 70 percent, 63 percent, and 62 percent for Sylhet, Faridpur, and Rangpur, respectively, it is reasonable to assume that this difference represents failure to achieve the project goal, rather than work accomplished under the cost estimate. For the 1984-1985 projects, the overall picture improved somewhat; final cost was 83 percent of estimated costs, but the spread from district to district was much more. It went from a low of 67 percent in Faridpur District to 78 percent in Rangpur, to 100 percent in Sylhet. However, an examination of Exhibit XXIII indicates that a comparison

Exhibit XXIII - COMPILATION OF PILOT MAINTENANCE PROJECT ACTIVITIES

Name And Description Of Maintenance Project	Maintenance Status																																				Remarks
	C.Y. 1983						C.Y. 1984												C.Y. 1985												C.Y. 1986						
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	
Sylhet District																																					
Hatimganj - Dhakadakshin, Earth	-	-	-	-	-	-	-	-	-	-	O	-	X	X	O	O	X	O	O	O	△	-	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Divided responsibility.
Badarghat - Shiber Bazar, Earth/B.P.	-	-	-	-	-	-	-	-	-	-	-	-	X	X	O	/	O	O	O	O	O	-	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Good work on B.P. sect.
Shahbondar - Shamsherganj, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Munshi Bazar - Kurma Char, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	△	△	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Prev. Maint. incomplete
Bahubal - Putijuri, Earth/B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	△	-	△	△	△	X	X	X	X	X	X	X	X	X	X	Good preventive maint.
Dulaikal - Mirpur, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Nabiganj - Baniyachung, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	-	-	O	O	△	X	X	X	X	X	X	X	X	X	X	Exemplary routine maint.
Sunamganj - Chhatak, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	Poor preventive maint.
Shahbag - Kanairghat, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	O	O	O	X	X	X	X	X	X	X	Low quality material
Fenchuganj - Maigaon, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Tajpur - Nayabondar, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	-	O	△	△	X	X	X	X	X	X	X	X	X	X	Acceptable work.
Dhakadakshin - Beanibazar, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Sherpur - Nabiganj	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(Reported as mainte
Chunarghat - Balah	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(nance projects, but
Maulavi Bazar - Shamshernagar	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(were const. projects.
Rangpur District																																					
Rangpur - Manigganj, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	-	O	O	/	-	O	O	-	-	-	O	△	△	X	X	X	X	X	X	X	X	X	X	(Work reported as of
Rangpur - Badarganj, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	-	O	O	/	-	O	O	-	-	O	O	△	△	X	X	X	X	△	△	X	X	X	X	(acceptable quality,
Rangpur - Sundarganj, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(but not an example of
Nilphamari - Jaldhaka,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(good maintenance
Gaibandha - Sadullahpur,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	X	X	X	X	X	X	X	X	X	X	(work.
Gaibandha - Kamarjani,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	X	X	X	X	X	X	X	X	X	X	Never uncertaken.
Rangpur - Kakina,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	(Work reported as of
Mirganj - Jaldhaka,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(acceptable quality,
Mahiganj - Damdama,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	△	X	X	X	X	X	X	X	X	X	X	(but not an example of
Baroagra - Bhendabari,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(good maintenance work.
Bhurungamari - Shikuria,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	△	△	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Gaibanda - Shaghatta, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(Reported as proposed
Domar - Dimla,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(maintenance projects,
Gangachara - Bardibari,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(but were construction
Rangpur - Kaliganj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(projects.
Faridpur District																																					
Rajbari - Baliakandi, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	O	/	O	/	O	O	O	O	△	△	△	△	△	X	X	△	X	X	X	△	X	X	X	) Work reported as per-
Talma - Nagarkanda, B. P.	-	-	-	-	-	-	-	-	-	-	O	-	O	O	/	O	/	O	O	O	O	O	△	△	△	△	△	X	△	X	X	X	X	X	X	X	) formed in a very
Pukuria - Sadarpur, Embankment Failures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	O	O	O	X	O	X	X	X	X	X	X	X	) satisfactory manner.
Madukhali - Baliakandi, Bridge Repairs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	X	X	X	-	X	X	X	X	X	X	X	)
Khalipur - Sibrampur - Lakhidasher, HBB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	-	X	X	X	X	X	X	X	)
Sadarpur - Piajkhali, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	X	-	X	X	X	X	X	X	X	Never fully undertaken.

Note : The maintenance work reported in this chart does not include any other maintenance work that might have been performed; it is limited to work performed under the ZKMI Project.

LEGEND

O - Preventive Maintenance Activities

△ - Routine Maintenance Activities

/ - Stopped For Lack Of Materials, Equipment, Supervision

X - Activity Stopped For Lack Of Funds

- - No Maintenance Activity Reported

TABLE XX - PILOT MAINTENANCE PROJECT COSTS

Name of Road	Est. Cost (Tk)	Final Cost (Tk)
SYLHET DISTRICT		
1983-1984 Program		
Sylhet - Badaghat - Earth)	229,090)	753,734
Sylhet - Badaghat - Bituminous Pavement)	809,339)	
Hatimganj - Dhakadakshin - Earth	84,709	38,451
Total - 1983-1984 Program	1,123,138	792,185
1984-1985 Program		
Munshi Bazar - Kurmachar	200,000	146,098
Bahubal - Putijuri	125,000	125,160
Nabiganj - Baniyachong	80,000	102,805
Sunamganj - Chhatak	88,000	77,004
Shahbag - Kanairghat	558,217	640,252
Tajpur - Khadimpur	80,000	87,391
Hatimganj - Dhakadakshin	60,000	55,941
Stockpile of RCC Pipe, 25 nos.	45,768	12,170
Total - 1984-1985 Program	1,236,985	1,246,821
FARIDPUR DISTRICT		
1983-1984 Program		
Talma - Nagarkanda	576,430	556,101
Rajbari - Baliakandi	1,578,962	803,628
Total - 1983-1984 Program	2,155,392	1,359,729
1984-1985 Program		
Modhukhali - Baliakandi	101,000	29,108
Pukuria - Sadarpur	413,900	345,502
Shibrampur - Khalilpur	57,200	---
Talma - Piajkhali	---	10,678
Total - 1984-1985 Program	572,100	385,288

TABLE XX - PILOT MAINTENANCE PROJECT COSTS

Name of Road	Est. Cost (Tk)	Final Cost (Tk)
RANGPUR DISTRICT		
1983-1984 Program		
Rangpur - Mahiganj Preventive Maintenance	475,000	230,289
Rangpur - Badarganj Routine Maintenance	191,810	184,060
Total - 1983-1984 Program	666,810	414,349
1984-1985 Program		
Rangpur - Sundarganj	150,000	43,278
Nilphamari - Jaldhaka	366,000	198,553
Gaibandha - Sadullahpur	30,000	41,293
Gaibandha - Kamarjani	165,000	---
Rangpur - Kakina	425,000	416,142
Mirganj - Jaldhaka	150,000	146,214
Mahiganj - Damdama	317,000	295,117
Barodarga - Bhendabari	127,000	123,803
Rangpur - Badarganj	370,000	374,373
Total - 1984-1985 Program	2,100,000	1,638,773

of work accomplished based on total expenditures versus estimated expenditures can be misleading.

b. Conclusions and Recommendations

1. At the start of the ZRMI Project, the concept of feeder road maintenance, at the (old) district level in Bangladesh, was quite different from the planned and managed road maintenance projects of many other countries. However, when the PM issued his maintenance guidelines circular in May 1984, based on the practices recommended by the Consultant in the maintenance manual, the picture improved somewhat. It is recommended that maintenance management be even more emphasized in the next phase of the Project.

2. One of the principal reasons for the erratic activity of the maintenance program was the constant shortage of operating funds. True, the size of the operating fund was increased progressively to Tk100,000, but increasing the size of the fund alone will not necessarily solve the problem. The entire cycle of expenditure and reimbursement must be streamlined so that revolving funds are not tied up in unprocessed invoices for reimbursement.

3. Planning maintenance programs on a year-to-year basis is not good maintenance practice. It is recommended that a road maintenance priority system be developed based on a numerical index of the road's condition at the time of the most current inventory.

E. CONSTRUCTION SYSTEMS AND SUPERVISON

1. General

Construction systems and construction supervision, each with its own distinct functions, although closely interrelated, have been discussed separately in this report.

2. Construction Systems

The terms of reference of the Contract did not clearly define the degree of attention to be accorded to the development of construction systems. Instead, it was the Consultant's responsibility to review existing procedures and make appropriate recommendations for improvement where indicated. Out of this came the two reports discussed in Section III.B. - Organization and Management. To better reflect the requirements of a rural administrative set-up based on the Upazila concept, it is now proposed to update these management studies through two additional studies of Upazila capabilities to handle: (1) construction management and (2) maintenance management.

To date, a great deal remains to be done before construction systems can be considered to have been successfully institutionalized. This does not mean to imply that radical changes must be wrought in current procedures followed in Bangladesh, but standardization within the three (old) districts would be a good start. The proposed updating of the organization and management studies will no doubt result in many viable recommendations for the systemization of efficient construction management procedures that would be compatible with present political institutions and organizations.

3. Construction Supervision

The Consultant's reponsibilities with regard to construction supervision, as defined by the Inception Report, raised quite a furor within the three Project (old) districts. By mid-1983, it was apparent that this issue had to be resolved if the Project was to be able to function in a harmonious manner. With the appointment of the permanent PM in October 1983 and his issuance of instructions and guidelines for 1983-1984 Projects, the situation was clarified.

a. The Projects

The planning, execution, control, and reimbursement of all road improvement projects in which USAID participated were guided by instructions laid down in basic documents issued by both LGEB and USAID.

- For LGEB, the instructions were contained in the Instructions and Guidelines for Preparation and Implementation of Schemes Under ZRMI Project for the Year 1983-1984, and the same document issued for the Year 1984-1985. These general guidelines were supplemented by many memos which addressed specific problems and questions.

- For USAID, PIL No. 7 contained the rules which were of basic consideration throughout the life of the first phase of the Project. Again, this basic document was supplemented by many letters which addressed specific issues.

From the point of view of USAID's participation in the financial aspects of the road improvement program, the basic target was 70 percent participation by USAID and 30 percent participation by BDG. This goal was essentially achieved in the third and fourth years of the Project. Throughout the life of the Project, it has been USAID's policy to use their annual budget allocations as an incentive factor to encourage both quantity as well as quality production. The plan was that the 1982-1983 budget allocation would be based on estimates of the individual (old) district's ability to accomplish both road rehabilitation and maintenance work; while each succeeding annual allocation would be based on the following factors:

- An evaluation of each district's performance in completing the previous year's program and its allocation, and

- An evaluation of each district's ability to complete the program proposed for the coming fiscal year.

Exhibit XXVI is a one-sheet summary of the technical aspects of all projects undertaken in each of the three Project (old) districts during the life of the Project up to the writing of this interim report. Costs are included in a separate summary. From a review of the data shown, it can be seen that there were a total of 113 road-related projects and 129 drainage

Exhibit XXVI - COMPILATION OF WORK PERFORMED BY DISTRICT, FISCAL YEAR, AND CATEGORY

District Fiscal Year Work Activity	Bituminous Pavement Projects	Total Length (km)	H.B.B. Surfacing Projects	Total Length (km)	Leveling Course Projects	Total Length (km)	Earth Work Projects	Total Length (km)	Box Culverts (No)	Pipe Culverts (No)	R.C.C. Bridges (No)	Bridge Decks (No)	Bridge Approaches (No)	Bridge Approach Spans (No)	Retaining Walls (No)
SYLHET DISTRICT															
F.Y. 1982 - 1983															
Road Improvement	6	8.04	-	-	-	-	1	1.20	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	6	23	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	4	4.85	-	-	2	7.58	2	5.25	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	19	10	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	2	2.42	-	-	3	7.90	1	2.80	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	22	15	1	8	-	-	1
Sub-Total, Sylhet	12	15.31	-	-	5	15.48	4	9.25	47	48	1	8	-	-	1
RANGPUR DISTRICT															
F.Y. 1982 - 1983	Note : There were also two (2) afforestation projects this fiscal year.														
Road Improvement	11	4.50	11	10.27	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	13	9.82	4	3.34	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	18	10.76	1	77	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	3	1	4	1	-	-	-
Sub-Total, Rangpur	42	25.08	16	13.61	-	-	-	-	3	1	4	1	-	-	-
FARIDPUR DISTRICT															
F.Y. 1982 - 1983															
Road Improvement	5	8.30	-	-	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	8	11.18	3	6.20	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	16	20.58	2	7.20	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-
Sub-Total, Faridpur	29	40.06	5	13.40	-	-	-	-	-	10	2	-	2	-	-
Total, All Districts	83	80.45	21	27.01	5	15.48	4	9.25	50	59	7	9	2	-	1

structures. However, individual work contracts often included more than one structure or more than one road-related activity. For purposes of evaluating overall accomplishments in road construction activities, it is considered that there were a total of 180 contracts, of which 12 were subsequently dropped or cancelled. Of the total of 168 active contracts, 163 are considered to be 100 percent complete, 3 are 98 percent complete, and 2 were finalized at the stage of 77 percent complete. Thus, the overall completion rate as of the writing of this report was 97 percent.

While the overall completion rate over the first four years of the Project was very good, it was not a straight-line function on an annual basis. In fact, during the first two years of the Project, the many delays caused by inclement weather, misunderstandings concerning acceptable procedures, poor planning and just plain bureaucratic "red tape" resulted in comparatively poor progress. The last two years of the Project saw quite a marked improvement. As a result, the overall rate of progress for the Project, depicted graphically, was the typical "s" curve wherein progress is slow at first and the curve is relatively flat, then the accelerating rate of progress gives a rather steep curve, and then the curve again flattens out at the end as the given program nears completion.

1. Sylhet District

Sylhet has the highest average annual rainfall of the entire country, which partially accounts for the fact that there were more drainage structure projects in that district than in either of the other two - a total of 104 compared with 9 for Rangpur and 15 for Faridpur. During the life of the Project, there were a total of 50 contracts undertaken, of which 46 are 100 percent complete, 3 are 98 percent complete, and one project has been dropped. This gives an overall completion rate of 92 percent for Sylhet.

Because of the comparatively high proportion of drainage structures involved, Sylhet was particularly hampered by adverse weather and site flooding. However, there was an improvement in contract over-run over the life of the Project. In 1982-1983, the average over-run for 15 contracts

was 6.5 months, this improved to 4.5 months for 16 contracts in 1983-1984, and for 1984-1985, the over-run for 18 contracts had dropped to 3.7 months.

2. Rangpur District

Rangpur also has a high rainfall, and its feeder road problems are further complicated by annual flooding of the Tista River and the Jamuna River. Also, the high winds experienced during the dry season will actually cause wind erosion to newly completed earthwork composed of the cohesionless silty soils found in many places in this district.

As of the writing of this summary, there were a total of 81 contracts undertaken (one contract had been split into two subsequent to the writing of the main report). Of the total of 81 contracts, 69 are 100 percent complete, 2 have been cancelled, 5 have been dropped, 3 have not yet been tendered, and 2 were 77 percent complete. This gives an overall completion rate of 97 percent for Rangpur.

Rangpur also suffered from delays caused by heavy rainfall and other problems inherent in the start-up of a new project with a new set of rules to which the participants are unaccustomed, but this district also improved over the life of the Project. In 1982-1983, the average over-run for 26 projects was 8.3 months, for 1983-1984, the average for 16 projects actually increased to 8.9 months, but in 1984-1985, the average over-run for 25 projects dropped to 3.1 months.

3. Faridpur District

The Faridpur District is also located in a high rainfall area, and its feeder road problems are also complicated by annual flooding, perhaps more so than either of the two other Project districts. In addition to the drainage problems inherent in the physical environment of Faridpur, the soils are principally unconsolidated recent alluvium composed of the fine silty clays and clays, both of which present problems in stability and consolidation when used as road construction materials.

During the life of this Project, the Faridpur District undertook a total of 49 contracts, of which 48 are 100 percent complete and one has been dropped. Thus, for active projects, Faridpur has a completion rate of 100 percent. Perhaps one of the reasons for this slightly better contractor performance was the threat of punitive action being taken, or threatened, for non-performance of contract.

Faridpur also suffered from delays caused by the same problems which befell the other districts. However, their overall performance record was slightly better. In 1982-1983, the average time over-run for 15 projects was 3.7 months, in 1983-1984, this improved to an average of 3.5 months for 11 projects, while in 1984-1985, the average time over-run was reduced to 1.1 months for 21 projects.

4. General Remarks

Observations concerning the lessons learned from the first phase of this Project can be summarized as follows:

- In the next phase of this Project, the rural administrative units would do well to not undertake more projects than they are prepared to handle.
- Future road projects should be planned to make the most efficient use of available equipment, particularly road rollers.
- Vis-a-vis the projected shortage of compaction equipment, drainage structures can be built as a part of a staged road improvement program, whether they be new structures, or replacement of old ones.
- Project construction time limits should be re-evaluated and reasonable time limits established for different construction projects.
- Once reasonable time limits have been established, existing penalty provisions should be more stringently applied for non-compliance.

- All concerned should be well versed in contractor payment procedures (both BDG and USAID) to avoid unnecessary delays in contractor payments.

- Unit costs for materials should be sufficiently flexible to encourage the contractor to procure quality materials that will meet specifications.

- Training sessions in project management should be intensified.

b. Cost of the Projects

Table XXI is a tabulation of road improvement fund allocations by source, district (old) and by year. Here it can be seen that annually the proportions of BDG/USAID funds varied from district to district. For FY 1982-1983, the average was 40 percent for BDG and 60 percent for USAID. By FY 1984-1985, the average proportion was about at the agreed level - 31 percent/69 percent. The overall average for three years of the Project was 31 percent for the BDG and 69 percent for USAID.

It is interesting that, while Faridpur received by far the most money over the 3-year period (Tk52,904,000 out of a total of Tk116,014,000), and built the most bituminous pavement (40.06 km out of a total of 80.45 km), the unit cost for bituminous pavement in Faridpur was not the lowest. Sylhet had the lowest unit cost for bituminous pavement at about Tk674,600/km, the unit cost for bituminous pavement in Rangpur was about 915,000/km, while Faridpur had the highest unit cost at about Tk985,000/km.

c. Quality Control

At the outset of the ZRMI Project, the decision was made to establish a testing laboratory in each of the three district headquarters and provide each of them with the equipment required to perform basic material tests. More sophisticated tests would be performed in the central materials testing laboratory in Dhaka. Table XXII is a compilation of the soil and material tests performed at each of the three district material testing laboratories and at the central testing laboratory in Dhaka.

TABLE XXI - ROAD IMPROVEMENT FUND ALLOCATIONS BY SOURCE, DISTRICT, AND YEAR

FISCAL YEAR	ANNUAL ALLOCATION (Tk)			PERCENTAGE (%)		
DISTRICT	BDG	USAID*	Total	BDG	USAID	Total
1982-1983						
Sylhet	4,214,000	4,400,000	8,614,000	48.92	51.08	100.00
Rangpur	4,144,000	4,000,000	8,144,000	50.88	49.12	100.00
Faridpur	3,042,000	8,400,000	11,442,000	26.59	73.41	100.00
Sub-Total	11,400,000	16,800,000	28,200,000	40	60	100
1983-1984						
Sylhet	1,990,000	8,100,000	10,090,000	19.72	80.28	100.00
Rangpur	1,880,000	7,700,000	9,580,000	19.62	80.38	100.00
Faridpur	1,250,000	16,200,000	17,450,000	7.16	92.84	100.00
Sub-Total	5,120,000	32,000,000	37,120,000	15	85	100
1984-1985						
Sylhet	5,750,000	9,400,000	15,150,000	37.95	62.05	100.00
Rangpur	5,432,000	6,100,000	11,532,000	47.10	52.90	100.00
Faridpur	3,612,000	20,400,000	24,012,000	15.04	84.96	100.00
Sub-Total	14,794,000	35,900,000	50,694,000	31	69	100
ALL YEARS (TOTAL)						
Sylhet	11,954,000	21,900,000	33,854,000	35	65	100
Rangpur	11,456,000	17,800,000	29,256,000	39	61	100
Faridpur	7,904,000	45,000,000	52,904,000	15	85	100
TOTAL	31,314,000	84,700,000	116,014,000	28	72	100

* USAID Project Implementation Letter (PIL) Numbers:

F.Y. 1982-1983 — PIL No. 07, dated 02/03/83, Tk 16,800,000
F.Y. 1983-1984 — PIL No. 12, dated 13/09/84, Tk 32,000,000
F.Y. 1984-1985 — PIL No. 14, dated 04/02/85, Tk 35,900,000

Total USAID Allocations Tk 84,700,000

TABLE XXII - MATERIAL TESTS PERFORMED IN ZRMI PROJECT LABORATORIES

DESCRIPTION	LOCATION OF LABORATORY				TOTAL
	Sylhet District	Rangpur District	Faridpur District	Dhaka City	
SOIL TESTS					
Grain-Size Analysis (Sieve/Hydrometer)	65	80	19	66	230
Specific Gravity	28	70	28	55	181
Atterberg Limits	10	47	4	12	73
Field Density	50	37	26	14	127
Proctor Compaction					
Modified	51	3	18	22	94
Standard	—	29	58	—	87
California Bearing Ratio (CBR)					
Unsoaked	33	17	40	17	107
Soaked	6	12	10	9	37
Unconfined Compression	—	—	—	6	6
Triaxial Compression	—	—	—	5	5
Consolidation	—	—	—	2	2
SAND AND GRAVEL TESTS					
Fineness Modulus (Sand)	51	91	134	6	282
Gradation (Pea Gravel)	1	30	—	—	31
BRICK AND STONE TESTS					
Gradation (Crushed Stone/Broken Brick)	—	27	—	—	27
Brick					
Size	—	16	—	—	16
Water Absorption	—	16	—	—	16
CONCRETE TESTING					
Compression Test to Failure	72	6	40	26	144
In-Situ Strength Testing (Concrete Test Hammer)	—	4	—	—	4
BITUMINOUS MATERIALS TESTS					
Penetration	—	—	—	24	24
Softening Point	—	—	—	20	20
Specific Gravity	—	—	—	18	18

F. PREPARATION OF TECHNICAL SPECIFICATIONS AND DESIGN MANUALS

1. General

The Inception Report proposed that the introduction of standardized designs, improved construction techniques, and quality control procedures be done in two stages or phases. In Phase 1, the Consultant would prepare design and specification manuals in 1983 so that they would be ready for trial in the 1983-1984 construction season. In Phase II, the Consultant would review the manuals and make any indicated changes. Aspects of the construction and maintenance processes to receive particular attention would include drainage, earth compaction, all-weather surfacing, access aprons, drainage structures, and quality control.

2. Phase I

a. Design Manual

Design and Construction Manual for ZRMI Projects was submitted in June 1983. In many respects, the manual was well received, but there were also many recommendations for changes and improvements. These were taken into consideration when the manual was subsequently revised.

b. Specifications Manual

Specifications and Construction Manual was submitted in July 1983. There were also many suggestions for improvements in this manual, which were considered in its subsequent revision in Phase II.

c. Mechanical Analyses of Soils Manual

Standard Methods of Mechanical Analysis of Soils was submitted in July 1983.

3. Phase II

a. Design Manual

Design Construction Manual was submitted in final form in June 1985. The revision was a much more comprehensive work than the original and it found much better acceptance.

b. Specifications Manual

Standard Specifications for Road Construction was submitted in final form in June 1985. The inclusion of sections on the different types of asphalts and their uses and on slope protection added to the usefulness of the manual.

c. Soil Survey Manual

Soils Survey Manual was submitted in final form in June 1985. The soil survey manual, as a separate document, was much more useful than having the same information included within a manual on construction techniques.

4. Bridge Design

a. Faridpur District

In this Project district, a third-party local consultant, Rahman and Associates, Ltd., was hired to execute the actual design work. These designs were reviewed by the Consultant and in June 1984, the report, Review of Design of 16 Bridges Under Zila Parishad, Faridpur, was issued.

b. Sylhet and Rangpur Districts

Here the Consultant accomplished the actual design of the drainage structures and issued finished plans in December 1984 and January 1985.

1. Sylhet District
   Dhakadakshin - Beanibazar Road, Radhajuri River
   Dhakadakshin - Beanibazar Road, Lula River
   Tajpur - Syedpur Road, Nayabandar River

2. Rangpur District
   Rajarhat - Ullaghatta Road, Deulia Bil.
   Rajarhat - Ullaghatta Road, Baddayar Bazar
   Rajarhat - Ullaghatta Road, Pengahat
   Gaibandha - Kamarjani Road, Kumarpara
   Baradarga - Venderbari Road, Sharifpur

G. PROCURMENT OF EQUIPMENT

1. General

The Consultant's responsibilities for equipment procurement were of two separate and distinct categories; that is, equipment procured with funds provided in the Technical Assistance element of the Project, and equipment procured with funds provided in the Equipment Procurement element. Equipment and supplies/materials procured for this Project can also be classified according to the source of authorization and available funds to defray costs of acquisition. The several sources of authorization and concomitant funds were as follows:

• Project Grant Agreement, PIL 19 (Amended)	US$ 674,299
• Contract, Table 6 - Allowances, and Sub-Tables (Amendment 6)	US$ 549,332 Tk 2,872,775
• Contract, Table 8 - Equipment, Materials/ Supplies, Vehicles, and Sub-Tables (Amendment 6)	US$ 83,095 Tk 4,238,690
• Contract, Table 9 - Special Equipment, and Sub-Tables (Amendment 6)	US$ 117,740 Tk 48,989
• Contract, Table 10-Training (Amendment 6)	US$ 164,082 Tk 1,036,429

In general, equipment/materials/supplies procured directly by the Consultant were obtained in an orderly and timely manner. Unfortunately,

procurement of equipment with Project funds was beset with many difficulties and obstacles.

2. Project Grant Agreement, PIL 19 (Amended)

a. Background

The Inception Report provided for the Maintenance Equipment Specialist to prepare a report covering the following features associated with feeder road maintenance and improvement:

- Evaluation of existing repair shop facilities and equipment in each of the three Project (old) districts.
- Evaluation of existing road construction and repair equipment available in each district for use on the ZRMI Project.
- Preparation of a recommended list of equipment, along with relevant specifications, for procurement by the Project.
- Preparation of a list of spare parts needed to effectively service and maintain the recommended equipment in an operating condition.

b. The Report

Maintenance Equipment Report was issued in May 1983. The report found the following:

1. Existing Facilities

Except for preventive maintenance procedures, the practice of contracting equipment repairs to private workshops should be continued.

2. Existing Equipment Available for Use

The report found that 65 to 80 percent of the equipment available in the three (old) districts was unserviceable, and therefore not available for use.

3. Recommended List of Equipment and Relevant Specifications

The original list of recommended equipment was submitted at the end of May 1983. The intent was to have all the equipment on hand for use in the 1983-1984 construction season, but a seemingly endless series of changes and indecisions precluded this possibility. PIL 16 covering the procurement costs of the items shown in Table XXV was issued 05/06/85. As indicated, some of the items were purchased locally within a short time of the issuance of the PIL. However, the major part of the items procured on an international basis did not arrive in the country until August and September 1986.

3. Contract, Table 6 - Allowances, and Sub-Tables

These fund allocations were concerned with household appliances and furnishings, some purchased internationally and some locally. All were available for distribution in May 1983.

4. Contract, Table 8 - Equipment, Materials/Supplies, Vehicles, and Sub-Tables

Procurement accomplished with funds from this source is shown on Table XXVI. The major items of equipment were the Jeeps, and they were available for Project use by June 1983.

5. Contract, Table 9 - Special Equipment, and Sub-Tables

a. Contract Table 9-1

This category was concerned with office furniture and equipment, some purchased internationally and some purchased locally. For the most part, all items were on hand for distribution by mid-1983.

Table XXV - EQUIPMENT PROCUREMENT FOR ZRMI PROJECT (PIL 16)

Equipment Item and Description	Number of Units	Source of Funds	Amount Allocated US$	Amount Allocated BTK	Amount Spent US$	Amount Spent BTK	Comments
1. TANDEM, STATIC WEIGHT ROAD ROLLERS, 6 - 9 Ton	6	PIL 16	222,390	-	229,692	-	LCom 005602 (FOB)
Spare Parts		PIL 16	14,400	-	-	-	No spare parts included in LCom 005602
CIF (Chittagong)		PIL 16	16,200	-	59,149	-	LCom 005605
2. FLATBED TRUCKS, 20,000 lbs. GVW	4	PIL 16	93,800	-	121,844	-	LCom 005603 (FOB)
Spare Parts		PIL 16	18,000	-	-	-	No spare parts included in LCom 005603
CIF (Chittagong)		PIL 16	33,000	-	See Item 1	-	LCom 005605
3. PICK-UP TRUCKS, 6,000 lbs. GVW, 4 x 4	4	PIL 16	30,992	-	24,980	-	LCom 005604 (CIF)
Spare Parts		PIL 16	6,200	-	-	-	No spare parts included in LCom 005604
CIF (Chittagong)		PIL 16	12,800	-	-	-	CIF costs included in the bid
4. PLATE COMPACTORS, 5,000 lb. Impact, Diesel	6	PIL 16	13,800	-	13,512	-	LCom will be prepared after new PA signed
Spare Parts		PIL 16	9,078	-	-	-	Spare Parts included in bid
CIF (Chittagong		PIL 16	1,500	-	-	-	CIF costs included in bid
5. CONCRETE VIBRATORS, 10,000 - 12,000 VPM, Diesel	9	PIL 16	22,923	-	31,585	-	LCom will be prepared after new PA signed
Spare Parts		PIL 16	8,307	-	-	-	Spare parts included in bid
CIF (Chittagong)		PIL 16	1,800	-	1,800	-	CIF costs included in bid
6. MECHANIC'S TOOL SETS	3	PIL 16	2,334)	-		-	(Direct payment and reimbursement to WSA. All
CIF (Chittagong)		PIL 16	450)	-		-	(equipment delivered and on hand in the Consultant's
			)		6,036	-	(storeroom in Dhaka. All equipment will be
7. SHOP EQUIPMENT AND TOOL SETS	3	PIL 16	2,829)	-		-	(distributed when the Project becomes operative
CIF (Chittagong)		PIL 16	450)	-		-	(again.
8. MOTOR CYCLES, Minimum 96 cc	15	PIL 16	16,500	-	-	375,000	P.O. WSA/05/879, 13/11/85, purchased 19/11/85. All units delivered and distributed to the 3 districts.
9. TAR BOILERS, 60 gal	12	PIL 16	9,720	-	-	240,000	W.O. WSA/05/728, 17/07/85, purchased 16/10/85. All units delivered and distributed to the 3 districts.
10. TRAILER-MOUNTED WATER TANKS, 350 gal	3	PIL 16	11,400	-	-	300,000	W.O. WSA/05/727, 17/07/85, purchased 29/09/85. All units delivered and distributed to the 3 districts.
CONTINGENCIES	—	PIL 16	45,707	-	-	-	
Total, Offshore and Domestic Procurement			564,580		488,625	915,000	At US$ 1.00 = BTk 26.80, converts to US$ 34,142
					34,142		
Total Spent					522,767		There remains a total of US$ 61,058 available for other uses. If spare parts for road rollers and flatbed trucks are estimated at US$ 55,000 CIF, and clearing charges at US$ 1,500, then the funds remaining will be enough to cover these requirements.
COMMITTED, PORT CLEARANCE AND INLAND TRANSPORT, ROAD ROLLERS, FLATBED TRUCKS, PICK-UP TRUCKS		PIL 16	-	-	10,755		
Total					533,522		

Table XXVI - EQUIPMENT PROCUREMENT FOR ZRMI PROJECT (VARIOUS)

Equipment Item and Description	Number of Units	Source of Funds	Amount Allocated US$	Amount Allocated BTK	Amount Spent US$	Amount Spent BTK	Comments
1. CONCRETE MIXER	6	PIL 9	-	870,000	-	889,200	W.O. WSA/10/390, 30/05/84, purchased 28/07/84 All equipment delivered and distributed.
2. TRAILER-MOUNTED WATER TANKS, 350 gal.	6	PIL 9	-	600,000	-)	562,200	W.O. WSA/31/556, 12/10/84 All equipment itesm delivered and distributed to the 3 districts.
3. WATER PUMPS	3	PIL 9	-	75,000	-)		
4. MOTOR CYCLES, Minimum 96 cc	18	PIL 9	-	459,000	-	528,000	P.O. WSA/10/378, 16/04/84 All equipment delivered distributed.
Total PIL 9				2,004,000		1,979,400	BTk 34,600 (US$ 1,291) available for other uses.
1. MOTOR CYCLE, Minimum 96 cc	6	PIL 13	-	132,000	-	132,000	P.O. WSA/05/508, 05/09/84 All equipment delivered and distributed.
1. DEEP SOIL DRILLING SETS	3	Contract Special Equipment	-	78,132	-	78,132	P.O. WSA/05/445, 26/06/84 All equipment delivered and distributed.
2. COMPACTION EQUIPMENT SETS	3	Contract Special Equipment	-	19,110	-	19,110	All equipment delivered and distributed.
3. JEEPS/SPARE PARTS	6	Contract	83,980	-	83,980	-	International procurement by direct payment and reimbursement to WSA. All units have been delivered and distributed in the 3 districts and the Dhaka office.
CONTINGENCIES	—	PIL 16	45,707	-	-	-	
Total, Offshore and Domestic Procurement			594,580	488,625		915,000	At US$ 1.00 = BTk 26.80, converts to US$ 34,142
Total Spent				34,142			
				522,767			
COMMITTED, PORT CLEARANCE AND INLAND TRANSPORT, ROAD ROLLERS, FLATBED TRUCKS, PICK-UP TRUCKS		PIL 16	-	- 10,755			There remains a total of US$ 61,058 available for other uses. If spare parts for road rollers and flatbed trucks are estimated at US$ 55,000 CIF, and clearing charges at US$ 1,500, then the funds remaining will be enough to cover these requirements.
Total				533,522			

b. Contract Table 9-2

This category covered all surveying equipment, and the items were on hand for distribution by mid-1983.

c. Contract Table 9-3

All procurement under this category was related to soil and material testing. The equipment was on hand for distribution by mid-1983.

6. Contract, [illegible]le 10 - Training

Equipment and materials acquired under this category consisted of small items that were procured from time to time as the need arose. All items were on for use when required.

7. Conclusions

Local and international procurement of small items functioned smoothly. However, government agency procurement procedures for large items often created problems that were time consuming to resolve. International procurement is further complicated by the manufacturer's lengthy production schedule, inland transportation, marine transportation, and clearance procedures at the port of deportations. Local procurement of large equipment is complicated by local fabricators' shortage of working capital, innate tendency to ignore contract terms and specifications, and lack of familiarity with USAID's procurement regulations. However, all parties concerned with the procurement activities have learned from these sometimes rather unfortunate experiences. Future procurement activities should proceed in a much smoother fashion so that equipment and materials are on hand as they are required by the Project.

IV - CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. General Conclusions

a. From the operational point of view, the ZRMI Project successfully accomplished its goals; that is, achieved progress in training was 95 percent of scheduled progress, all design and specifications manuals were completed, some 95 percent of all road improvement projects were completed, and pilot road maintenance projects were underway in all three Project (old) districts. However, the institutionalizing of the systems required to accomplish these operations (including the development of sound program and project management guidelines) was quite another story. There is very little evidence to indicate that any of these segments so essential to the accomplishment of long term goals will remain in place once the foreign assistance funds are no longer available.

b. In all three Project districts, there was a steady improvement in the quality of work performed by local contractors. This may be taken as positive evidence of the beneficial impact on the ZRMI Project. However, it remains to be seen whether this improvement is permanent in nature, or if it is merely a reflection of a temporary expediency to satisfy the demands of the holder of the purse strings. Since demand for adherence to contract terms and specifications is one of the aspects of a viable construction system, it may well be that this improvement will not last.

c. Though the training element of the ZRMI Project enjoyed considerable success, a weak point was the failure to develop a testing system as one means of measuring the impact of the program. To the observer, it would appear that the participants did absorb a large part of the material presented, but a simple testing system would aid in confirming this observation.

d. Equipment procurement, especially at the international level, consumed an inordinate amount of time. However, most of the delays were occasioned by a lack of knowledge on the part of one party of the requirements of the other party. Now that the result of such lack of knowledge is known to all, there is no reason why such delays should ever again be experienced in the follow-up phase of the Project.

2. Problems Common to All Districts and Their Solutions

a. Every year delays due to heavy rainfall and the accompanying flooding were reported by all three districts. However, it is well known to all that Bangladesh lies within the monsoon area and that the beginning and end of the monsoon rains occurs annually at about the same time. Therefore, good management should take this factor into account when planning and scheduling the projects.

b. Delays were often reported as being due to "lack of funds." This usually meant that reimbursement had been delayed because the documentation required by USAID had either not been supplied at all, or had been improperly prepared. The obvious solution is to submit the proper documentation with every request for reimbursement.

c. Another obstacle to full reimbursement was the practice of undertaking projects whose total cost exceeded that amount approved for the district by LGEB and USAID. Obviously, the solution is to stay within the approved budget until advised in writing by the PM that the revised budget has been approved.

d. In all three districts, the projects suffered abnormally from time over-runs, many of which were due to impractical contract time durations and/or poor contract scheduling. Future contract time durations should be realistic and compatible with the scope of work and the environment in which it is to be done.

e. Quality control is a key factor in assuring adherence to contract specifications. Good use of the district laboratory facilities has been noted, but they could have been used much more extensively.

f. Since both construction and maintenance equipment will always be in relatively short supply, it is critical that optimum service be obtained from that which is available. With good equipment management and preventive maintenance, it is reasonable to expect an availability factor of at least 66 percent during the relatively short construction season in the Project areas.

B. RECOMMENDATIONS FOR FUTURE ACTION

1. General

Any recommendations for future action in feeder road maintenance and improvement in Bangladesh must necessarily take into account the new rural administrative emphasis of the Upazila concept. Since most of the personnel in the newly-organized Upazilas are unacquainted with the policies of this feeder road maintenance and improvement project, the initial stages of the next phase of this project will require a great deal of orientation, particularly with regard to program and project management.

2. Recommendations

a. One of the first actions of the next phase should be a seminar for top level personnel of all Upazilas included in the Project; a seminar with the dual purpose of both introducing Project personnel to the Upazila personnel, as well as orienting Upazila personnel concerning Project goals, purposes, and operating procedures. Explanation of documentation procedures could be explained by the PM and the PE.

b. A second early action should be a visit to all the Upazilas by Project personnel to again explain Project goals and procedures. At this time, the RE and the ARE should be present to establish their position in

Project operations and to encourage Upazila personnel to utilize their assistance in program and project management.

c. At an early stage, the fallacy of planning for projects whose resource requirements exceed those that are available should be clearly demonstrated. The system of subsequent budget reduction by the amount that a current budget is underutilized should be used as a lever to discourage attempting too big a work load.

d. In the next phase, there should be a heavy emphasis on institutionalization of maintenance and construction systems for feeder roads; not necessarily the creation of new organizations, but steps taken within existing ones to rationalize systems for managing these two vital rural development operations.

e. The Phase II Project Training Program should get underway as quickly as possible. There is every reason to believe that the Upazila personnel will require additional training in maintenance and construction of feeder roads.

f. If the training needs survey indicates that significantly large numbers of technicians will require training in the basic skills of surveying, soil sampling and testing, and road maintenance, then it may be desirable to consider holding that training session in some centralized location where the facilities for handling comparatively large numbers of trainees are available.

g. The program and project management training sessions should receive a high priority. These sessions can be held at a centralized locations, or at the various project sites, whichever is the more convenient.

h. Soon after the start of the next phase of this Project, negotiations should get underway for the combined in-country/third country training course.