

No. 1

JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
THE REPUBLIC OF THE PHILIPPINES

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR CONSTRUCTION OF BRIDGES
ALONG
RURAL ROADS IN MINDANAO AREA
IN
THE REPUBLIC OF THE PHILIPPINES**

DECEMBER 1994

**KATAHIRA & ENGINEERS INTERNATIONAL
ORIENTAL CONSULTANTS CO., LTD.**

JICA BASIC DESIGN STUDY REPORT ON THE PROJECT FOR CONSTRUCTION OF BRIDGES
ALONG RURAL ROADS IN MINDANAO AREA IN THE REPUBLIC OF THE PHILIPPINES

DECEMBER 1994

KATAHIRA & ENGINEERS INTERNATIONAL
ORIENTAL CONSULTANTS CO., LTD.

118
618
GRS

GRS
CR(2)
94-175

27344

 LIBRARY



1118635(0)

国際協力事業団

27344

JAPAN INTERNATIONAL COOPERATION AGENCY

**DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
THE REPUBLIC OF THE PHILIPPINES**

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR CONSTRUCTION OF BRIDGES
ALONG
RURAL ROADS IN MINDANAO AREA
IN
THE REPUBLIC OF THE PHILIPPINES**

DECEMBER 1994

**KATAHIRA & ENGINEERS INTERNATIONAL
ORIENTAL CONSULTANTS CO., LTD.**

P R E F A C E

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the Project for Construction of Bridges Along Rural Roads in Mindanao Area and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Katsuyoshi Kanazawa, Manager of Road Division, Planning and Development Department, Honshu-Shikoku Bridge Authority and constituted by members of Katahira & Engineers International and Oriental Consultants Co., Ltd., from February 16 to October 29, 1994.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss a draft report, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the teams.

December, 1994



Kimio Fujita
President

Japan International Cooperation Agency

December, 1994

Mr. Kimio Fujita,
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal


We are pleased to submit to you the basic design study report on the Project for Construction of Bridges Along Rural Roads in Mindanao Area in the Republic of the Philippines.

This study was conducted by Katahira & Engineers International and Oriental Consultants Co., Ltd., under a contract to JICA, during the period February 10, 1994 to December 24, 1994. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Philippines and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

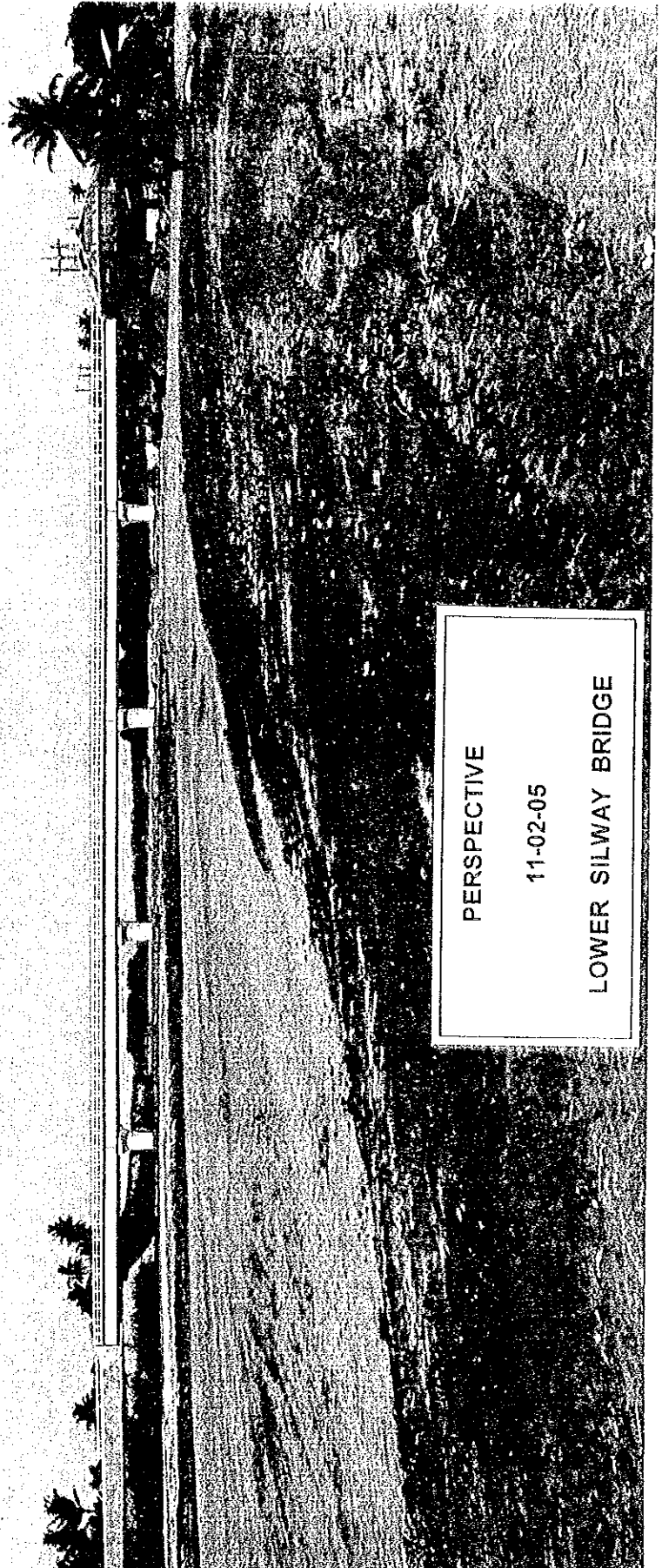
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Construction. We would also like to express our gratitude to the officials concerned of the Department of Public Works & Highways, the JICA Philippine Office, the Embassy of Japan in the Philippines for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the project.

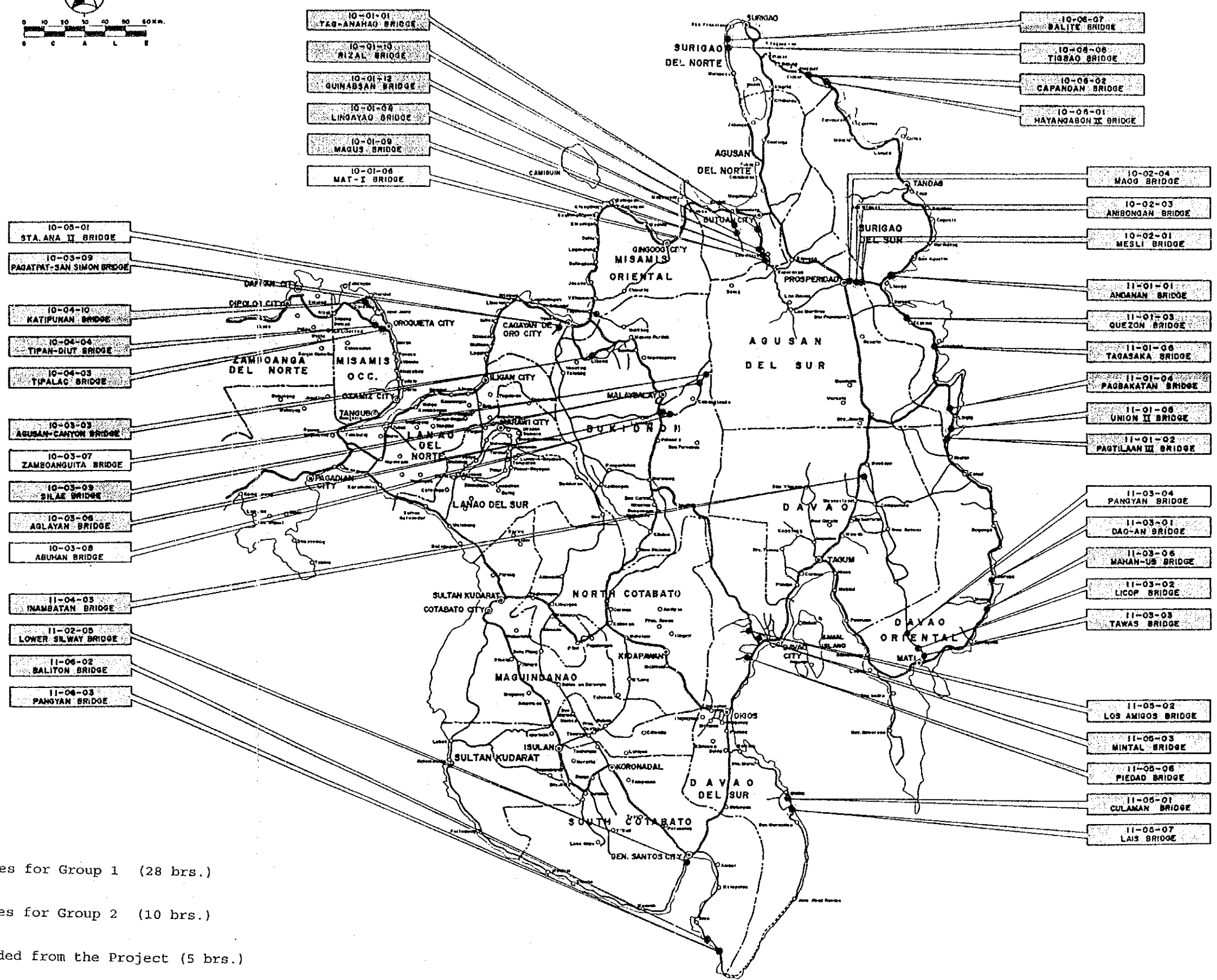
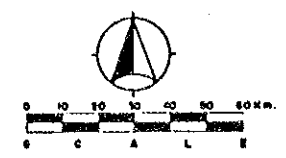
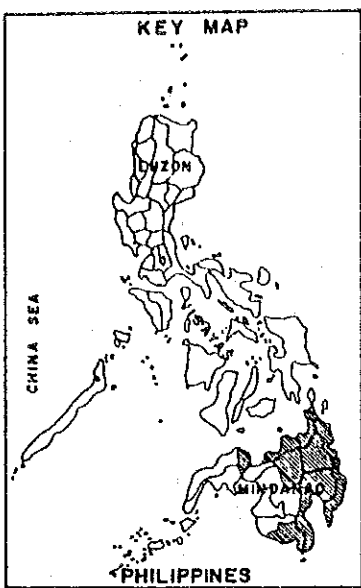
Very truly yours,



Minoru Miura
Project Manager,
Basic design study team on the
Project for Construction of Bridges
Along Rural Roads in Mindanao Area
Katahira & Engineers International
Oriental Consultants Co., Ltd.



PERSPECTIVE
11-02-05
LOWER SILWAY BRIDGE



- 10-01-01 TEG-ANAHAO BRIDGE
- 10-01-10 RIZAL BRIDGE
- 10-01-12 GUINABSAN BRIDGE
- 10-01-08 LINGAYAO BRIDGE
- 10-01-09 MAGUS BRIDGE
- 10-01-06 MAT-I BRIDGE

- 10-06-07 BALITE BRIDGE
- 10-06-08 TIGBAO BRIDGE
- 10-06-02 CAFANGAN BRIDGE
- 10-06-01 HAYANGABON II BRIDGE

- 10-08-01 STA. ANA II BRIDGE
- 10-03-09 PAGATPAT-SAN SIMON BRIDGE

- 10-02-04 MAOG BRIDGE
- 10-02-03 ANBONGAN BRIDGE
- 10-02-01 MESLI BRIDGE

- 10-04-10 KATIPUNAN BRIDGE
- 10-04-04 TIPAN-DIUT BRIDGE
- 10-04-03 TIPALAC BRIDGE

- 11-01-01 ANANAN BRIDGE
- 11-01-03 QUEZON BRIDGE
- 11-01-06 TAGASAKA BRIDGE

- 10-03-03 AGUSAN-CANYON BRIDGE
- 10-03-07 ZAMBOANGUITA BRIDGE

- 11-01-04 PAGBAKATAN BRIDGE
- 11-01-05 UNION II BRIDGE
- 11-01-02 PAGTILAN III BRIDGE

- 10-03-03 SILAE BRIDGE
- 10-03-06 AGLAYAN BRIDGE
- 10-03-08 ABUHAN BRIDGE

- 11-03-04 PANGYAN BRIDGE
- 11-03-01 DAO-AN BRIDGE
- 11-03-06 MAHAN-US BRIDGE

- 11-04-03 INAMBATAN BRIDGE
- 11-02-05 LOWER SILWAY BRIDGE
- 11-06-02 BALITON BRIDGE
- 11-04-03 PANGYAN BRIDGE

- 11-03-02 LICOP BRIDGE
- 11-03-03 TAWAS BRIDGE

- 11-05-02 LOS AMIGOS BRIDGE
- 11-05-03 MINTAL BRIDGE
- 11-05-06 PIEDAD BRIDGE
- 11-05-01 CULAMAN BRIDGE
- 11-05-07 LAIS BRIDGE

LEGEND:

- : Bridges for Group 1 (28 hrs.)
- : Bridges for Group 2 (10 hrs.)
- : Excluded from the Project (5 hrs.)

(Basic Design Study Bridges : 43 hrs.)

LOCATION OF THE PROJECT BRIDGES



Bridge No : 10-02-01
 Bridge Name: Mesli

Location: Km 12991780
 NRI-Awa Azpitia-Lianga
 National Secondary Road, Agusandel Sur

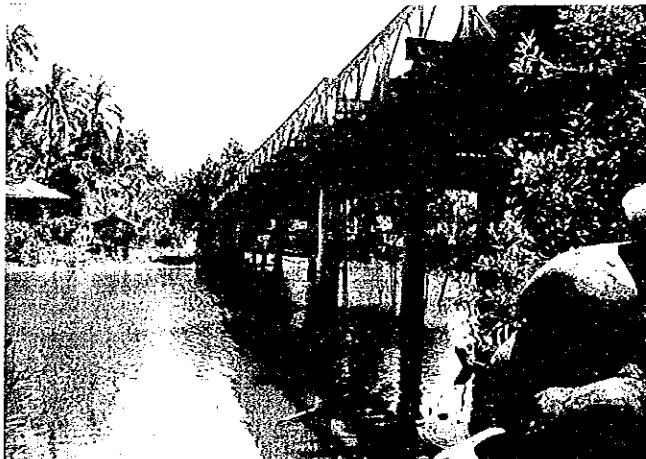
Existing Bridge: Timber
 (Former bridge was washed out)
 Priority : A



Bridge No : 10-03-03
 Bridge Name: Agusan Canyon

Location: Km 14521000
 Jct, Manolo Fortich-Libona-Indahad Road
 Agusan Canyon, Manolo Fortich, Bukidnon

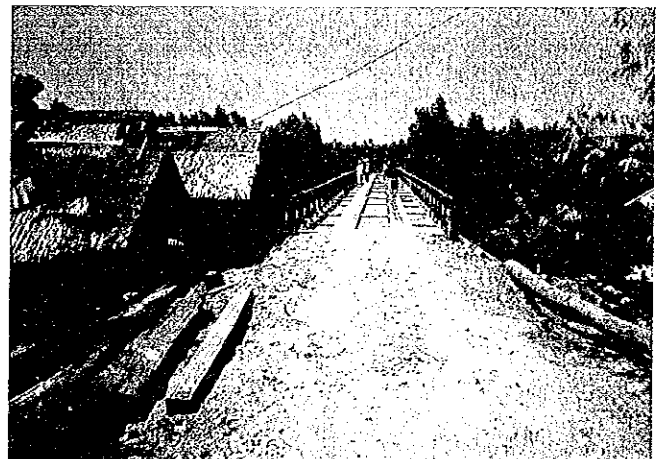
Existing Bridge : Bailey
 Priority : A



Bridge No : 10-04-10
 Bridge Name: Katipunan

Location: km 17631422
 Looc katipunan-Cartagena-Luzaran
 Prov'l Road, Brgy, Katipunan, Plaridel
 Misamis Occidental

Existing Bridge : Bailey
 Priority : B

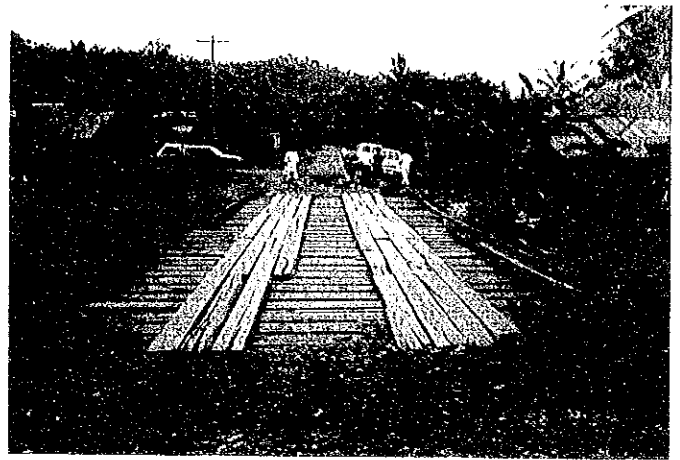


GROUP 1

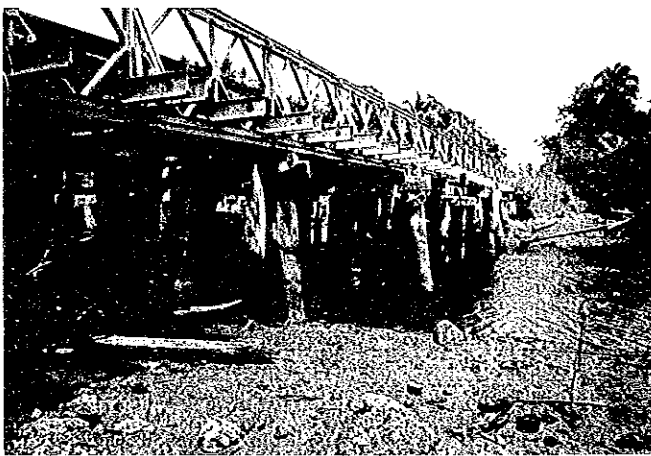


Bridge No : 10-06-02
 Bridge Name: Capandan

Location: km 1186/970
 Surigao-Davao Coastal Road,
 Surigao del Norte



Existing Bridge : Timber
 Priority : B



Bridge No : 11-01-01
 Bridge Name: Andanan

Location: Km 1381/655
 Davao Oriental-Surigao del Sur, Coastal Road
 Andanan Lianga, Surigao del Sur

Existing Bridge : Bailey
 Priority : B



Bridge No : 11-03-06
 Bridge Name: Mahan-UB

Location: Km 1649/210
 Davao Oriental-Surigao del Sur, Coastal Road
 Manay, Davao Oriental

Existing Bridge : None
 Priority : A



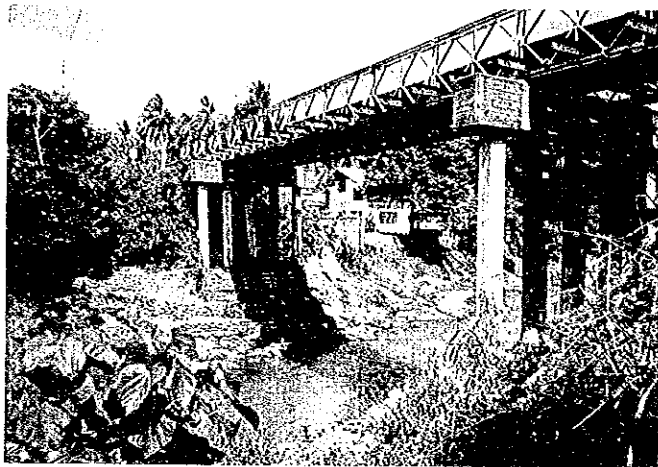
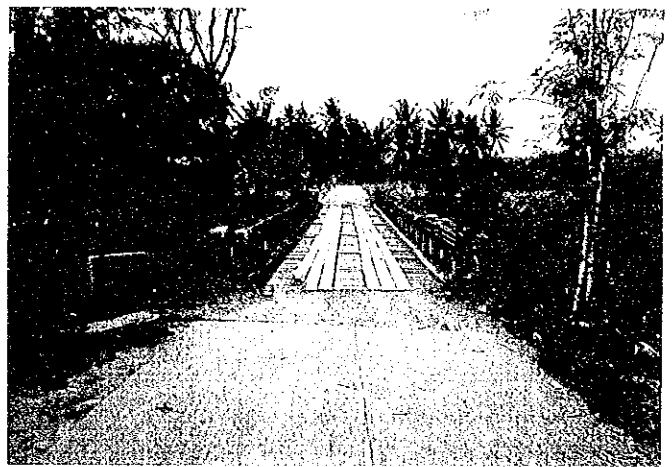
GROUP 1



Bridge No : 11-05-02
 Bridge Name: Los Amigos

Location: km 16891282
 Tugbok-Balangaeng Road, Tugbok District
 Davao City

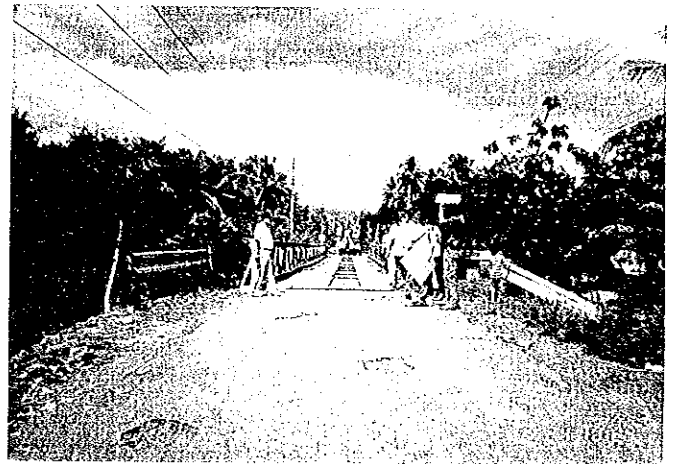
Existing Bridge : Bailey
 Priority : B



Bridge No : 11-05-06
 Bridge Name: Piedad

Location: km 15261780
 Toril District: Eden Road, Toril
 Davao City

Existing Bridge : Bailey
 Priority : A



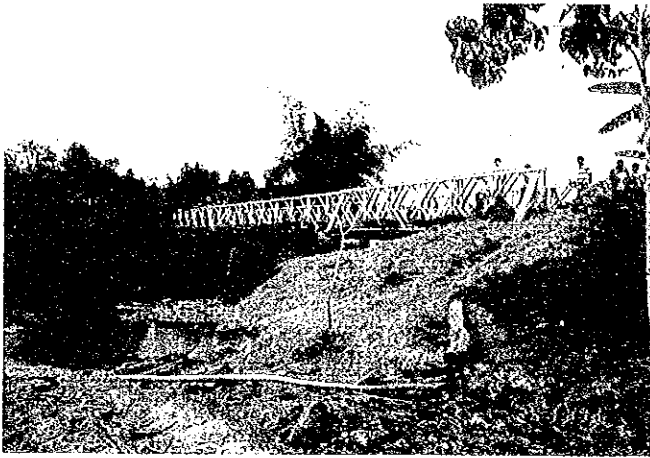
Bridge No : 11-06-03
 Bridge Name: Pangyan

Location: Km. 17331949
 Sarangani-Davao del Sur, Coastal Road
 Pangyan, Glan, Sarangani

Existing Bridge : Ford Crossing
 Priority : B



GROUP 1



Bridge No : 10-01-08
 Bridge Name: Lingayao

Location: Km 12711920
 Agusan-Malaybalay Road,
 Agusan del Norte

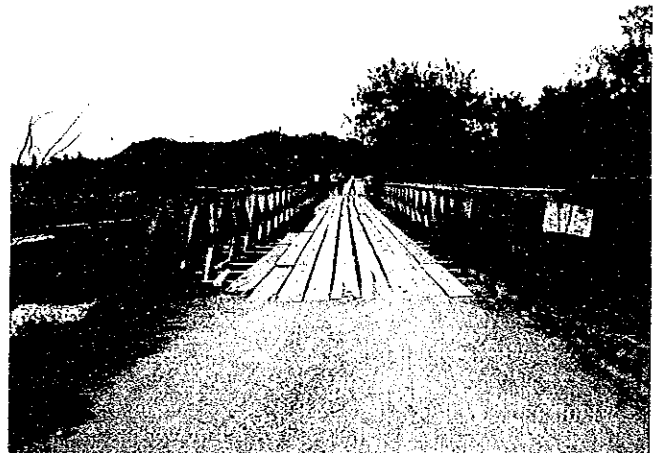


Existing Bridge : Bailey
 Priority : A



Bridge No : 10-01-09
 Bridge Name: Magus

Location: Km 12731484.22~12731524.22
 Agusan Malaybalay Road
 Agusan del Norte



Existing Bridge : Bailey
 Priority : A



Bridge No : 10-01-10
 Bridge Name: Rizal

Location: km 12611171.89~12611231.89
 Buenavista-Bumaguit Road,
 Agusan del Norte



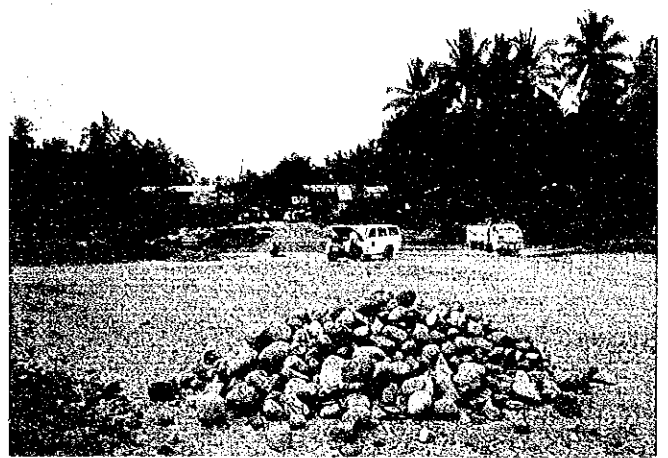
Existing Bridge : Ford Crossing
 Priority : A

GROUP 2



Bridge No : 10-01-12
 Bridge Name: Guinabsan

Location: Km 12631560
 Buenavista Bonaguit Road
 Agusan del Norte

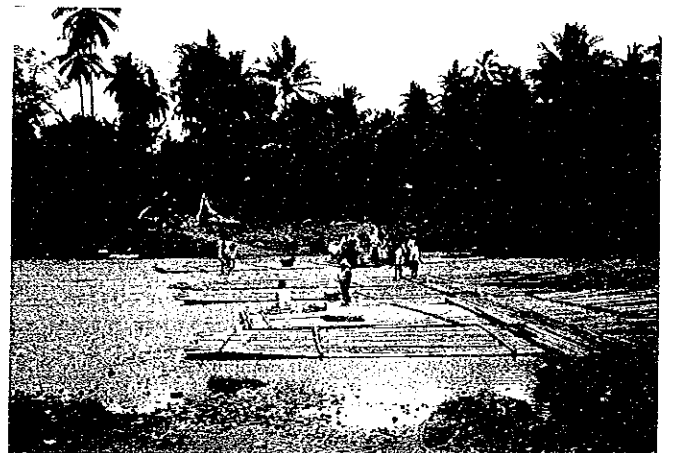


Existing Bridge : Ford Crossing
 Priority : A



Bridge No : 10-02-04
 Bridge Name: Maog

Location: Km 12921650 ~12921713.60
 NRJ Awa-Azpitia-Lianga
 National Secondary Road, Agusan del Sur

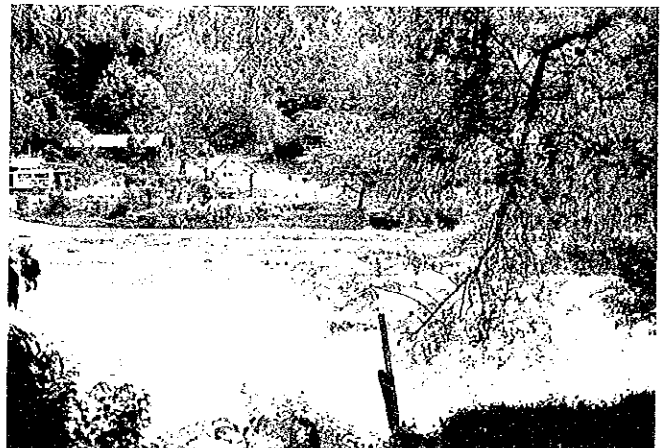


Existing Bridge : None (Raft Crossing)
 Priority : A



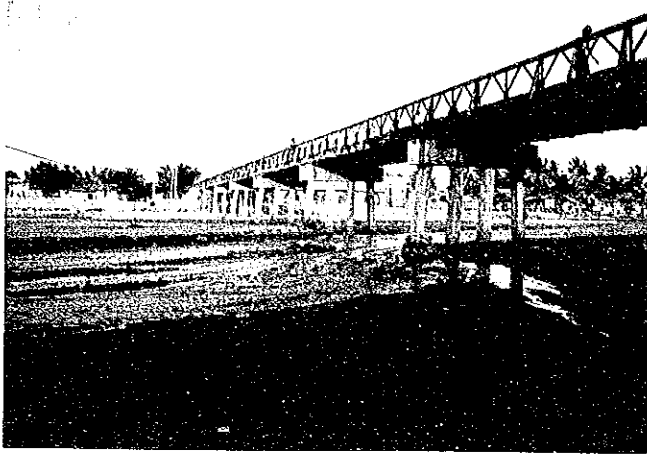
Bridge No : 10-05-09
 Bridge Name: Pagatpat San Simon

Location: km. 0 | 050
 Bulua Pagatpat San Simon Road
 Cagayan de Oro City, Misamis Oriental



Existing Bridge : None (Raft Crossing)
 Priority : B

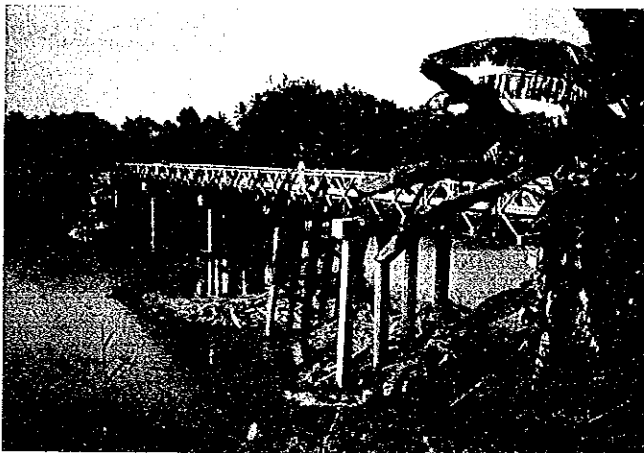
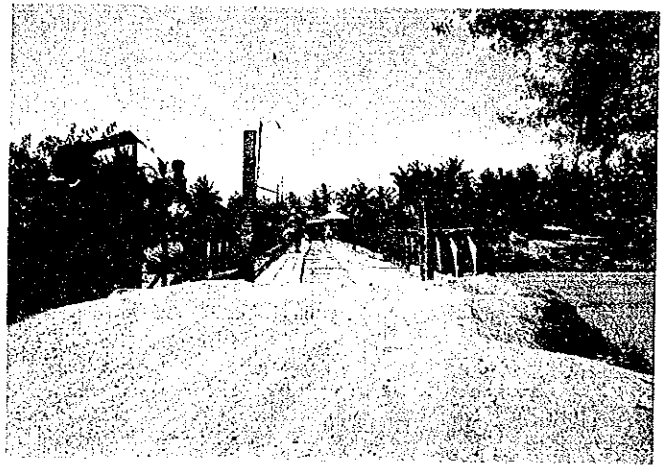
GROUP 2



Bridge No : 11-02-05
 Bridge Name: Lower Silway

Location: km. 1656+032
 Gen. Santos City Makar Wharf Road
 Gen. Santos City, South Cotabato

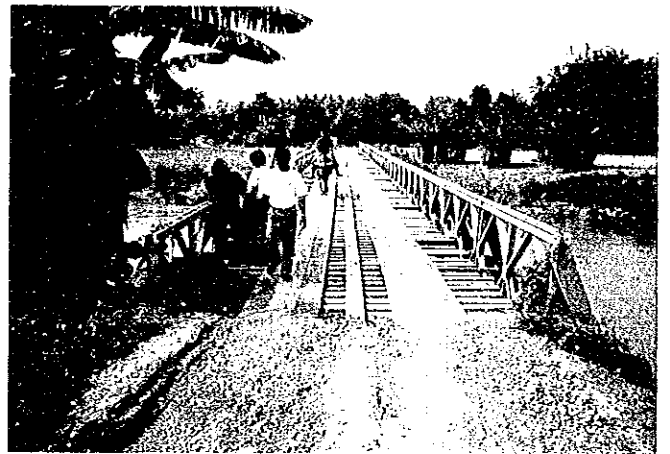
Existing Bridge : Bailey
 Priority : A



Bridge No : 11-04-03
 Bridge Name: Inabatan

Location: Km. 1400+570
 Olaycon-Inabatan Macopa
 Compostela Road, Monkayo, Davao

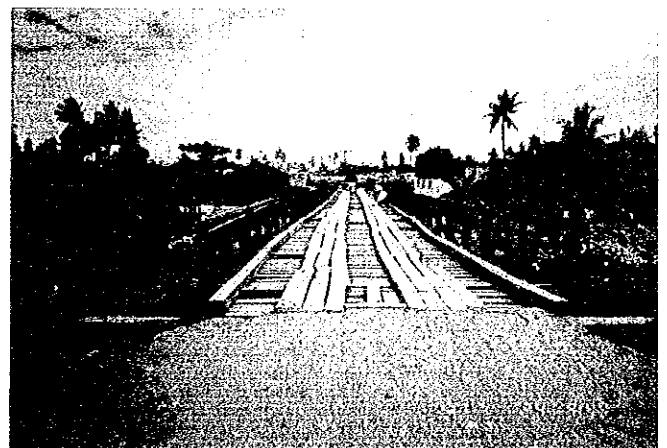
Existing Bridge : Bailey
 Priority : B



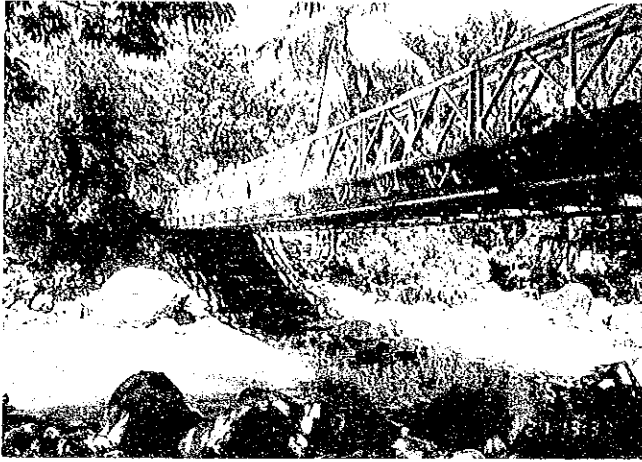
Bridge No : 11-05-01
 Bridge Name: Culaman

Location: km. 1637+000
 Davao del Sur-Sarangani, Coastal Road
 Malita, Davao del Sur

Existing Bridge : Bailey
 Priority : A

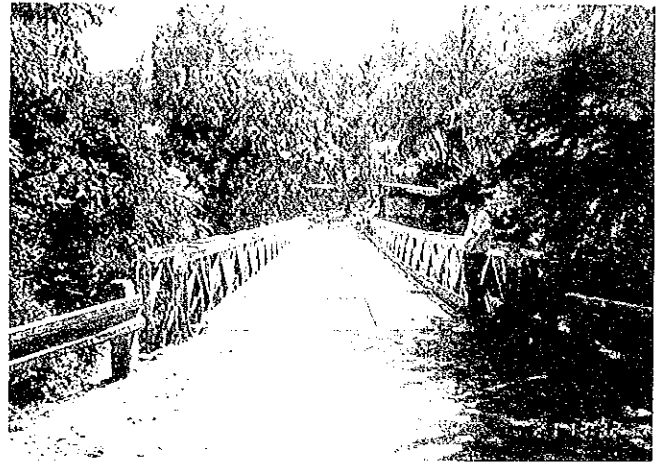


GROUP 2



Bridge No : 11-05 03
Bridge Name: Mintal

Location: km. 16961012
Mintal-Calinan Road, Mintal, Davao City



Existing Bridge : Bailey
Priority : B

GROUP 2

SUMMARY

The Republic of the Philippines had a total population of approximately 60 million in 1990 and 300,000 square kilometers of land area. The main economic activities in the Philippines are agriculture and manufacturing.

Road transport has been playing an dominant role in the socioeconomic development of the Philippines and is the largest mode for inland transport of the country. However, many bridges in rural areas are old and temporary bridges which are often closed to traffic, especially during rainy seasons. Missing or weak bridges diminish the usefulness of many existing roads. This situation is regarded as one of the main constraints on development in rural areas.

Given these circumstances, the Government of the Philippines formulated the Project for Constructing Bridges Along Rural Roads and requested Japan's Grant Aid for the Project. In response to the request, the Government of Japan extended the Grant Aid for procurement of steel girders for 24 bridges (Phase I) in 1987, and for construction of 10 bridges (Phase II) in 1988.

The Government of the Philippines greatly valued the important facilities resulting from the project execution of Phase I and Phase II. In line with this, the Government of the Philippines formulated the "Five Year Comprehensive Bridge Construction Program along Secondary Roads" to improve the road network in rural areas. In order to implement the program, the Government of the Philippines has requested Japan's Grant Aid assistance for Phase III (first package) and Phase IV (second package), and the Japan's Grant Aid assistance has been extended for procurement of steel girders and for construction bridges.

This time, construction of 86 bridges selected from the area of Regions X and XI is planned for this Project (third package), and Japan's Grant Aid assistance for the project is requested.

In response to the request, the Government of Japan decided to conduct a basic design study on the Project for Construction of Bridges Along Rural Roads in

Mindanao Area. Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team from February 16 to March 17, 1994 and from April 27 to June 20, 1994 for the field survey.

The Basic Design Study Team, during its stay in the Philippines, conducted the field survey which consists of clarifying the background and objectives of the Project, evaluation of necessity, socioeconomic effects, appropriateness and other factors, and topographical and geological survey at the project sites.

As a result of the evaluation, 28 bridges were selected for the "Group 1" project (procurement of materials), and 10 bridges were selected for the "Group 2" project (construction of bridges).

Reflecting local conditions in formulating the most appropriate plan for the project, basic design of the projected bridges and the materials was conducted. As a result, the Group 1 and Group 2 projects summarized in the tables below were proposed.

Group 1 (Procurement of materials for 29 bridges)

Outline of Materials				
		H-Beam Girder	Built-up Beam Girder	Total
Steel Girders	No. of Bridges (brs.)	18	10 *	28
	Total Bridge Length (m)	612	319	931
	Span Length (m)	12 to 24	25 to 40	12 to 40
	No. of Spans	30	10	40
	Weight of Steel Beams (t)	737.0	35.6	772.6
	Weight of Steel Plates (t)	77.9	397.8	475.7
	Other Steel Materials	Bolts, Shoes, Drains etc. Bearings (t)	66.9	38.1
Erection Tools	(t)	8.9	7.2	16.1
Field Paint Materials	(t)	3.4	3.2	6.6
Prestressed Concrete Piles (φ 700)	64 piles			
Sheetpiles (Type III)	1,816 m			
Gabions	1,046 m			
Filter Units	12,095 pcs.			
Guardrails	1,856 m			

Note: One of the bridges with * (Lais Bridge) is composed of both H-beam girders and built-up beam girders.

Group 2 (Construction of 10 bridges)

Outline of Bridges	
No. of Bridges	10 (bridges)
Total Bridge Length	751 m
Span Length	20 m to 40 m
No. of Spans	31 (spans)
Width of Bridges	Carriageway 3.7 m x 2 lane Side walk 0.42 m x 2 side (0.42m + 2.5m for Lower Silway Br.)
Types of Superstructure	H-Beam composite girder : 5 brs. Built-up beam composite girder : 1 br. Continuous built-up beam girder : 2 brs. PC composite girder : 2 brs.
Types of Substructure	Abutment : Inverted-T wall type : 20 units Pier : Inverted-T column type : 21 units Foundation: RC pile : 35 units Foundation: Steel pipe pile : 6 units
Approach Roads	PCC pavement 2,371 m
River Bank Protection	Grouted Riprap 7,540 m ²

The implementation periods required are 2.5 months for detailed design and 7 months for procurement of materials for Group 1, and 3 months for detailed design and 12 months for construction of bridges for Group 2.

The Department of Public Works and Highways (DPWH) is the executing agency of the Project.

This project aims to provide efficient transportation facilities by constructing permanent bridges and replacing temporary bridges with permanent ones to promote social and economic development in rural areas in Mindanao where the socioeconomic development level is generally low due to difficulties in transportation. The direct effects of implementing the project are as follows:

- Local populations that are isolated by ford crossings without bridges during rainy seasons can have access to cities and markets at any time. (Approx. beneficiaries are 650,000.)

- Heavy vehicles such as cargo trucks which are too heavy to cross temporary bridges can have access to the areas. (Timber bridges' loading capacity is about one ton and that of Bailey bridges about 3 tons, while a cargo truck weighs 5 to 20 tons.)
- Local farmers who do not have transportation means to ship their products due to bad road conditions can do so. Decrease of transportation costs and increase of products' farmgate prices due to construction of bridges and improvement of roads cause incentives to produce surplus products for farmers. As a consequence, the project expedites development of the areas.
- Technology of steel bridge construction will be transferred to Filipino engineers through the construction works with Japanese engineers. (About 70 Filipino engineers will be employed for the project.)
- Employment opportunity will be created by hiring construction workers and purchasing local materials. (About 3,600 man-months are required for the project.)

Improvement of essential transport facilities in rural areas to increase activities in those areas for greater production and to induce direct development therein, especially in Mindanao area, is emphasized in the national development plan. In line with national development policy, this project will contribute to increasing the productivity of rural industries and promoting greater investment in rural development.

As a result, it is appropriate to implement this project under Japan's Grant Aid.

TABLE OF CONTENTS

	<u>Page</u>
<i>PREFACE</i>	
<i>LETTER OF TRANSMITTAL</i>	
<i>PERSPECTIVE</i>	
<i>LOCATION MAP</i>	
<i>PHOTOS</i>	
<i>SUMMARY</i>	
CHAPTER 1 BACKGROUND OF THE PROJECT.....	1
1.1 Background of the Project.....	1
1.2 Outline of the Request and Main Components.....	2
1.3 Projects of Other Donors	6
CHAPTER 2 OUTLINE OF THE PROJECT	8
2.1 Objectives of the Project	8
2.2 Study and Examination on the Request	9
2.2.1 Present Condition of the Requested Bridges.....	9
2.2.2 Confirmation of the Final Request	11
2.2.3 Selection and Priority of Candidate Bridges for the Project	11
2.2.4 Selection of Bridges for the Project.....	15
2.2.5 Classification of Bridges by Project Type.....	17
2.2.6 Appropriateness of the Project	20
2.3 Project Description.....	23
2.3.1 Execution Agency Implementation Organization	23
2.3.2 Maintenance Plan	28
CHAPTER 3 BASIC DESIGN OF GROUP 1 PROJECT.....	29
3.1 Basic Design Concepts.....	29
3.2 Project Site Survey and Analysis of the Collected Data.....	31
3.3 Examination of Design Criteria.....	42

3.4	Basic Plan	43
3.4.1	Planning of Bridges	43
3.4.2	Examination of Superstructure Types.....	48
3.4.3	Examination of Substructure Types	55
3.4.4	Design of Superstructures.....	57
3.4.5	Design of Substructures	57
3.4.6	Design of Approach Roads.....	58
3.4.7	Design of Pavement	58
3.4.8	Design of Riverbank Protection.....	59
3.4.9	Scouring Protection.....	60
3.4.10	Summary of Basic Plan.....	61
3.5	Implementation Plan.....	68
3.5.1	Basic Conditions	68
3.5.2	Implementation Method.....	68
3.5.3	Implementation Supervisory Plan	70
3.5.4	Procurement Plan.....	72
3.5.5	Implementation Schedule.....	72
3.5.6	Scope of Work.....	73
CHAPTER 4	BASIC DESIGN OF GROUP 2 PROJECT	74
4.1	Basic Design Concepts	74
4.2	Project Site Survey and Analysis of the Collected Data	76
4.3	Examination on Design Criteria	84
4.4	Basic Plan.....	86
4.4.1	Planning of Bridges	86
4.4.2	Examination of Superstructure Types.....	88
4.4.3	Examination of Substructure Types	99
4.4.4	Design of Superstructures.....	101
4.4.5	Design of Substructures	101
4.4.6	Design of Approach Roads.....	101
4.4.7	Design of Pavement	102
4.4.8	Design of Riverbank Protection.....	102
4.4.9	Scouring Protection.....	103
4.4.10	Summary of Basic Plan.....	104
4.5	Implementation Plan.....	108
4.5.1	Basic Conditions	108
4.5.2	Implementation Method.....	108

4.5.3	Construction and Supervisory Plan.....	110
4.5.4	Procurement Plan.....	111
4.5.5	Implementation Schedule.....	113
4.5.6	Scope of Work.....	114
CHAPTER 5	PROJECT EVALUATION AND CONCLUSION	116

APPENDICES

APPENDIX 1	Member List of Survey Team
APPENDIX 2	Survey Itinerary
APPENDIX 3	Member List of Party Concerned in the Philippines
APPENDIX 4	Minutes of Discussions
APPENDIX 5	Summary of the Requested Bridge Site Data
APPENDIX 6	Priority and Selection of Candidate Bridges for the Project
APPENDIX 7	Letters
APPENDIX 8	Figures and Tables of the Basic Design
APPENDIX 9	Figures and Tables of the Implementation Plan
APPENDIX 10	Cost Estimation Borne by the Republic of the Philippines

Tables

Table 1-1	REQUESTED BRIDGE LIST	4
Table 1-2	LIST OF FOREIGN ASSISTED ROAD DEVELOPMENT PROJECTS UNDER IMPLEMENTATION IN MINDANAO	6
Table 2-1	FLOWCHART OF PLANNING AND IMPLEMENTATION OF GROUP 1 AND GROUP 2 PROJECTS	10
Table 2-2	NUMBER OF CANDIDATE BRIDGES BY PRIORITY.....	15
Table 2-3	LIST OF BRIDGES FOR BASIC DESIGN STUDY	16
Table 2-4	LIST OF PROJECT BRIDGES BY PROJECT TYPE	21
Table 2-5	ANNUAL BUDGET OF DPWH	27
Table 2-6	DPWH INVESTMENT PROGRAM FOR INFRASTRUCTURE (1994).....	27
Table 2-7	MAINTENANCE ACTIVITIES FOR BRIDGES	28
Table 3-1	TOPOGRAPHIC SURVEY SITES	33
Table 3-2	SUMMARY OF PROJECT SITE SURVEY RESULTS (GROUP 1) (1/3) - (3/3).....	35-37
Table 3-3	OUTLINE OF TOPOGRAPHIC AND RIVER CONDITION OF THE PROJECT SITES (GROUP 1) (1/4) - (4/4)	38-41
Table 3-4	MATERIAL OF PROPERTIES OF STEEL FOR GIRDERS	43
Table 3-5	BRIDGE LENGTH, SPAN LENGTH AND BRIDGE ELEVATION OF THE PROJECT BRIDGE (1/2) - (2/2)	46-47
Table 3-6	APPLICATION OF H-BEAM SIZE.....	52
Table 3-7	GEOMETRIC STANDARD OF APPROACH ROADS.....	58
Table 3-8	SUMMARY OF BASIC PLAN OF GROUP 1 BRIDGES (1/3) - (3/3).....	62-64
Table 3-9	SUMMARY OF PROCUREMENT MATERIALS.....	65
Table 3-10	CONTENTS OF STEEL MATERIALS FOR H-BEAM GIRDERS	65
Table 3-11	CONTENTS OF STEEL MATERIALS FOR BUILT-UP BEAM GIRDERS	66
Table 3-12	IMPLEMENTATION SCHEDULE (GROUP 1 PROJECT)	72
Table 3-13	UNDERTAKINGS OF THE GOVERNMENTS (GROUP1 PROJECT)..	73
Table 4-1	SUMMARY OF PROJECT SITE SURVEY RESULTS (GROUP 2).....	79
Table 4-2	OUTLINE OF TOPOGRAPHIC, GEOLOGICAL AND RIVER CONDITION OF THE PROJECT SITES (GROUP 2) (1/4) - (4/4)	80-83
Table 4-3	MATERIAL PROPERTIES OF STEEL FOR GIRDERS	85
Table 4-4	BRIDGE LENGTH, SPAN LENGTH AND BRIDGE ELEVATION OF THE PROJECT BRIDGES	89
Table 4-5	PROPOSED SUPERSTRUCTURE TYPE.....	91
Table 4-6	COMPARISON OF SUPERSTRUCTURE TYPES.....	92

Table 4-7	GEOMETRIC STANDARD OF APPROACH ROADS.....	102
Table 4-8	SUMMARY OF BASIC PLAN OF GROUP 2 BRIDGES (1/3) - (3/3)	105-107
Table 4-9	PROCUREMENT PLAN OF MAJOR MATERIALS AND EQUIPMENT (1/2) - (2/2)	112-113
Table 4-10	IMPLEMENTATION SCHEDULE (GROUP 2 PROJECT)	114
Table 4-11	UNDERTAKINGS OF THE GOVERNMENTS (GROUP 2 PROJECT)	115
Table A8-1	SUMMARY OF DESIGN COMPUTATION OF SUPERSTRUCTURES (GROUP 1) (1/3) - (3/3)	8-3
Table A8-2	REACTION FORCE OF SUPERSTRUCTURES (GROUP 1).....	8-6
Table A8-3	HEIGHTS OF GIRDERS, SLABS, BEARINGS (GROUP 1)	8-7
Table A8-4	SUMMARY OF DESIGN COMPUTATION OF SUPERSTRUCTURES (GROUP 2)	8-16
Table A8-5	REACTION FORCE OF SUPERSTRUCTURES (GROUP 2).....	8-17
Table A8-6	HEIGHTS OF GIRDERS, SLABS, BEARINGS (GROUP 2)	8-18
Table A9-1	TRANSPORTATION ROUTE AND TEMPORARY BRIDGE REINFORCEMENT PLAN (GROUP 1) (1/4) - (4/4)	9-1
Table A9-2	TRANSPORTATION ROUTE AND TEMPORARY BRIDGE REINFORCEMENT PLAN (GROUP 2) (1/2) - (2/2)	9-5
Table A9-3	ERECTION PLAN (GROUP 2)	9-7
Table A9-4	COFFERDAM CONSTRUCTION PLAN (GROUP 2)	9-8
Table A9-5	DETOUR ROAD CONSTRUCTION PLAN (GROUP 2).....	9-9

Figures

Figure 1-1	THE PROJECT FOR CONSTRUCTION OF BRIDGES ALONG RURAL ROADS.....	3
Figure 1-2	LOCATION OF REQUESTED BRIDGES.....	5
Figure 1-3	LOCATION OF FOREIGN ASSISTED ROAD DEVELOPMENT PROJECTS UNDER IMPLEMENTATION IN MINDANAO	7
Figure 2-1	LOCATION OF CANDIDATE BRIDGES FOR THE PROJECT.....	14
Figure 2-2	ORGANIZATION CHART OF DPWH.....	24
Figure 2-3	ORGANIZATION CHART OF DPWH REGIONAL OFFICE	25
Figure 2-4	IMPLEMENTATION ORGANIZATION OF THE PROJECT	26

Figure 3-1	STEEL MATERIALS COSTS VERSUS SPAN LENGTHS.....	49
Figure 3-2	COMPARISON OF NUMBER OF GIRDERS AND THEIR INTERVALS.....	50
Figure 3-3	CROSS SECTION OF THE PROJECT BRIDGE.....	51
Figure 3-4	RELATION BETWEEN SPAN LENGTH AND GIRDER DEPTH (H-BEAM COMPOSITE GIRDER).....	52
Figure 3-5	RELATION BETWEEN SPAN LENGTH AND GIRDER DEPTH (SIMPLE BUILT-UP BEAM COMPOSITE GIRDER).....	53
Figure 3-6	EXPANSION JOINT.....	54
Figure 3-7	TYPICAL RIVERBANK PROTECTION.....	60
Figure 3-8	STEEL SHEETPILE FOUNDATION GROUTED RIPRAP.....	61
Figure 4-1	STEEL MATERIALS COSTS VERSUS SPAN LENGTHS.....	90
Figure 4-2	COMPONENT OF BRIDGE WIDTH.....	93
Figure 4-3	COMPONENT OF BRIDGE WIDTH (LOWER SILWAY BRIDGE).....	93
Figure 4-4	COMPARISON OF NUMBER OF GIRDERS AND THEIR INTERVALS.....	94
Figure 4-5	RELATION BETWEEN SPAN LENGTH AND GIRDER DEPTH (H-BEAM COMPOSITE GIRDER).....	95
Figure 4-6	EXPANSION JOINT.....	97
Figure 4-7	TYPICAL RIVERBANK PROTECTION.....	103
Figure 4-8	TYPICAL SCOURING PROTECTION.....	104
Figure A8-1	BASIC DESIGN OF SIMPLE H-BEAM COMPOSITE GIRDERS.....	8-1
Figure A8-2	BASIC DESIGN OF SIMPLE BUILT-UP BEAM COMPOSITE GIRDERS.....	8-2
Figure A8-3	STANDARD ABUTMENTS.....	8-8
Figure A8-4	STANDARD PIER AND PILE-BENT PIER.....	8-9
Figure A8-5	TYPICAL CROSS SECTION OF APPROACH ROADS.....	8-10
Figure A8-6	SCOURING PROTECTION.....	8-11
Figure A8-7	BASIC DESIGN OF CONTINUOUS BUILT-UP BEAM GIRDERS (1/2) - (2/2).....	8-12
Figure A8-8	BASIC DESIGN OF PC COMPOSITE GIRDERS (1/2) - (2/2).....	8-14
Figure A8-9	DETAILS OF EXPANSION JOINTS.....	8-19
Figure A9-1	WOODEN BRIDGE REINFORCING PLAN.....	9-10
Figure A9-2	BAILEY BRIDGE REINFORCING PLAN.....	9-11
Figure A9-3	STEEL GIRDER ERECTION SCHEME.....	9-12
Figure A9-4	WOODEN BENT FOR STEEL GIRDER ERECTION.....	9-13
Figure A9-5	STANDARD TIMBER BRIDGE FOR CONSTRUCTION.....	9-14
Figure A9-6	COFFERDAM PLAN.....	9-15

CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1

BACKGROUND OF THE PROJECT

1.1 Background of the Project

The Government of the Philippines has proposed a national development plan which aims to reinforce the physical foundation of the economy to support the overall development thrust of sustained economic growth, economic efficiency and recovery. The Government of the Philippines is concerned about the establishment and improvement of essential transport facilities in rural areas to increase activities in those areas for greater production and to induce direct development therein.

Many bridges in rural areas are old and temporary bridges which are often closed to traffic, especially during rainy seasons. Missing or weak bridges diminish the usefulness of many existing roads. This situation is regarded as one of the main constraints on development in rural areas.

The Government of the Philippines considers the improvement of rural areas as an important policy in line with the national development plan; thus the immediate replacement of these temporary and dilapidated bridges by permanent structures will ensure fast, safe and smooth land transportation, which will greatly contribute to the socioeconomic development of these areas.

Given these circumstances, the Government of the Philippines requested that the Government of Japan reconstruct selected bridges in different regions nationwide. In response to the request, the Government of Japan conducted a basic design study and formulated the project. Steel materials for the superstructures of 24 bridges were provided under The Project for Constructing Bridges Along Rural Roads Phase I in 1987, and 10 bridges were constructed under The Project for Constructing Bridges Along Rural Roads Phase II in 1988, as Japan's Grant Aid.

The Government of the Philippines greatly valued the important facilities resulting from the project execution of Phase I and Phase II. As a result, the Government of the Philippines formulated the "Five Year Comprehensive Bridge Construction Program along Secondary Roads" to improve the road network in rural areas. In order to implement the program, the Government of the Philippines has requested Japan's Grant Aid assistance for Phase III (Package 1) and Phase IV (Package 2).

In response to the request, Japan's Grant Aid has been extended for the provision of steel materials for 27 bridges (Package 1, Group 1) and construction of 10 bridges (Package 1, Group 2) in the area of Regions I, III and IV under the Phase III project, and for the provision of steel materials for 34 bridges (Package 2, Group 1) and construction of 11 bridges (Package 2, Group 2) in the area of Regions V, VI, VII and VIII under the Phase IV project. Location of the bridges constructed under the projects is shown in Figure 1-1.

This time, construction of 86 bridges selected from the area of Regions X and XI is planned for this project (third package), and Japan's Grant Aid assistance for the project is requested.

1.2 Outline of the Request and Main Components

The request comprises 86 bridges, of which 65 bridges were requested for Group 1 project and 21 bridges for Group 2 project. The description of each Group is as follows. The requested bridge list is shown in Table 1-1, and their locations are shown in Figure 1-2.

Group 1 project :

- Japan's Grant Aid will cover the supply of steel girders for the bridges.
- The Government of the Philippines will cover design and construction of the bridges, approach roads and related structures.
- The Government of the Philippines will undertake land acquisition, obstacle demolition and maintenance of bridges and roads for transportation of materials.

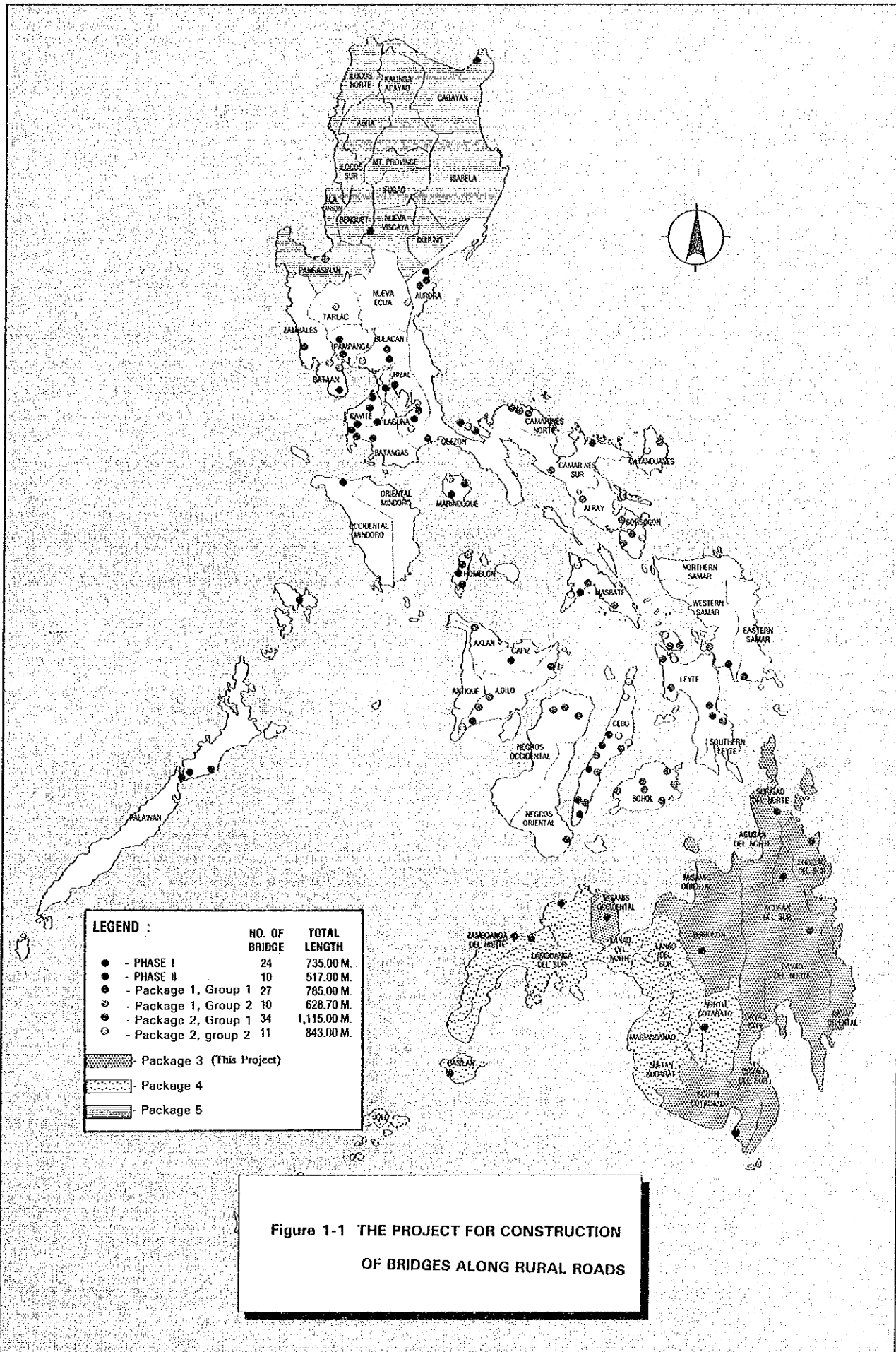
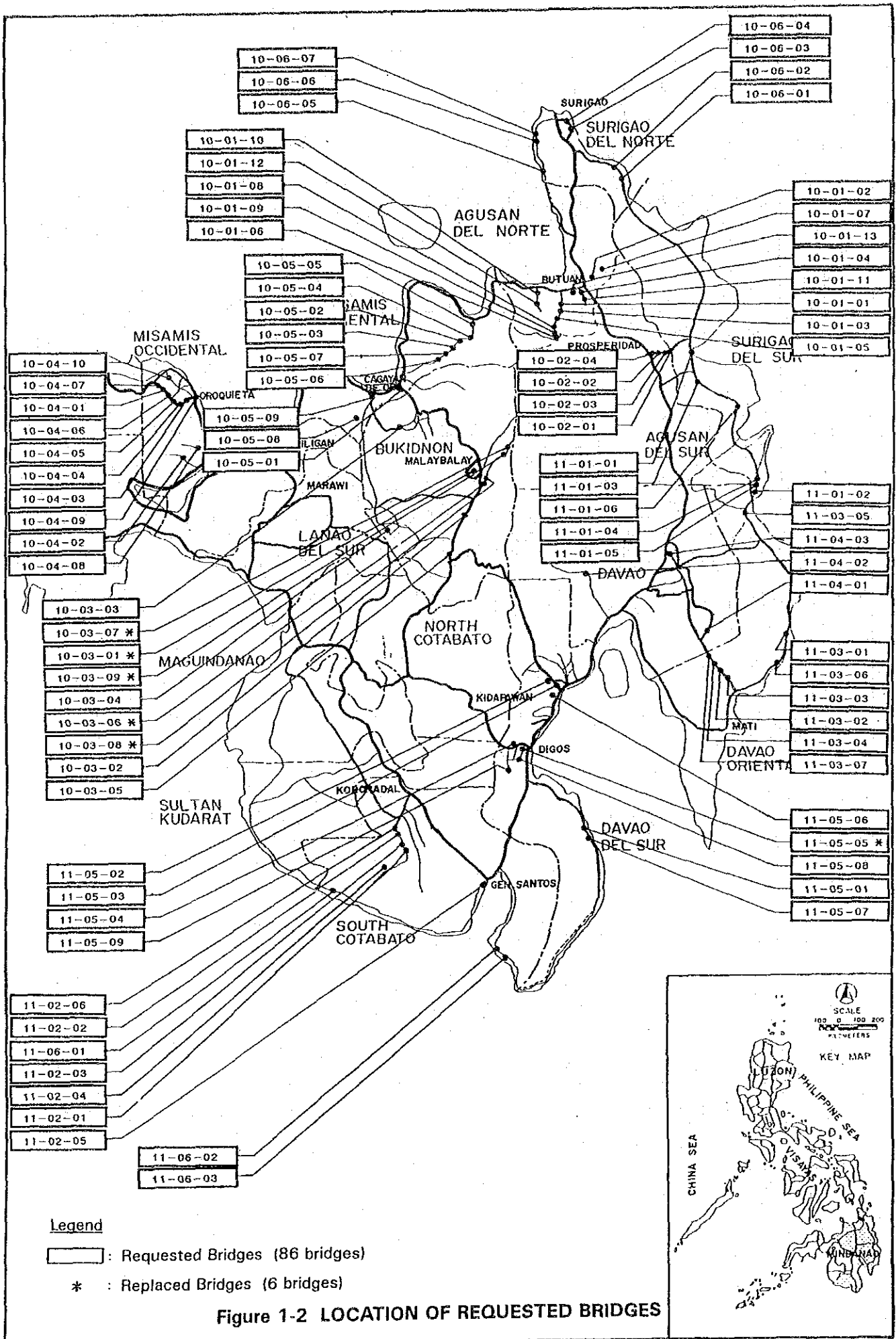


Figure 1-1 THE PROJECT FOR CONSTRUCTION OF BRIDGES ALONG RURAL ROADS

Table 1-1 REQUESTED BRIDGE LIST

No.	Bridge No.	Bridge Name	Region	Province	Proposed Group
1	10-01-01	Tag-Anahao	X	Agusan Del Norte	1
2	10-01-02	Pianing	X	ditto	1
3	10-01-03	Tungao I	X	ditto	1
4	10-01-04	Ubod-Ubod	X	ditto	1
5	10-01-05	Tungao II	X	ditto	1
6	10-01-06	Mat-I	X	ditto	1
7	10-01-07	Anticala	X	ditto	1
8	10-01-08	Lingayao	X	ditto	2
9	10-01-09	Magus	X	ditto	2
10	10-01-10	Rizal	X	ditto	2
11	10-01-11	Lemon	X	ditto	2
12	10-01-12	Guinabasan	X	ditto	2
13	10-01-13	Alternate Magsaysay	X	ditto	2
14	10-02-01	Mesli	X	Agusan Del Sur	1
15	10-02-02	Azpitia	X	ditto	1
16	10-02-03	Anibongan	X	ditto	1
17	10-02-04	Maog	X	ditto	2
18	10-03-01	Bobonawan (Casibang)	X	Bukidnon	1
19	10-03-02	Musuan	X	ditto	1
20	10-03-03	Agusan Canyon	X	ditto	1
21	10-03-04	Olayan	X	ditto	1
22	10-03-05	Kinapolo	X	ditto	1
23	10-03-06	Impasug-Ong (Aglayan)	X	ditto	1
24	10-03-07	Culasihan (Zamboanguita)	X	ditto	1
25	10-03-08	Bugcaon (Abuhan)	X	ditto	1
26	10-03-09	Alanib (Silae)	X	ditto	1
27	10-04-01	Sulipat Diut	X	ditto	1
28	10-04-02	Labo	X	Misamis Occidental	1
29	10-04-03	Tipalac Bridge	X	ditto	1
30	10-04-04	Tipan Diut	X	ditto	1
31	10-04-05	Tipan Daku	X	ditto	1
32	10-04-06	Deboloc	X	ditto	1
33	10-04-07	Sulipat Daku	X	ditto	1
34	10-04-08	Taguima	X	ditto	1
35	10-04-09	Old Pelaez Utility	X	ditto	2
36	10-04-10	Katipunan	X	ditto	2
37	10-05-01	Sta Ana II	X	Misamis Oriental	1
38	10-05-02	Cabulig	X	ditto	1
39	10-05-03	Guibone	X	ditto	1
40	10-05-04	Hinandigan	X	ditto	1
41	10-05-05	Kahulugan	X	ditto	1
42	10-05-06	Dal-As	X	ditto	1
43	10-05-07	Minanopol	X	ditto	1
44	10-05-08	Batlnay	X	Misamis Oriental	1
45	10-05-09	Pagatpat-San Simon	X	ditto	2
46	10-06-01	Hayangabon II	X	Surigao Del Norte	1
47	10-06-02	Capandan	X	ditto	1
48	10-06-03	Capalayan	X	ditto	1
49	10-06-04	Orok	X	ditto	2
50	10-06-05	Cuyangan	X	ditto	2
51	10-06-06	Tigbao	X	ditto	2
52	10-06-07	Balite	X	ditto	2
53	11-01-01	Andanan	XI	Surigao Del Sur	1
54	11-01-02	Pagtlaan	XI	ditto	1
55	11-01-03	Quezon	XI	ditto	1
56	11-01-04	Pagbakatan	XI	ditto	1
57	11-01-05	Union	XI	ditto	1
58	11-01-06	Tagasaka	XI	ditto	1
59	11-02-01	Kilob	XI	South Cotabato	1
60	11-02-02	Kalma I	XI	ditto	1
61	11-02-03	Kalma II	XI	ditto	1
62	11-02-04	Luhib	XI	ditto	1
63	11-02-05	Lower Silway	XI	ditto	2
64	11-02-06	Colonggolo	XI	ditto	2
65	11-03-01	Dao-An	XI	Davao Oriental	1
66	11-03-02	Licop	XI	ditto	1
67	11-03-03	Tawas	XI	ditto	1
68	11-03-04	Pangyan	XI	ditto	1
69	11-03-05	Manat	XI	ditto	2
70	11-03-06	Mahan-Jb	XI	ditto	2
71	11-03-07	Upper Sumlog	XI	ditto	2
72	11-04-01	Agusan	XI	Davao	1
73	11-04-02	Binasbas	XI	ditto	2
74	11-04-03	Inambatan	XI	ditto	2
75	11-05-01	Culaman	XI	Davao Del Sur	1
76	11-05-02	Los Amigos	XI	ditto	1
77	11-05-03	Mintal	XI	ditto	1
78	11-05-04	Estrella	XI	ditto	1
79	11-05-05	Matanao (Sacub-Lanuro)	XI	ditto	1
80	11-05-06	Piedad	XI	ditto	1
81	11-05-07	Lals	XI	ditto	1
82	11-05-08	Hagonoy	XI	ditto	1
83	11-05-09	Mal	XI	ditto	1
84	11-06-01	Luan	XI	Sarangani	1
85	11-06-02	Baliton	XI	ditto	1
86	11-06-03	Pangyan	XI	ditto	1

Note: Bridges with () were substituted at the request of DPWH.



Group 2 project:

- Japan's Grant Aid will cover design and construction of the bridges, approach roads and related structures including supply of materials.
- The Government of the Philippines will undertake land acquisition, obstacle demolition and maintenance of bridges and roads for transportation of materials.

Of the requested bridge list, replacement of 6 bridges was proposed by DPWH when the Study Team arrived in the Philippines. (Please refer to Appendix 7). The reason for the change was that construction of those 6 bridges has already been financed due to the urgency of their implementation.

The change of request was accepted, and the Basic Design Study of the project was conducted based on the revised request. The substituted bridges are shown as () in the requested bridge list in Table 1-1.

1.3 Projects of Other Donors

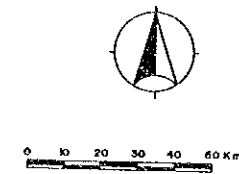
Foreign assisted road development projects under implementation in Mindanao are listed in Table 1-2 and their locations are shown in Figure 1-3. All of the projects are improvement/rehabilitation of primary national roads.

Table 1-2 LIST OF FOREIGN ASSISTED ROAD DEVELOPMENT PROJECTS UNDER IMPLEMENTATION IN MINDANAO

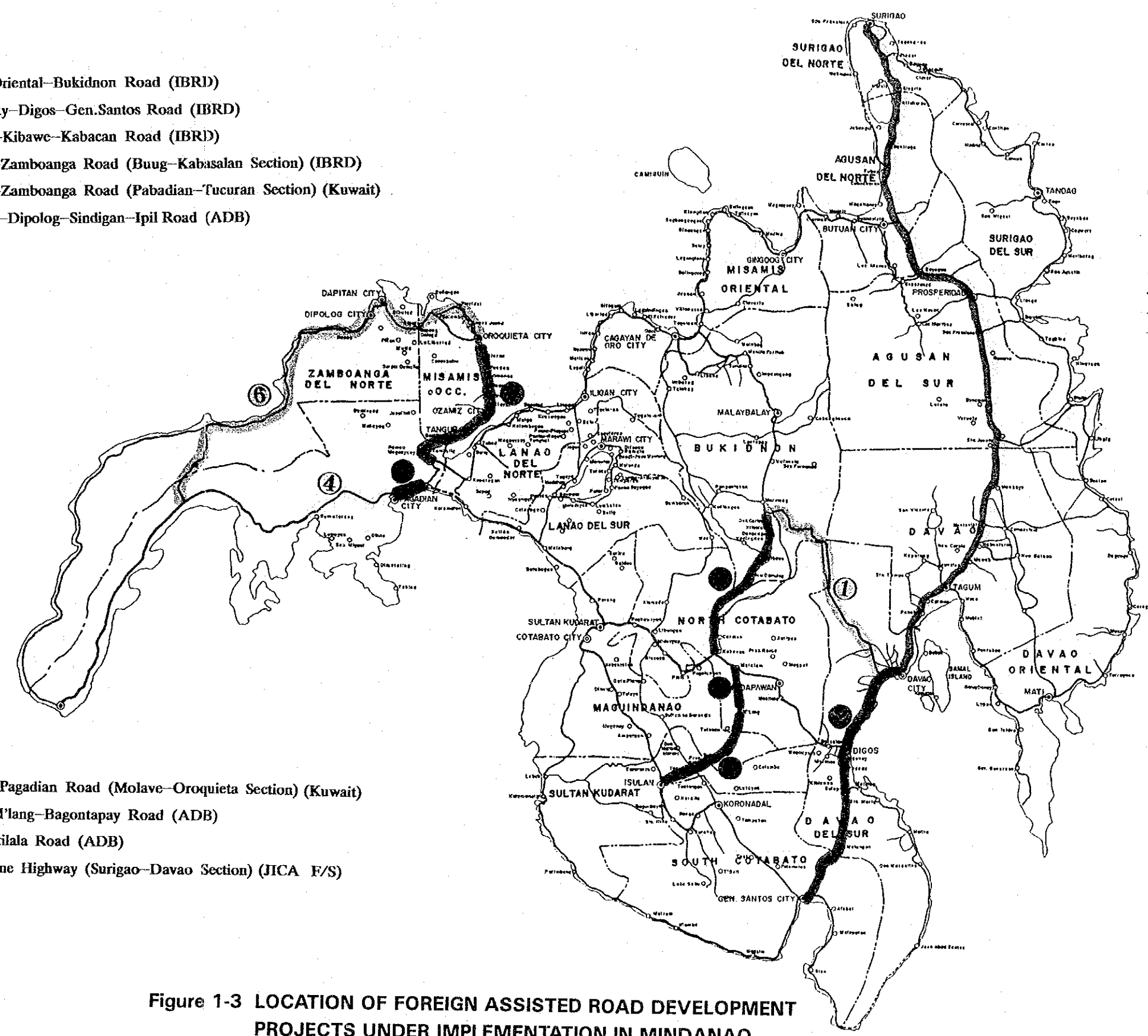
Route	Class	Length (km)	Cost (P Mil)	Period	Fund Source
(1) Misamis Oriental-Bukidnon-Davao City Road	Primary National	143.00	490.000	1993-96	IBRD
(2) Davao City-Digos-Gen. Santos City Road	Primary National	85.50	400.000	1993-96	IBRD
(3) Maramag-Kibawe-Kabacan Road	Primary National	60.00	275.000	1993-96	IBRD
(4) Pagadian-Zamboanga Road (Buug-Kabasalan Section)	Primary National	52.50	420.000	1993-96	IBRD
(5) Pagadian-Zamboanga Road (Pagadian-Tucuran Section)	Primary National	18.91	87.375	1992-94	Kuwait
(6) Oroquieta-Dipolog-Sindangan-Ipil Road	Primary National	160.88	1,008.416	1989-95	ADB
(7) Oroquieta-Pagadian Road (Molave-Oroquieta Section)	Primary National	90.00	632.109	1991-95	Kuwait
(8) Matalam-M'lang-Bagontapay Road	Primary National	39.08	222.745	1993-95	ADB
(9) Isulan-Makilala Road	Primary National	45.72	138.489	1992-95	ADB

Source : DPWH

- ① Misamis Oriental-Bukidnon Road (IBRD)
- ② Davao City-Digos-Gen.Santos Road (IBRD)
- ③ Maramag-Kibawe-Kabacan Road (IBRD)
- ④ Pagadian-Zamboanga Road (Buug-Kabasalan Section) (IBRD)
- ⑤ Pagadian-Zamboanga Road (Padian-Tucuran Section) (Kuwait)
- ⑥ Oroquieta-Dipolog-Sindigan-Ipil Road (ADB)



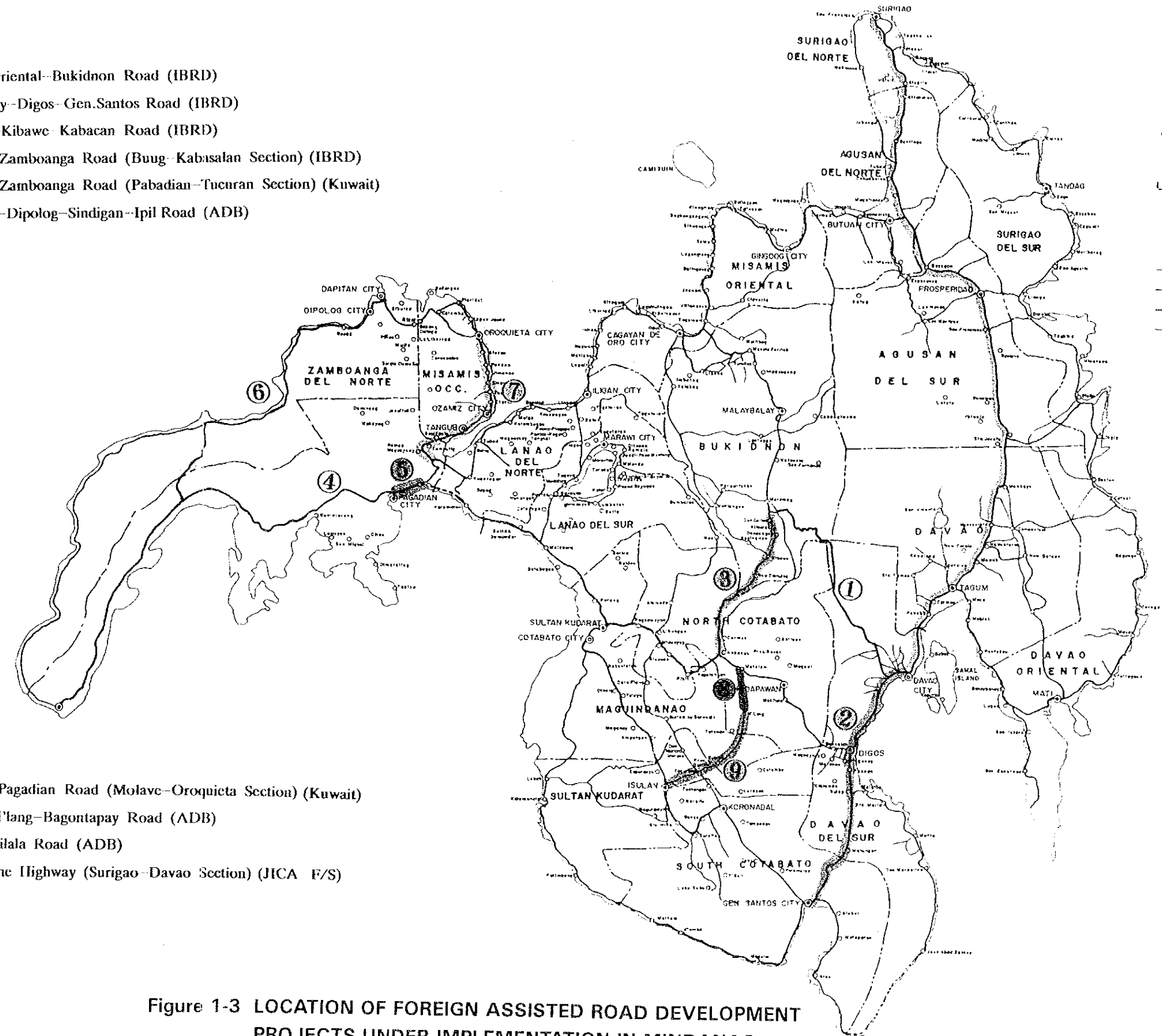
- LEGEND :
- ⊙ : Provincial Capital
 - ⊕ : City
 - : Municipality
 - : Provincial Boundary
 - : Primary National Road
 - - - : Secondary National Road
 - : Major Rural Road





- ⑦ Oroquieta-Pagadian Road (Molave-Oroquieta Section) (Kuwait)
- ⑧ Matalam-M'lang-Bagontapay Road (ADB)
- ⑨ Isulan-Makilala Road (ADB)
- Pan-Philippine Highway (Surigao-Davao Section) (JICA F/S)

Figure 1-3 LOCATION OF FOREIGN ASSISTED ROAD DEVELOPMENT PROJECTS UNDER IMPLEMENTATION IN MINDANAO

- ① Misamis Oriental-Bukidnon Road (IBRD)
- ② Davao City-Digos-Gen.Santos Road (IBRD)
- ③ Maramag-Kibawe-Kabacan Road (IBRD)
- ④ Pagadian-Zamboanga Road (Buug-Kabisalan Section) (IBRD)
- ⑤ Pagadian-Zamboanga Road (Pabadian-Tucuran Section) (Kuwait)
- ⑥ Oroquieta-Dipolog-Sindigan-Ipil Road (ADB)



LEGEND :

- ⊙ : Provincial Capital
- ⊕ : City
- : Municipality
- : Provincial Boundary
- : Primary National Road
- : Secondary National Road
- : Major Rural Road

- ⑦ Oroquieta-Pagadian Road (Molave-Oroquieta Section) (Kuwait)
- ⑧ Matalam-M'lang-Bagontapay Road (ADB)
- ⑨ Isulan-Makilala Road (ADB)
- : Pan-Philippine Highway (Surigao-Davao Section) (JICA F/S)

Figure 1-3 LOCATION OF FOREIGN ASSISTED ROAD DEVELOPMENT PROJECTS UNDER IMPLEMENTATION IN MINDANAO

CHAPTER 2

OUTLINE OF THE PROJECT

CHAPTER 2

OUTLINE OF THE PROJECT

2.1 Objectives of the Project

Rural roads in the Philippines, which consist of secondary national, provincial, city, municipal and barangay roads, are connected by many temporary bridges over rivers.

Most of the temporary bridges are Bailey or timber type which have a small loading capacity and easily become unusable. Consequently, these bridges limit and obstruct travel and transportation in rural areas.

These rural road conditions are not only inconvenient and dangerous for the local population but also constrain the expansion of rural industries and the provision of social services.

The replacement of these temporary bridges by permanent bridges will ensure safe and effective means of transportation, which will greatly contribute to the socioeconomic development of rural areas.

In order to effect smooth implementation of the replacement, the Government of Republic of the Philippines established its Five Year Comprehensive Bridge Reconstruction Program along Secondary Roads in April 1989.

In line with the Five Year Program, the First Package (1991) and the Second Package (1993) have been implemented, and this project, the Third Package, is proposed to construct 86 bridges selected from the area of Regions X and XI.

The project aims to construct bridges with the assistance of Japan's Grant Aid which covers procurement of steel girders and other specific materials (Group 1) and construction of bridges (Group 2). The project

was formulated after examination on the request and study of the contents of the project in the course of the Basic Design Study. The flowchart of planning and implementation of Group 1 and Group 2 projects are shown in Table 2-1.

2.2 Study and Examination of the Request

2.2.1 Present Condition of the Requested Bridges

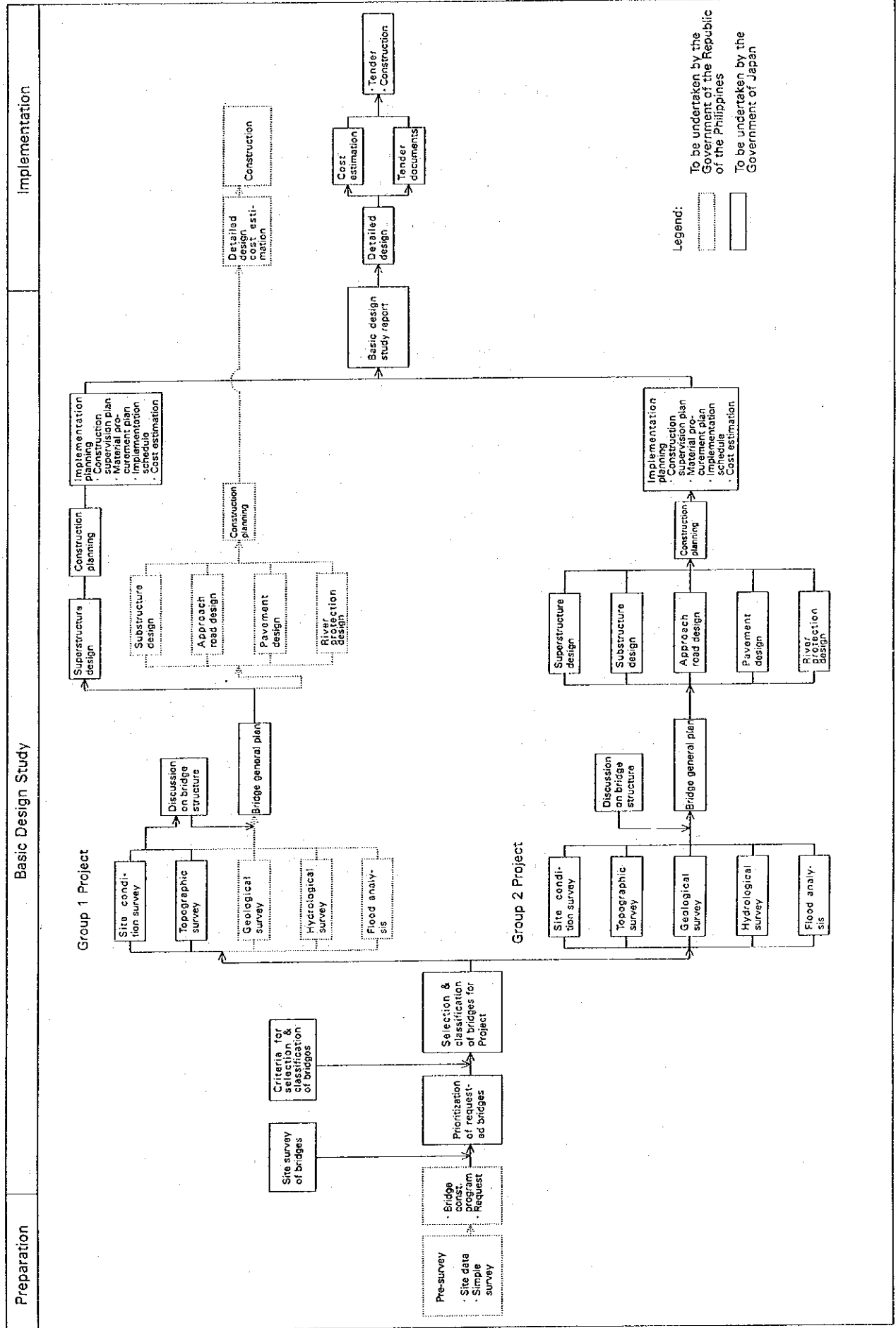
The site survey of the 86 requested bridges was conducted. The items surveyed were as follows:

- Existing bridge condition (type, length, condition)
- Affected area condition (population, major products, development plan)
- Road condition (traffic volume ADT, road class, carriageway width, surface type, condition, improvement plan)
- Site condition (topography, land use)
- River condition (depth & width of LWL & HWL, velocity)
- Bridge scheme proposed by surveyor (length, height)
- Construction condition (difficulty of girder transportation & girder erection, temporary work method for pier excavation, existence of detours)
- Necessity of reconstruction of bridge
- Peace and order condition
- Other remarkable conditions

As a result of the survey, a summary of the requested bridge site data is presented in Appendix 5.

Based on the site survey results, discussions was held, and the contents of the final request were confirmed.

Table 2-1 FLOWCHART OF PLANNING AND IMPLEMENTATION OF GROUP 1 AND GROUP 2 PROJECTS



2.2.2 Confirmation of the Final Request

As a result of the discussion and the confirmation, 12 bridges out of 86 requested bridges were finally excluded from the request. The excluded bridges, with reasons, are as follows:

- The bridge is planned along a proposed new road whose implementation is uncertain.
10-01-13 Alternate Magsaysay Bridge
- Land acquisition for the bridge is uncertain.
11-05-04 Estrella Bridge
- The bridges are slightly damaged permanent RCDG.
10-03-02 Musuan Bridge
10-03-05 Kinapolo Bridge
- Peace and order conditions at the sites are uncertain.
10-05-02 Cabulig Bridge
10-05-03 Guibone Bridge
10-05-04 Hinandigan Bridge
10-05-06 Dal-As Bridge
10-05-07 Minapolo Bridge
11-03-05 Manat Bridge
11-03-07 Upper Sumlong Bridge
11-06-01 Luan Bridge

2.2.3 Selection and Priority of Candidate Bridges for the Project

The candidate bridge selection criteria was established as follows:

Candidate bridge selection criteria

Bridges which fulfill the following 3 conditions were selected as candidate bridges:

- (1) Urgent necessity of reconstruction (for bridges which fulfill any of the following conditions):

- Temporary weak bridge which limits traffic from passing.
- Dilapidated or damaged bridge which is dangerous for traffic.
- Ford crossing which is impassable during rainy seasons.

(2) Considerable socioeconomic effects (for bridges which fulfill any of the following conditions):

- The local population, whose living and economic activity conditions will be improved by bridge reconstruction, is large. (The present population is not less than 50,000.)
- Traffic volume, whose condition will be improved by bridge reconstruction, is large. (Present traffic volume ADT is not less than 50.)
- Uncultivated cultivable land area, whose population and traffic volume are small since no bridge crosses the river, which can be developed and which can generate a large population and traffic volume soon after bridge construction, is very large.

(3) Appropriateness to the project (for bridges which fulfill the following conditions):

- Bridge size is appropriate for the project. (Bridge length is 15 m to 200 m.)
- Bridge type (common girder bridge) is appropriate for the project.
- Bridge benefits the local population.
- Bridge construction is not difficult.
- Bridge material procurement, especially girder transportation, is not difficult.
- Problems related to peace and order are not anticipated during surveying and construction.

As a result of the evaluation base on the criteria, 57 bridges out of 74 finally requested bridges were selected as the candidate bridges.

The criteria for priority evaluation of the candidate bridges was established as follows:

Candidate bridge priority evaluation criteria

Priority A (very high priority; bridges which fulfill all of the following conditions):

- Population benefiting from the bridge is large (more than 50,000).
- Traffic volume benefiting from the bridge is large (ADT is more than 50).
- Bridge is located on an important road (national or city road).
- Bridge size is relatively large. (Bridge length is longer than 20 m.)
- Alternative detour road does not exist.

Priority B (high priority; bridges which do not fulfill all of the conditions for priority A, but whose priority is high due to one of the following reasons):

- Bridge is located along an important road whose road improvement is on-going or planned.
- Bridge should be reconstructed together with other bridges located on the same road.
- Existing one lane temporary bridge has a large volume of light traffic (tricycles and bikes), which causes traffic congestion.
- Other special urgent reason (e.g., ford crossing having high necessity, effects and appropriateness).

Priority C (relatively low priority; bridges which do not come under priority A or B):

The evaluations and the reasons for selection and priority for the project are presented in Appendix 6. The number of candidate bridges by priority is shown in Table 2-2. The location of the candidate bridges is shown in Figure 2-1.

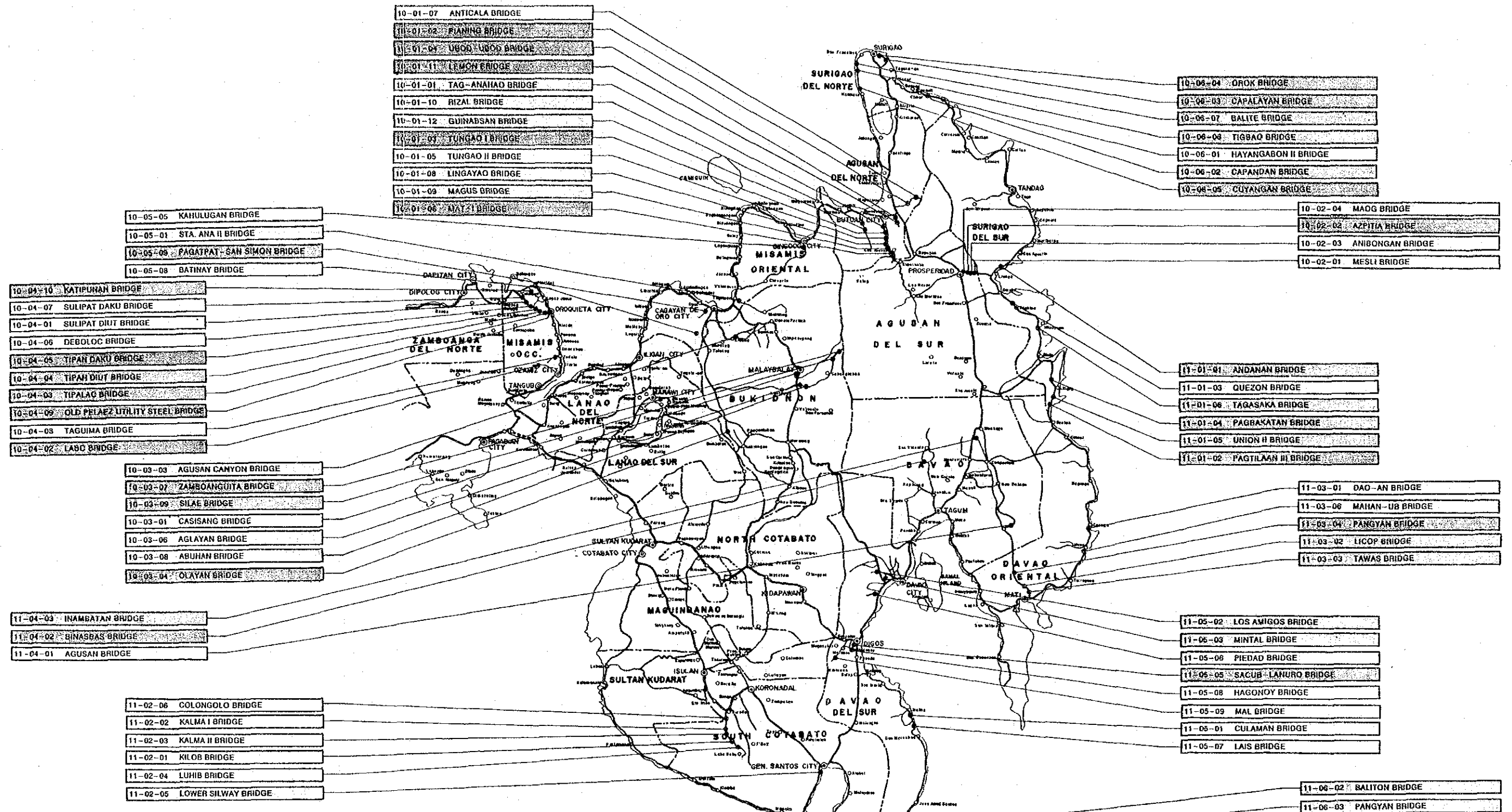
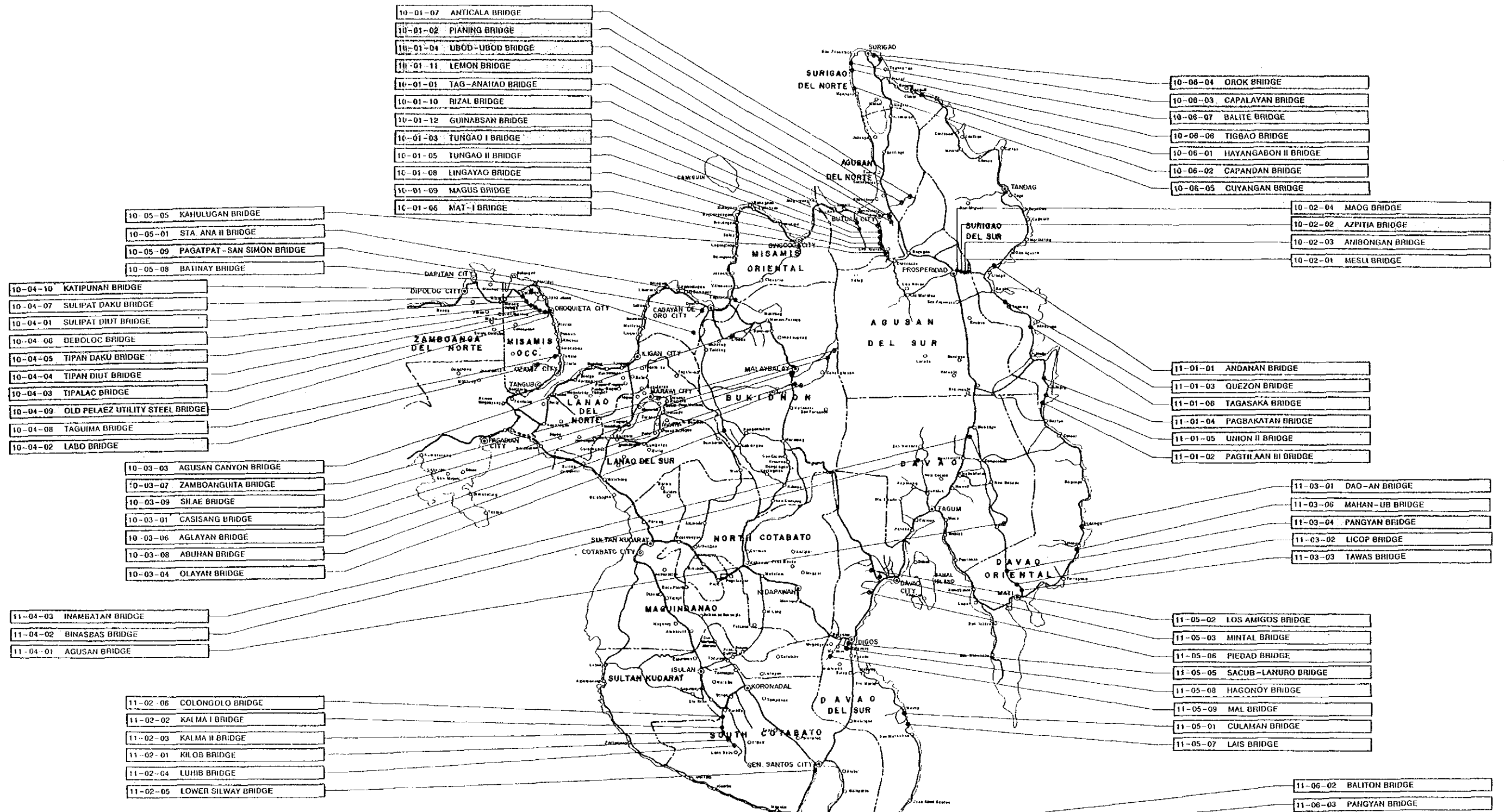


Figure 2-1 LOCATION OF CANDIDATE BRIDGES FOR THE PROJECT



Legend

- : Priority A (20 brs.)
- : Priority B (20 brs.)
- : Priority C (17 brs.)
- : No Priority (17 brs.)

Figure 2-1 LOCATION OF CANDIDATE BRIDGES FOR THE PROJECT

Table 2-2 NUMBER OF CANDIDATE BRIDGES BY PRIORITY

Priority		Bridge Number
Candidate Bridges	A : Very high priority	20
	B : High priority	20
	C : Low priority	17
	Candidate bridge total	57
Bridges without priority		17
Finally requested bridge total		74

2.2.4 Selection of Bridges for the Project

Detailed site survey and basic design study were conducted on priority A and B candidate bridges and 3 priority C bridges which were additionally requested by DPWH. (DPWH had requested that 6 priority C bridges be added to the basic design study. As a result of discussion, 3 relatively high priority bridges were added to the basic design study. Please refer to Appendix 7.) The list of bridges for the basic design is shown in Table 2-3.

Based on the engineering examination of the basic design of the bridges, 38 bridges were selected for the project. The excluded bridges, with reasons, are as follows:

10-01-06 Mat-I bridge : A wooden bridge was constructed after the collapse of the former bridge. The wooden bridge can carry the current traffic since the traffic is small. Large scale earthwork for an approach road is needed to construct a 2 lane bridge.

10-03-07 Zamboanguita Bridge :

A 51 m long span bridge, which is difficult to transport and erect, is needed.

10-03-08 Abuhan Bridge and 11-03-04 Pangyan Bridge :

They can be easily constructed with local materials and technology since their spans are small.

10-05-01 Sta Ana II Bridge :

The provincial government decided to undertake the construction with their fund since urgent construction of the bridge is needed.

Table 2-3 LIST OF BRIDGES FOR BASIC DESIGN STUDY

No.	Bridge No.	Bridge Name	Priority	No.	Bridge No.	Bridge Name	Priority
1	10-01-01	Tag-Anabhao	A	24	11-01-01	Andanan	B
2*	10-01-06	Mat-I	C	25	11-01-02	Pagtilaan	C
3	10-01-08	Lingayao	A	26	11-01-03	Quezon	A
4	10-01-09	Magus	A	27	11-01-04	Pagbakatan	B
5	10-01-10	Rizal	A	28	11-01-05	Union	B
6	10-01-12	Guinabsan	A	29	11-01-06	Tagasaka	B
7	10-02-01	Mesli	B	30	11-02-05	Lower Silway	A
8	10-02-03	Anibongan	B	31	11-03-01	Dao-An	A
9	10-02-04	Maog	A	32	11-03-02	Licop	B
10	10-03-03	Agusan Canyon	A	33	11-03-03	Tawas	B
11	10-03-06	Aglayan	A	34*	11-03-04	Pangyan	C
12*	10-03-07	Zamboanguita	B	35	11-03-06	Mahan-Ub	A
13*	10-03-08	Abuhan	B	36	11-04-03	Inambatan	B
14	10-03-09	Silae	B	37	11-05-01	Culaman	A
15	10-04-03	Tipalac	B	38	11-05-02	Los Amigos	B
16	10-04-04	Tipan Diut	B	39	11-05-03	Mintal	B
17	10-04-10	Katipunan	B	40	11-05-06	Piedad	A
18*	10-05-01	Sta Ana II	A	41	11-05-07	Lais	A
19	10-05-09	Pagatp-S. Simo	B	42	11-06-02	Baliton	B
20	10-06-01	Hayangabon II	A	43	11-06-03	Pangyan	B
21	10-06-02	Capandan	B				
22	10-06-06	Tigbao	B				
23	10-06-07	Balite	B				

Note: Bridges with * were excluded from the project.