付　属　資　料

1．ブータン政府からの本格調査正式要請内容

2．ブータン政府からの本格調査変更要請内容

3．Scope of Works

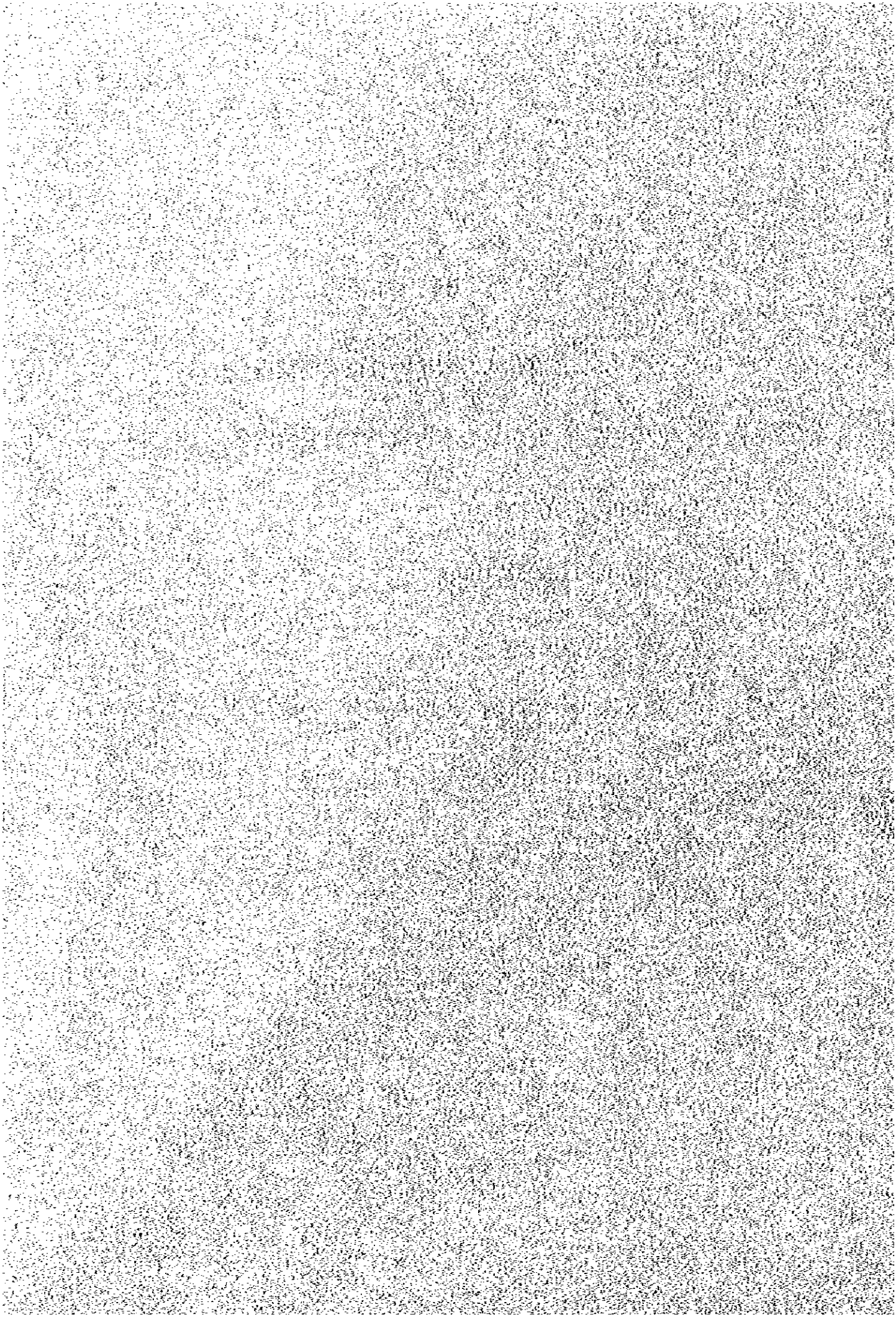
4．Minutes of Meeting

5．Questionnaire

6．第8次5ヶ年計画・道路セクターの抜粋

7．Bridge Inventory

8．収集資料リスト



付属資料1．ブータン政府からの本格調査正式要請内容

Application for the Technical Cooperation (Development Study)by the Government of Japan.

1 Project Digest

i) Project Title: The Study on National Highway Bridge replacement Project

i) Location: Bhutan

iii) Implementing Agency: PWD, Ministry of Communications.

- Number of the staff of the Agency Annex-'A'
- Budget allocated to the Agency. Annex-'B'
- Organization chart. Annex-'C'

iv) Justification of the Project

The lack of a well developed transport network in Bhutan has been identified as one of the major constrains to the development of more-remote areas of the country.

National highway construction began in 1959 with the assistance of the Government of India.

At present, Bhutan has a lateral East-West highway from the capital Thimphu to Tashigang, and it is connected to Southern Bhutan by four 4 North-South highways. These highways are narrow with winding horizontal alignments having a lot of hairpin bends and have many landslides and sinking sections.

Most of the bridges were constructed as temporary structures(Bailey bridges with stone masonry substructure) and they have passed their design life. Within a few years, they will not be suitable for use by any transport facilities let alone by heavy vehicles. The construction and maintenance of roads is technically difficult because of the fragility of the ground and risk of landslides during the monsoon period. The terrain in which roads have to follow valleys and are cut into hillside, makes road construction technically more demanding in terms of Technology & financial inputs and therefore are costlier than in the plains.

The long term objective in the roads sector is to construct and maintain all National Highway and Bridges to facilitate the efficient movement of goods and passengers. A sufficient road network in Bhutan is a prerequisite for the socio-economic development of the country.

In taking account of these conditions, the Royal Government of Bhutan, through the Public Works Department, intends to implement the Study on National Highway/Bridges Replacement Project with the assistance of the Government of Japan.

vi) Desirable or scheduled time of the commencement of the project.

The study is desired to be commenced as early as possible in fiscal year 1994.

vii) Expected funding source and/or Assistance: Not identified or specified.

viii) Other relevent project. East-West Lateral Highway Maintenance Project under ADB Loan.

2. Terms of reference of the proposed study.

i) Necessity / Justification of the study

The national highway network in Bhutan consist of a lateral East-West highway from the capital Thimphu to Tashigang and four(4) North-South highways:

Thimphu-Phuntsholing;Wangdi-Damphu-Gaylephug;Trongsa-Zhemgang Gaylephug and Trashigang-Samdrupjongkhar.

These highways are narrow with winding horizontal alignments having a lot of hairpin bends and have many landslide zones and sinking sections. Most of the bridges constructed were temporary structures(bailey bridges with stone mansonry substructure), and they have passed their design life. Within a few years, they will not be trafficable by all category vehicles.

Besides, the construction and maintenance of roads is technically difficult because of the fragility of the ground and risk of landslides during the monsoon period. The terrain in which roads have to follow valleys and with heavy cut into hillsides, makes road construction technically most challanging and hence are costlier than in the plains.

The national highway development in Bhutan is very important for the comprehensive National Development and for the smooth and efficient movement of goods and passengers.

Therefore it is necessary to start the implementation of the study on National Highway/bridges replacement project as soon as possible.

ii) Necessity / justification of the Japanese Technical Cooperation

A very advanced technology and a comprehensive experience of Japanese in the construtcion, maintenance and replacement practices on highly developed Road network system is believed to bring Bhutan the best know-hows and answers in this study.

3. Objectives of the study

i) To establish a basic plan for National Highway/Bridges replcement Project.

ii) To carry out a feasibility study for the improvement of highways and bridges to establish an improvement schedule in accordance with priority ranking based on the basic plan.
iii) To prepare a programme of implementation and construction methods for the recommended projects.

4. Area to be covered by the study

The study for the basic plan shall cover all National Highways, but the feasibility study will cover the following three routes leaving out Dantak (an organization of the Government of India) administrative routes. (See Appendix-1)

Routes to be covered by the feasibility study:

Thimphu-Tashigang highway	- 546km
Wangdiphodrang-Damphu-Gaylephug highway	- 153km
Tongsa-Shemgang- Gaylephug highway	- 244km

5. Scope of the study

In order to achieve the objectives mentioned above, this study shall cover Socio-economic and technical studies including field surveys, enviromental study, economic analysis and other related works as shown below:

1. Existing Socio-economic conditions
i) Collection of existing data/informations
ii) Analysis of existing socio-economic conditions

2. Socio-economic framework study
i) National development scenario/pattern analysis
ii) Determination of socio-economic frameworks

3. Traffic Survey and Analysis
i) Data collection and analysis
ii) Traffic surveys (Traffic count/travel speed survey) and analysis

4. Traffic demand forecast
i) Analysis of traffic growth rate
ii) Future traffic volumes

5. Collection and review of existing data related to the road sector
Road network under different categories
Road/bridges inventory data
Road Classification and design standards
Organization/Institutions on the sector

6. Physical conditions survey
i) Collection of existing data
ii) Road/bridge inventory survey
iii Topography/Disaster survey
iv) Soil/Materials survey
v) Hydrologic/Hydrographic survey
vi) Loading test

Identification of issues on the National Highway improvement / Bridge replacement.

8. Basis plan for the national highway/Bridge replacement project
i) Candidate lists of the projects (Organisational setup for the Project).

ii Screening to determine priority of the project
iii Proposal for the organization/institutions on the road sector

9. Policies on preliminary design works

10. Preliminary design works
i) Design standard
ii Geometric design
iii Bridge/structure design
iv) Pavement design
v) Drainage facilities design
vi) Traffic facilities design

11. Construction planning
i) Construction method
ii) Implementation schedule

12. Maintenance and operation works
i) Organization for maintenance and operations
ii) Maintenance and operations schedules(Phases)

13. Evaluation of project costs
i) Quantities calculations
ii) Cost estimates

14. Environmental survey
i) Socio-economic impacts
ii) Nature environment

15. Economic analysis
i) Estimation of benefits
ii) Analysis of indirect socio-economic effects
iii Economic analysis and evaluation

16. Conclusions and recommendations
i) Necessity of the project
ii) Implementation of the project

6. Study Schedule

As soon as possible in early 1994

7. Expected major output of the study

i) Basic plan for the formulation of National Highway improvement/Bridge replacement projects.
- Priority ranking of the projects
- Organization/Institutions of the road sector

ii) Emergency/Short-term improvement project
iii Long-terms improvement projects
iv) Programmes of implementation and construction methods for the recommended projects.

Request of the study to other donor agencies

None

5 Other relevant information:

ADB Loan Project on East- West Highway Maintenance Project (Re-surfacing of distressed pavements), starting August '94 for 3 years.

3 Facilities and information for the study team, etc.

i) Counterpart of the implementing agency for the study
ii) Availiable Data, Information, Documents, maps etc, related to the study. Data lists related to the study are shown in Appendix-3.
iii) Information on the Security Conditions in the study area, assurance to be made by Royal Government of Bhutan for the Team's security.

4 Undertakings of the Royal Government of Bhutan;
In order to facilitate a smooth and effecient conduct of the study, the Royal Government of Bhutan shall take following measures:

i) to secure the safety of the study team.
ii) to permit the members of the study team to enter, leave and sojourn in Bhutan in connection with their assignment therin, and exempt them from alien registration requirement and consular fees.
iii) to exempt the study team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of Bhutan for the conduct of the study.
iv) to exempt the study team from income tax and charges of any kind imposed on or in connection with any documents or allowances paid to the members of the study team for their services in connection with the implementation of the study.
v) to provide necessary facilities to the study team for remittance as well as utilization of the funds introduced in Bhutan from Japan in connection with the implementation of the study.
vi) to secure permission of entry into private properties or restricted areas for the conduct of the study.
vii) to secure permission for the study to take all data, documents and necessary materials related to the study out of the Bhutan to Japan.
viii to provide medical services as needed. Its expenses will be chargable to members of the study team.

5. The Royal Government of Bhutan shall bear claims, if any arising against member(s) of the Japanese Study Team resulting from, occuring in the course of or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arises from gross negligence or willful misconduct on part of the member of Study Team.

6 The Public Works Department shall provide the Japanese Study Team with the following, in cooperation with other agencies concerned:

i) Available data and information related to the Study
ii) Counterpart personnel
iii) Suitable office with telephone nd necessary furniture in Thimphu.
iv) Drivers
v) Credentials of identification cards.
vi) Permission for use off radio communication(walkie-talkie).

7. The Public Works Department shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other Governmental and Non- governmental organizations concerned for the smooth implementation of the Study.

The Royal Government of Bhutan assured that the matters related in this form will be ensured for a smooth conduct of the Development Study by the Japanese Study Team.

Signed:

Title:

On behalf of the Royal Government of Bhutan.

Date:

Appendix-3

Available Data Lists


BHUTAN
LEGEND
Capital
Dzongkhag(District) Headquarter
Major Town/Village
Airport
Pass
Dzongkhag(District) Boundary
PWD Administrative
National Highway
DANTAK Administrative
National Highway
District Road
KULA KANGRI 7554
MASANG GANG 7194
GANGKHAR PUNSUM 7529
GANCHEN TA 6714
JICHU DRAKE 6974
JHOMO LHARI 7314
Laya
Gasa
Lingshi
PUNAKHA
Lhedang
LHUNTSEI
BUMTHANG
Lhuntshi
Tashi Yangtse
WANGDIPHODRANG
Punakha
Thimphu
PARO
Paro
Ha
Dochu La
Simtoka
Wangdi-phodrang
Cangte Conpa
Pele La
Yuto La
Jakar
Tongsa
Dra
TONGSA
TASHIGANG
Radi
Sekteng
Tashigang
Mera
Dametsi
Mongar
Shemgang
MONGAR
SHEMGANG
Chhukha
DAGANA
Daga
Dagapela
Damphu
SAMTSHI
Sibsu
Dorokha
Chengmari
Samtchi
CHHUKHA
CHIRANG
GEYLEGPHUG
Phuntsholing
Sarbang
Ceylegphug
Panbang
Nganglam
PEMAGATSEL
Pemagatsel
Trashiyangtse
Thrimshing
SAMDRUP JONGKHAR
Dhanglar
Daifam
Samdrup Jongkhar
Kalikhola
Trunk Road Network

Appendix-I

Tentative Study Schedule

Months		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Work																			
	in Bhutan																		
	in Japan																		
Reports			IC/R							I/R						DF/R			F/R

Note: IC/R Inception Report
I/R Interim Report
DF/R Draft final Report
F/R Final report

Appendix-3

Available Data Lists

1. The 7th Five Year Plan (1992-97), Royal Government of Bhutan
2. General Purpose Map, 1:500,000, 1993
3. Topographical Map, 1:50,000, 1992
4. Landcover, Soil and Water Reflections from LANDSAT Imagery, Scale 1:250,000, 1982
5. Road Construction Manual, Public Works Department(PWD)
6. Specifications for Building & Road Works, PWD
7. Field Manual of Road Maintenance, PWD
8. Road Design Manual, PWD
9. Specifications for Mechanised Road Construction, PWD
10. Drilling and Selection of Drilling Equipment, PWD
11. Bituminous Surface Treatment Manual, PWD
12. Blasting Manual, PWD
13. Survey Manual, PWD
14. Techno-Economic Feasibility Report on Bridge Construction Project, Final Report, Volume-I, Executive Summary & Report, April 1988, Asian Development Bank
15. Road Project, Bhutan, Thimphu to Tashigang National Highway, Final Report, June 1993, Asian Development Bank

Length

ROAD LENGTHS IN BHUTAN

I UNDER DEPARTMENT OF ROADS

Length of National Highway	1013 kms
Length of District Roads	381 kms
Length of Feeder Roads	486 km
Total	1880 kms

II UNDER DANTAK

Length of National Highway	478 kms
Length of District Roads	62 kms
Length of Feeder Roads	16 kms
Total	556 kms

III UNDER DEPARTMENT OF FORESTS

Length of National Highway	NIL
Length of District Roads	NIL
Length of Feeder Roads	470.50 kms
Total	470.5 kms

IV UNDER EDUCATION / ANIMAL HUSBANDRY / AGRICULTURE DEPARTMENTS

Length of Feeder Roads	82 kms

ROAD STATUS IN BHUTAN

1.	Bitumin Sealed Roads	1919 kms
2.	Based Coursed Roads	53 kms
3.	Earthern Roads	1016.5o kms

V TOTAL ROAD LENGTH IN BHUTAN 2988.50 KMS

Appendix-I (Annex - 'A')

Sl.No.	Name of Unit	Total Number of staff
1.	Headquarters	43
2.	Mechanical Cell	14
3.	Survey & Design Cell	20
4.	Road Construction Unit, Wangdue	144
5.	Road Maintenance Unit, Lobeysa	61
6.	Road Maintenance Unit, Trongsa	103
7.	Road Maintenance Unit, Zhemgang	55
8.	Road Construction Unit, Phuentsholing	57
9.	Road Construction Unit, Sarpang	53
10.	Road Maintenance Unit, Limithang	79
11.	Road Maintenance Unit, Trashigang	100
12.	Road Maintenance Unit, Thimphu	56
13.	Road UNCDF Project, Trashigang	52
14.	Stores Unit, Phuentsholing	35
15.	Central Workshop, Gelephu	38
16.	Modular Bridge Workshop, Gelephu	10
	Total :	920

(Annex-'B')

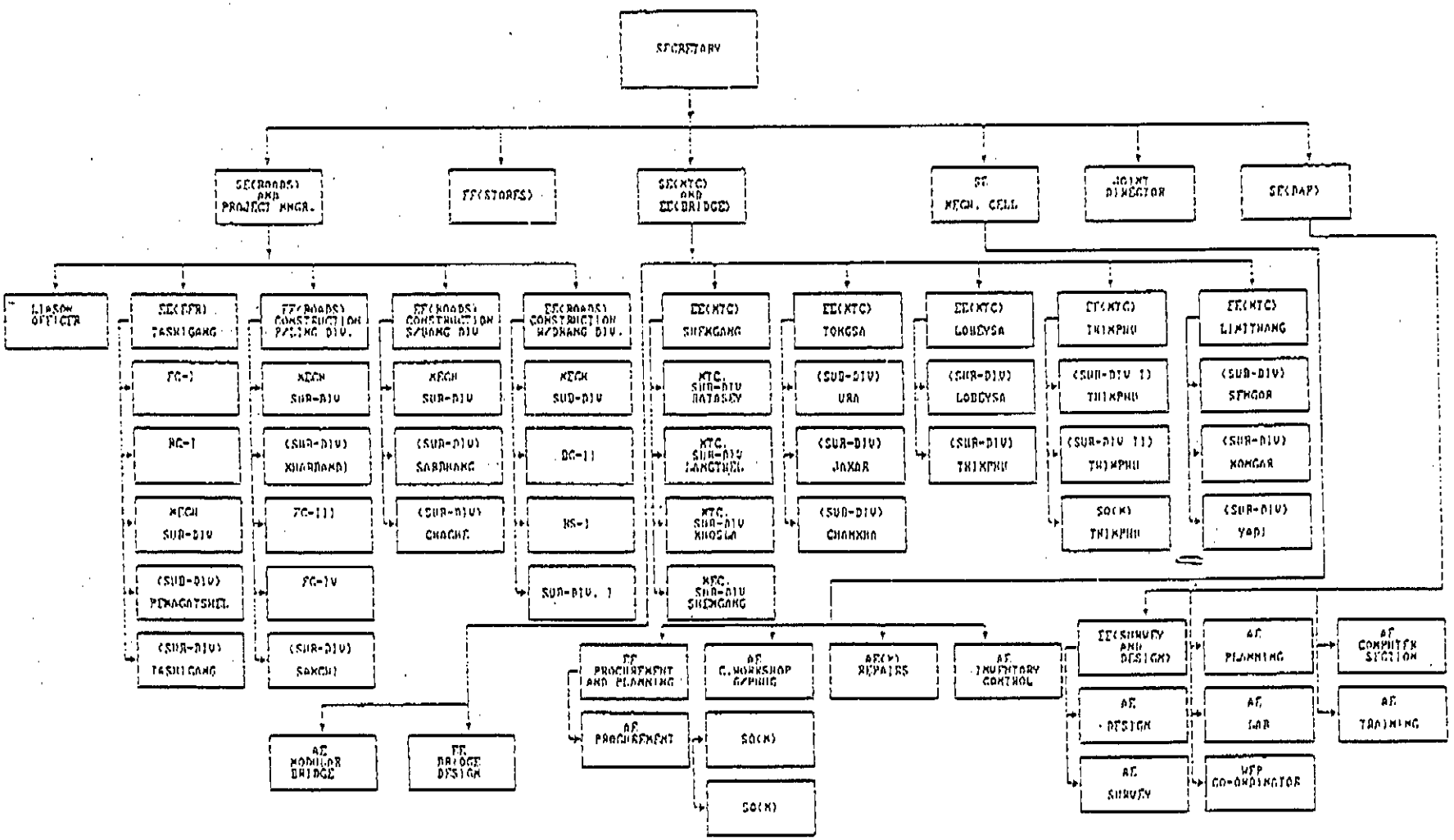
Budget allocated during 93-94 FY.

FUND.XLS

	current	capital
Trongsa Maint. Division	1.74	12.782
Lobesa Maint. Division	2.271	11.749
L/thang Maint. Division	2.619	10.892
Thimphu Maint. Division	1.616	4.116
Zhemgang Maint.Division	1.205	9.914
Sarpang Roads Division	2.473	19.821
P/ling Roads Division	2.572	23.736
Rolong Maint. Division	3.675	9.756
Wangdi Roads Division	1.924	12.19
TOTAL in Ngultrums	20.095	114.956

(Annex-I)

MINISTRY OF COMMUNICATIONS



EXISTING ORGANISATION OF D.O.R. (CHART I)

(edited on 30-06-92)

付属資料2．ブータン政府からの本格調査変更要請内容

ROYAL BHUTANESE EMBASSY
CHANDRA GUPTA MARG
CHANAKYAPURI
NEW DELHI - 110 021

b. The ADB funded project does not cover the construction of permanent bridges. Most of the bridges are of temporary nature, (Bailey types) and they have all outlived their life. The Royal Government has been able to carry out minor periodic maintenance only. Due to lack of resources, no permanent bridges could be constructed. As the bridges are part of the road network, the situation has become critical, and the collapse of any one bridge would mean disruption of road communication for a considerable length of time. A list of the bridges for the consideration of the Japanese government is attached herewith.

c. Other donors involved in the bridges are the Government of India for four bridges and Switzerland for one.

2. Puna-Tsangchhu Hydropower Project Study

With regard to this project, we would like to inform you that there is no charge in the information already sent to your office vide our letter No.RBE/ECO/302-A/2501 dated April 22, 1996.

I may mention here that the Power Master Plan of Bhutan has already been forwarded to the Japanese Embassy vide our letter No.RBE/ECO/302/3012 dated June 21, 1996.

With warm regards,

Yours sincerely,

2.8.96

(Sangye Rinchhen)
Second Secretary

Mr. M. Sasago
Resident Representative
Japan International Cooperation Agency(JICA)
New Delhi

ROYAL BHUTANESE EMBASSY
CHANDRA GUPTA MARG
CHANAKYAPURI
NEW DELHI - 110 021

NO.RBE/ECO/45-A/231

1 August, 1996

RR	O.R.R.	A.R.R. (I)	A.R.R. (II)					

Dear Mr. Sasago,

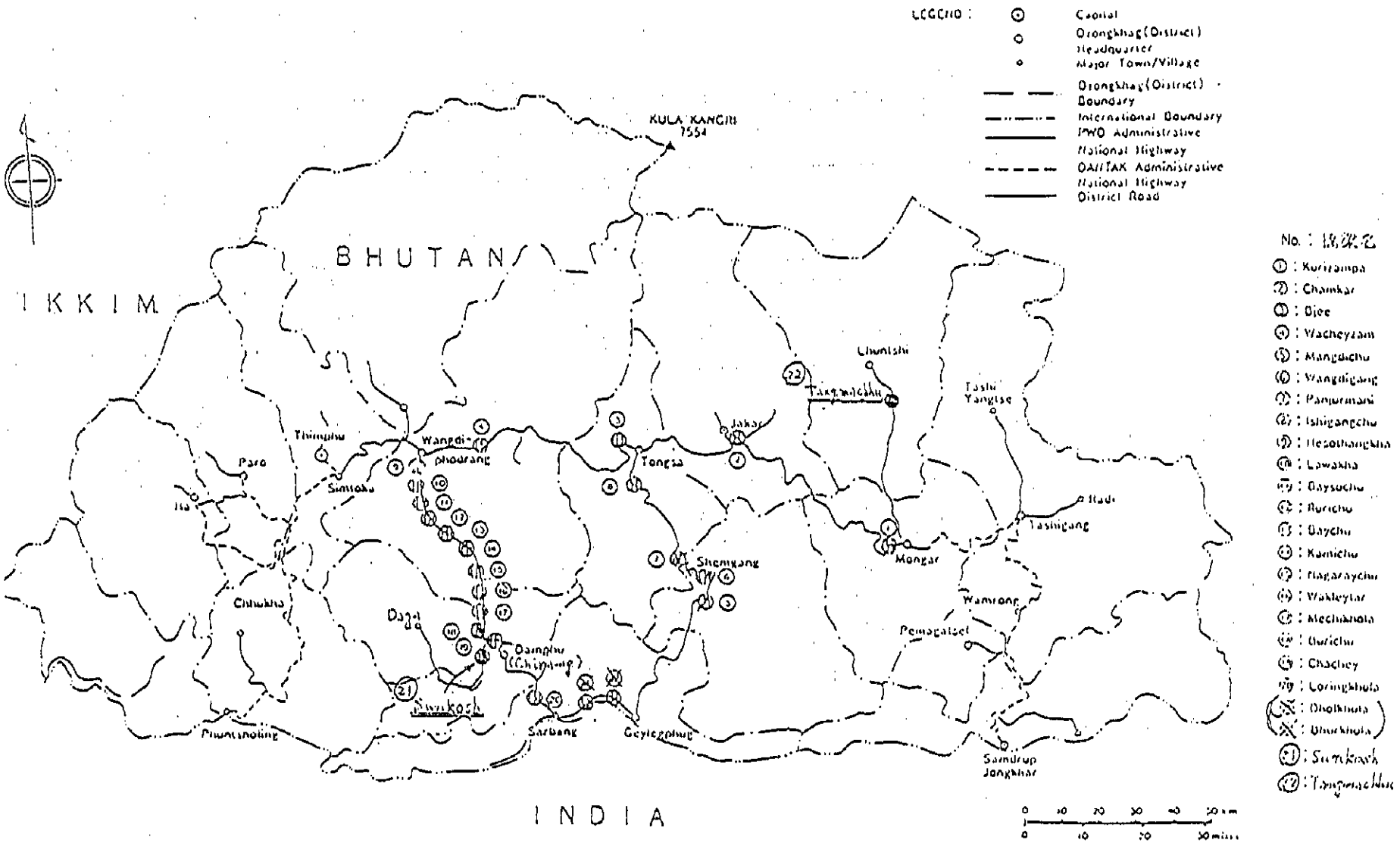
Please refer to your letter dated 20 June, 1996 with regard to the additional informations on (1) Study on National Highways/Bridges replacement project and (2) Study on Punatsangchu Hydropower Project.

In this regard, I have the honour to furnish the following information which are essentially the same as those forwarded vide our letter No.RBE/ECO/302-A/2501 dated April 22, 1996.

1. Improvement of Highways/Bridges Construction

a. The ADB's involvement is only along the East-West highway. The scope of the ADB project is for resurfacing certain stretches of that highway. The project ends by December 31, 1997, and does not cover many aspects such as widening, permanent works, geometric improvements and so on, which are also most essential to reduce accidents, ease the flow of traffic and reduce maintenance costs in the long run.

The Japanese grant assistance could go a long way in bringing the highway to a good standard and give a permanency to its structure, as the highway is very essential for the maintenance of the socio-economic link between the different parts of the country. It benefits many districts and villages along the way, and due to the weakness of the present structure, road communications are disrupted to days and weeks during the winter (snow) and rainy seasons. This cuts off the people from their main supply lines and increases their hardship. Therefore, the project under Japanese assistance will have immense benefit to the people of Bhutan.



No. :
① : Kurtzampa
② : Chamkar
③ : Djee
④ : Wacheyzam
⑤ : Mangdichu
⑥ : Wangdigang
⑦ : Pangarmani
⑧ : Ishigangchu
⑨ : Hesothangkha
⑩ : Lawakha
⑪ : Gaysuchu
⑫ : Buricha
⑬ : Gaychu
⑭ : Kamichu
⑮ : Nagaraychu
⑯ : Wakleytar
⑰ : Mechhanola
⑱ : Gurichu
⑲ : Chachey
⑳ : Loringkhola
㉑ : Dhalkhola
㉒ : Dhurkhola
㉑ : Samtokha
㉒ : Tongmachhu

No.	路線名、橋梁名	位置 (Km)	橋梁形式	橋長 (m)	幅員 (m)	許容荷重 (ton)	建設年
A.	EAST-WEST HIGHWAY (TRASHIGANG-THIMPHU)						
①	1 Keri Zampa	116.00	TSR Bailey	43.0	3.4	7	1971
②	2 Chamkar Zam	283.52	DS Bailey	34.0	3.4	15	1978
③	3 Bjee Bridge	358.60	TSR Bailey	43.0	3.4	9	1969
④	4 Wachey Zam	468.00	DSR Bailey	34.0	3.4	18	1969
B.	SARBANG-GELEPHUG-TRONGSA HIGHWAY (GELEPHUG-TRONGSA)						
⑤	1 Mangdi Chu	98.00	BS Bridge	98.0	3.4	4	1965
⑥	2 Wangdigang	155.60	DS Bailey	34.0	3.4	24	1969
⑦	3 Panjurnani	169.00	SS Bailey	27.0	3.4	18	1995
⑧	4 Ishigang Chu	224.65	RCC T-Beam	37.0	3.4	40	1981
	(GELEPHUG-SARBANG)						
	1 Bhur Khola	9.03	RSJ Girder	8.0		40	1973
	2 Dhol Khola	20.00	DS Bailey	31.0		18	1991
C.	WANGDI-THIRANG-SARBANG HIGHWAY (WANGDI-THIRANG)						
⑨	1 H/Thanktha Bridge	2.50	SS Bailey	9.0	3.4	18	1985
⑩	2 Lawakha Bridge	8.90	DS Bailey	31.0	3.4	18	1988
⑪	3 Bayso Chu	13.80	SS Bailey	18.0	3.4	15	1985
⑫	4 Ruri Chu	16.50	SS Bailey	15.0	3.4	18	1987
⑬	5 Bay Chu	24.05	SS Bailey	15.0	3.4	17	1985
⑭	6 Kami Chu	32.00	SS Bailey	18.0	3.4	15	1986
⑮	7 Ngaray Chu	52.00	DS Bailey	31.0	3.4	24	1992
⑯	8 Wakleytar Bridge	54.00	BS Bridge	73.0	3.4	18	1987
⑰	9 Mechi Khola	59.00	Modular Bridge	18.0	3.6	8	1990
⑱	10 Buri Chu	69.00	DS Bailey	27.0	3.4	18	1985
⑲	11 Chachey Chu	75.00	TS Bailey	37.0	3.4	18	1990
	(SARBANG-THIRANG)						
⑳	1 Lhoring Khola	20.00	DDR Bailey	49.0	3.4	18	1992
	(MONGAR - LHUNTSI)						
㉑	Tangmachhu	–	BS Bridge	85.3	–	18	1982
	(CHIRANG - DAGA)						
㉒	Sunkosh	–	BS Bridge	85.3	–	24	1982

(参照) 橋梁形式

TSR Bailey — Triple Single Reinforced Bailey Bridge
DS Bailey — Double Single Bailey Bridge
DSR Bailey — Double Single Reinforced Bailey Bridge
BS Bridge — Bailey Suspension Bridge
SS Bailey — Single Single Bailey Bridge
RCC T-Beam — Reinforced Concrete T-Beam Bridge
Modular Bridge — Wooden-Truss Bridge
TS Bailey — Triple Single Bailey Bridge
DDR Bailey — Double Double Reinforced Bailey Bridge

付属資料３．Scope of Works

SCOPE OF WORK
FOR
THE STUDY
ON
NATIONAL HIGHWAY BRIDGE CONSTRUCTION
IN
THE KINGDOM OF BHUTAN

AGREED UPON BETWEEN
MINISTRY OF COMMUNICATIONS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

THIMPHU, April 22, 1997

Dasho Dorji Tenzing
Secretary
Public Works Division
Ministry of Communications

Minoru Arita
Leader,
Preparatory Study Team
Japan International
Cooperation Agency

I. INTRODUCTION

In response to the request of the Royal Government of Bhutan, the Government of Japan has decided to conduct the Study on National Highway Bridge Construction in the Kingdom of Bhutan (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Kingdom of Bhutan.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study is:

- to carry out a feasibility study for the improvement of selected bridges on national highways in order to facilitate efficient movement of goods and passengers in rural areas

III. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study shall cover the following items:

1. Data Collection and Analysis
   - ① Socio-economic data
   - ② Land use conditions
   - ③ Traffic data
   - ④ Topographic data
   - ⑤ Geological data
   - ⑥ Meteorological and hydrogical data
   - ⑦ Bridges and Road Conditions
   - ⑧ Development plans
   - ⑨ Road related administration and bidgetary situation

⑩ Disaster records
⑪ Bridge and road related facilities design standards
⑫ Environmental conditions and relevant legislation
⑬ Construction materials

2. Field Reconnaissance Survey
   ① Supplemental sectional traffic, road side OD and travel speed surveys
   ② Preliminary Road and Bridge Observation
3. Identification of Damaged and Bottleneck Sections on National Highways
4. Formulation of Socio-economic Framework
5. Forecast of Future Traffic Demand
   ① Preparation of present OD table
   ② Preparation of future OD table
   ③ Traffic assignment
6. Determination of Design Standards
7. Economic Evaluation
8. Initial Environmental Evaluation (IEE)
9. Setting up a Criteria for Selection of Bridges for the Study on Bridge Construction Alternatives Including Approach Road
10. Selection of Bridges for the Feasibility Study and for Bridge Construction Alternatives including Approach Roads
11. Detailed Field Surveys for Selected Sections
    ① Natural condition surveys
      a. Topographic survey
      b. Geological survey
      c. Construction material survey
    ② Bridge and approach Road condition survey
    ③ Hydrogic/Hydrographic survey
    ④ Environmental Survey
12. Bridge Construction Alternative Study (including type of bridge)
13. Preliminary Engineering Design
14. Environmental Impact Assessment (EIA)
15. Preparation of Construction Plan
16. Preparation of Maintenance Plan
17. Cost Estimates
18. Economic Evaluation of the Project
19. Preparation of Project Implementation Program
20. Overall Project Evaluation and Recommendations

IV STUDY SCHEDULE

The Study will be carried out in accordance with the attached tentative study schedule (APPENDIX).

V. REPORTS

JICA shall prepare and submit the following reports in English to the Royal Government of Bhutan.

1. Inception Report
   Ten (10) copies
   At the beginning of the Study in Bhutan.

2. Progress Report (1)
   Ten (10) copies
   Within three (3) months after the beginning of the Study

3. Interim Report
   Twenty (20) copies
   Within five (5) months after the beginning of the Study

4. Progress Report (2)
   Ten (10) copies
   Within eight (8) months after the beginning of the Study

5. Draft Final Report
   Twenty (20) copies
   Within eleven (11) months after the beginning of the Study

The written comments on the Draft Final Report from the Royal Government of Bhutan shall be delivered to JICA within four (4) weeks after receipt of the Draft Final Report.

6. Final Report
   Thirty (30) copies
   Within two (2) months after the receipt of the written comments on the Draft Final Report from the Royal Government of Bhutan.

VI. UNDERTAKINGS OF THE ROYAL GOVERNMENT OF BHUTAN

1. To facilitate smooth conduct of the Study, the Royal Government of Bhutan shall take the following necessary measures:

(1) To secure the safety of the Japanese Study Team (hereinafter referred to as "the Team") in Bhutan,

(2) To permit the members of the Team to enter, leave and stay in Bhutan for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

(3) To exempt the members of the Team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of Bhutan for the conduct of the Study,

(4) To exempt the members of the Team from income taxes and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study,

(5) To provide the necessary facilities to the Team for remittances as well as utilization of fund introduced into Bhutan from Japan in connection with the implementation of the Study,

(6) To secure permission for entry into private properties or restricted areas for implementation of the Study,

(7) To secure permission for the Team to take all data and documents related to the Study out of Bhutan to Japan, and

(8) To provide medical services as needed. Its expenses will be chargeable on the members of the Team.

3. The Royal Government of Bhutan shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Team.

4. Public Works Division, Ministry of Communications shall act as counterpart agency to the Team and as coordinating body in relation with other governmental

and non-governmental organizations concerned for the smooth implementation of the Study.

5. Public Works Division, Ministry of Communications shall, at its own expense, provide the Team with the followings, in cooperation with other organizations concerned;

(1) available data and information related to the Study, including aerial photographs and maps,
(2) counterpart personnel,
(3) suitable office space with necessary equipment in Thimphu, and
(4) credentials or identification cards
(5) to arrange appropriate number of vehicles with drivers

Ⅳ. UNDERTAKINGS OF JICA

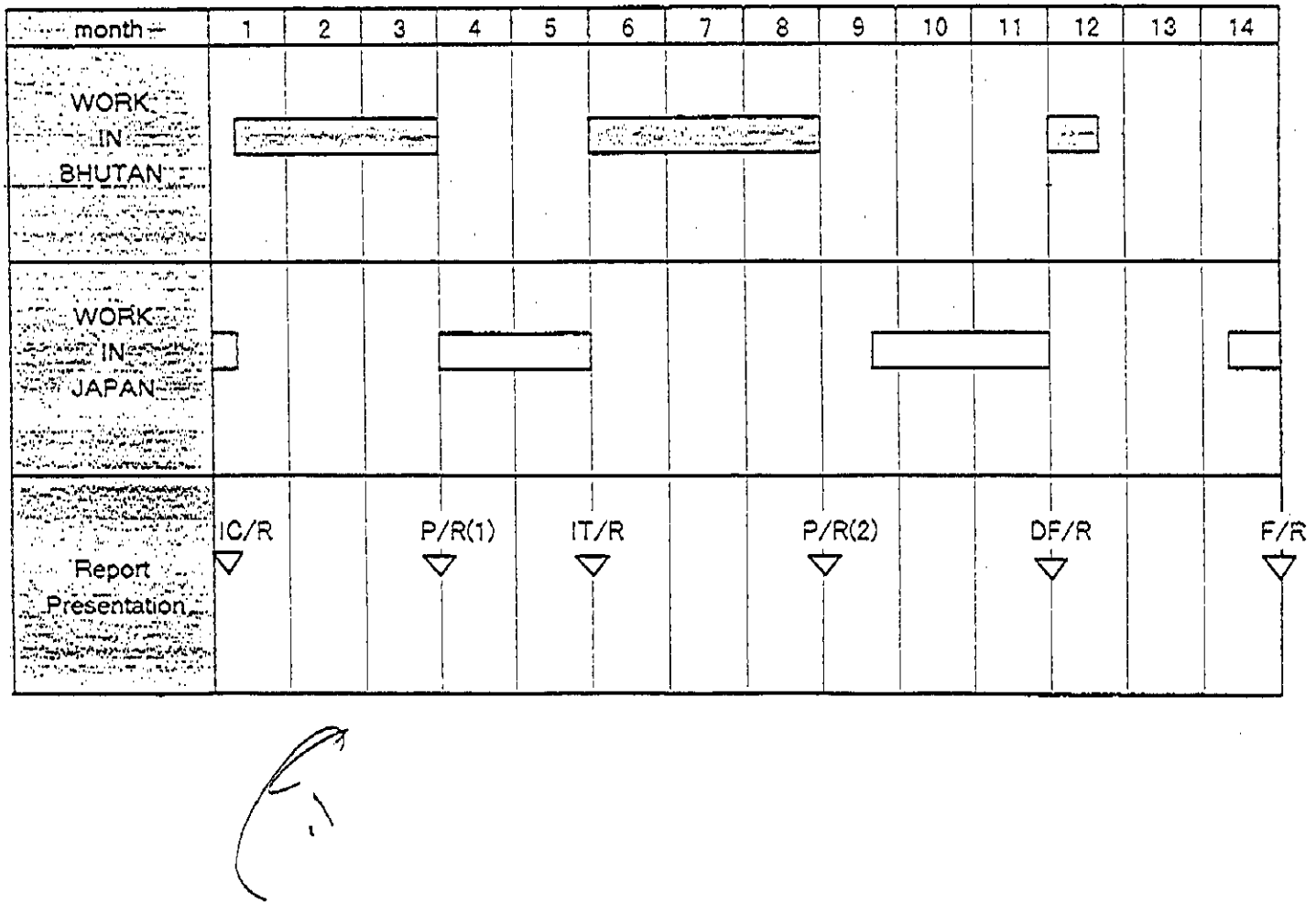
For the implementation of the Study, JICA shall take the following measures:

(1) to dispatch, at its own expense, the Team to Bhutan, and
(2) to pursue technology transfer to Bhutanese counterpart personnel in the course of the Study.

Ⅴ. OTHERS

JICA and Ministry of Communications shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Tentative Schedule



付属資料4．Minutes of Meeting

MINUTES OF MEETING
FOR
THE STUDY
ON
NATIONAL HIGHWAY BRIDGE CONSTRUCTION
IN
THE KINGDOM OF BHUTAN

AGREED UPON BETWEEN
MINISTRY OF COMMUNICATIONS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

THIMPHU, April 22, 1997

Dasho Dorji Tenzing
Secretary
Public Works Division
Ministry of Communications

Minoru Arita
Leader,
Preparatory Study Team
Japan International
Cooperation Agency

The Preparatory Study Team was organized by Japan International Cooperation Agency (JICA) and dispatched to Bhutan from 13th April to 30th April, 1997. The team conducted site survey and had a series of discussions with the officers and engineers of Public Works Division (hereinafter referred to as "PWD"), Ministry of Communications. List of attendants is as shown in Annex 1.

Through exchange of opinions and discussions, both PWD and JICA preparatory study team agreed upon the scope of work as per hereto attached. The major points discussed in connection with the scope of work are the following.

1. Title of the Study

Both sides agreed to use 'The Study on National Highway Bridge Construction in the Kingdom of Bhutan' as the title of this study.

2. Study Area

Both sides agreed that the study should cover the twenty-two Bailey bridges controlled by PWD on Thimphu-Tashigang Wangdi-Chirang, Tongsa-Geyleyphu, Chirang-Sunkosh and Mongar-Lhuntsi National Highways. (National Highway means road connecting two or more district capitals.)

The list of the twenty-two bridges is as shown in Annex 2.

And both sides agreed that feasibility study should be conducted on up to five bridges out of the above-mentioned twenty-two bridges.

3. Vehicle Load for the Bridge Design

Japanese side explained that the vehicle load for the bridge design should not be based on any military purpose.

4. Target Year for the Traffic Demand Forecast

Both sides agreed that the target year for the traffic demand forecast would be 2020.

5. Undertaking of the Kingdom of Bhutan / Undertaking of JICA

(1) Traffic Survey and Topographic Survey

Both sides agreed that the required traffic, topographic survey (scale 1:200) at the selected bridge sites for the feasibility study should be undertaken by PWD at its own expense.

[illegible]

(2) Environmental Survey

Both sides agreed that Japanese expert (s) and Bhutanese counterpart (s) would cooperate to carry out environmental survey.

(3) Geological Survey

There is no private consulting company in Bhutan. PWD strongly request the study team to contract with Division of Geology and Mines, Ministry of Trade and Industry of Bhutan to be the subcontractor for drilling. The request letter, which is conveyed to JICA headquarters, is as attached in Annex 3.

(4) Road Maintenance

Japanese sides confirmed that Bhutanese side would make every effort to maintain the national highways as mentioned under '2. Study Area' in order to keep the highways open all seasons.

(5) Steering Committee

Both sides agreed that the Royal Government of Bhutan would establish steering committee consisting of PWD / Ministry of Communications, Ministry of Finance, Ministry of Trade and Industry, National Enyironment Commission, and Survey of Bhutan.

(6) Office Equipment

With reference to the item VI 5. (3) in Scope of Work, PWD request that office equipment such as telephone, facsimile machine, and copy machine should be prepared by Japanese side. JICA preparatory study team conveys this request to JICA headquarters.

(7) Vehicles

Reliable four-wheel drive vehicles are not readily available in Bhutan. Therefore, with reference to the item VI 5. (5) in Scope of Work, PWD strongly request that JICA provide appropriate numbers of vehicles to be used while the study team is in Bhutan. JICA preparatory study team conveys this request to JICA headquarters.

(8) Survey Equipment

Bhutanese side strongly request JICA to provide GPS instrument, since all bridge sites are not accurately located on the map because of lack of accurate x-y-z measuring instrument. JICA preparatory study team conveys this request to JICA headquarters.

(9) Counterpart Training

With reference to the item VII (2) in Scope of Work, PWD request that counterpart training in Japan should be considered as a means of technology transfer. JICA preparatory study team conveys this request to JICA headquarters.

Annex 1

LIST OF ATTENDANTS

BHUTANESE SIDE

- Ministry of Communications -	
HE Dasho Leki Dorji	Deputy Minister
Dasho Dorji Tenzing	Secretary, Public Works Division (PWD)
Mr. Thering Dorji	Director, PWD
Mr. Phuntsho Wangdi	Superintending Engineer, PWD
Mr. Y.N.Sharma	Assistant Bridge Engineer, PWD
- Ministry of Finance -	
Mr. Wangdi Norbu	Joint Secretary, National Budget and Aid Coordination Division (NBACD)
- Ministry of Trade and Industry -	
Mr. Yeshi Dorji	Senior Engineering Geologist, Division of Geology and Mines
- National Environment Commission-	
Mr. Tshering Tashi	Deputy Director / Head of RNR Division
- Survey of Bhutan -	
Mr. Choeki Khorlo	O.C. Topography Division

JAPANESE SIDE

- JICA Preparatory Study Team -	
Mr. Minoru Arita	Team Leader
Mr. Hiroshi Yoshida	Member of the Team
Ms. Tomoko Nishiuma	Member of the Team
Mr. Kunio Ohashi	Member of the Team
Mr. Hiroshi Nakamura	Member of the Team
Mr. Toshiaki Tanaka	Deputy Resident Representative, JICA India Office

LIST OF BRIDGES PROPOSED UNDER GOVT OF JAPAN ASSISTANCE

Sl No	Name of Bridge	Tentative Span (m)	Unit Cost (Nu/m) million	Total Cost (Nu) million
1	Kurizampa	50	0.45	22.50
2	Chamkar	45	0.45	20.25
3	Bjee Bridge	50	0.45	22.50
4	Wachey Zam	45	0.45	20.25
5	Mangdichu	120	0.45	54.00
6	Wangdigang	45	0.45	20.25
7	Panjurmani	35	0.45	15.75
8	Ishigangchu	65	0.45	29.25
9	Hesothangkha	25	0.45	11.25
10	Lawakha	40	0.45	18.00
11	Basochu	30	0.45	13.50
12	Rurichu	25	0.45	11.25
13	Baychu	25	0.45	11.25
14	Kamichu	30	0.45	13.50
15	Ngaraychu	45	0.45	20.25
16	Wakleytar	100	0.45	45.00
17	Mechikhola	30	0.45	13.50
18	Burichu	45	0.45	20.25
19	Chanchey	50	0.45	22.50
20	Loringkhola	60	0.45	27.00
21	Tangmachu	120	0.45	54.00
22	Sunkosh	120	0.45	54.00
		1200 m		540.00 million

Annex 3

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATION
PUBLIC WORKS DIVISION

P.B No. 143
THIMPHU
BHUTAN
TEL :23117/22430

No. PWD/JICA/96-97/ 3602

Date: 22/ 4/1997

The Team Leader
Preparatory Study Team
The Study on National Highway Bridge Construction
in the Kingdom of Bhutan

Dear Sir,

It is to inform you that there are no private consultants available for carrying out the Sub-Soil Investigation of Bridges in the kingdom of Bhutan. The Division of Geology & Mines under the Ministry of Trade & Industries is the only sole agent responsible for Sub-Soil Investigation.

Therefore, the Division of Geology & Mines will under take the above work for the Study for which necessary payments will have to be made from the JICA fund. The PWD would desire Geology & Mines to under take the job in preference to foreign Consultants given their experience & competance in this field.

Thanking you

Yours faithfully

[Dorji Tenzing]
SECRETARY

ROYAL GOVERNMENT OF BHUTAN

ANSWERS TO QUESTIONNAIRE OF JICA PREPARATORY STUDY TEAM FOR THE STUDY ON NATIONAL HIGHWAY/BRIDGE REPLACEMENT PROJECT IN THE KINGDOM OF BHUTAN

I GENERAL

(1) Background and Priority of the Project

Lack of a well-developed transport network in Bhutan has been the major constraints to the development of more remote areas of the country. While a considerable proportion of early Five Year Plans were devoted to the development of basic road infrastructures, the majority of the population still remain at considerable distances from motor roads. This increases the cost for providing services to the remote settlements and reduces viability of cash crops or industrial production in the areas. The provision of adequate road network in Bhutan like anywhere else in the world is the prerequisite for the socio-economic development of the Kingdom. The all time objective of the Road Sector is to construct and maintain all category highways and bridges to facilitate the efficient movement of goods and passengers.

Motor Road construction in Bhutan began in 1959 with the assistance from the Government of India. The construction & maintenance of roads is technically difficult because of the fragile topography lending itself to high risks of landslides during the monsoon period. The roads alignment follow valleys, deep gorges and steep hillsides making road construction technically more demanding and a very costly investment for the Royal Government of Bhutan.

Bhutan's terrain means, all roads have to make frequent river crossings. Many of the bridges built in 1960's are already in a very precarious condition. Most of the bridges were constructed as temporary structures [Bailey steel/suspension & wooden bridges with stone masonry substructures] and they have already passed their design lives and most of the bridges are now suitable for light vehicles only. Replacement of these temporary structures by a permanent bridge is a most & for obvious reasons to enhance the capacity of the structures while consolidating the life line of the country's road network system for higher load capacity will permit safe movement of goods and passengers. The project initially envisaged replacement of 22 existing temporary bridges across the Kingdom's Highways.

(2) Existing condition of the Project National Highway and Bridges with Priority for improvement and replacement.

At present, Bhutan has the following important National Highways:

East - West Lateral Highway [Thimphu - Trashigang]	546 Km
Gelephu - Zhemgang - Trongsa Highway	244 Km
Gelephu - Sarpang - Tsirang -Wangdue Highway	187 Km
Thimphu - Phuntsholing Highway	179 Km
Samdrupjongkhar - Trashigang Highway	180 Km

The Lateral East - West Highway connects the capital Thimphu in the West with Trashigang in the East. It is connected to Southern Bhutan by four North - South Highways. The Public Works Division [PWD], Ministry of Communication is in charge of Lateral Highway, Gelephu - Zhemgang- Trongsa highway and Gelephu - Sarpang - Tsirang - Wangdue Highway. A length of about 116 Km from Trashigang to Kurichu [part of Lateral Highway] has been handed over to Border Road Organisation, Govt of India for improvement to facilitate the movement of heavy machinery & materials for the Kurichu Hydro Power Project. The ADB project has been launched for the surface improvements on the Lateral Highway for the identified stretches only. There are four temporary bridges that are identified to be replaced on this road.

Trongsa - Zhemgang - Gelephu Highway is another important highway connecting Central Bhutan with India. The road alignment passes through young mountainous terrain, consisting of thick forest, soft soil, sinking & slide prone areas and rocky outcrops. There are four temporary bridges that are identified to be replaced on this road by permanent ones.

Gelephu - Sarpang - Tsirang - Wangdue is an equally important highway connecting interior Western regions to Southern Bhutan and India. The road starts from Wangdue Bridge and the alignment passes through the almost vertical slopes of the Sunkosh Valley on its right bank up to almost 60 Km. The road climbs up towards Tsirang after 75Km and descends down hill up to Sarpang for almost 60 Km. The 28Km road stretch between Sarpang & Gelephu is in the foothill plains. There are 12 temporary bridges that are identified to be replaced by the permanent bridges for the safe movement of essential goods & passengers within Bhutan and between Bhutan & India.

The Kingdom's national highways are characterised by sharp hairpin bends in horizontal alignment at numerous places, insufficient sight distances, narrow carriageways, surface deterioration & slope failures. Moreover, seasonal damages such as landslides, slope failure, rock fall, snowfalls and flash floods occur more frequently due to monsoonal downpours.

(3) Actions/discussion having been undertaken/being undertaken between the Royal Government and international organizations (such as ADB, UNCDF, USAID etc.) in connection with the implementation of the project.

The ADB's ongoing project is involved in resurfacing and minor improvement of only 420Km of East - West Lateral Highway and have no relationship with the implementation of Highway Bridge/Replacement Project.

Actions/discussions between the Royal Government and ADB, UNCDF, USAID etc. has never been undertaken/being undertaken in connection with the implementation of this project.

However, A preliminary Study on the National Highway/Bridge Replacement Project was under taken by the Infrastructure Development Institute of Japan [IDIJ] under the Ministry of Construction, the Government of Japan in March 1994 in connection with this Project.

(4) Possible action to be under taken by the Royal Government of Bhutan [RGOB] based upon the out put of the Study.

The PWD, RGOB shall act as counterpart agency to the Japanese Team and also as coordinating body in relation with other governmental and non-governmental organisations and will take all necessary measures for smooth and efficient implementation of the Project.

(5) The name of the agencies responsible for the following action and roles [together with organisation charts]

5.1 Road & Bridge development planning [National District, Municipal]
5.2 Road & Bridge construction [National, District, Municipal]
5.3 Road & Bridge improvement/betterment [National, District, Municipal]
5.4 Road & Bridge maintenance/ management [National, District, Municipal]

The Public Works Division, Ministry of Communication is responsible for the above work. The organisation chart is attached.

(6) **Names of agencies and the person in charge of the following for additional information.**

6.1 **Permission to take aerial photos**

The Survey of Bhutan, Ministry of Home Affairs

6.2 **Custody of topographic maps/aerial photos and topo surveying.**

The Survey of Bhutan/PWD

6.3 **Conservation Area(Environmental)**

National Environment Commission

6.4 **Geological data/information.**

Division of Geology & Mines, Ministry of Trade & Industries

(7) **Budgetary/manpower/construction equipment situations of Ministry of Transport for the past five years:**

List of equipments, Budgetary & Manpower attached

(8) **Outline of road sector development master plan:**

Refer to Bhutan 8th Five Year Plan Documents

(9) **Details of existing and on going major road development projects:**

Refer to Eight Five Year Plan Vol II project profile

9.1 **Major design specifications**
Available in PWD headquarter

9.2 **Implementation schedules**
To decide after study by mission

9.3 **Current Project status.**
Under Study

(10) Current situation of Public Sector reformation and its future prospects in road sector: (Ex: Role delineation of public/private sectors, number of private construction companies, future reformation policy etc)

The PWD through ADB has awarded the resurfacing works of East - West highway to five different private companies. The experience with these companies has been so far promising to the hopes & aspirations of the Department. The restoration works, i.e. constructions of Retaining/Breast walls are mainly carried out through Petty Contractor which is so far successful. However, bridge work being a specialised job, the execution is taken up departmentally. There are no good experience Private Construction Company to execute the Bridge works. The following categories of private companies/contractors are available as of 1996.

10.1	Class A Contractor	36 Nos
10.2	Class B Contractor	29 Nos
10.3	Class C Contractor	87 Nos
10.4	Class Petty Contractor	307 Nos

11. AVAILABILITY OF DATA/INFORMATION

1. TECHNICAL DATA/INFORMATION

Note:- Please mark for the Data/item in the "Availability" which is available.

Item	Description	Availability		Name of Materials
		Available	Place of Availaility	
4. Traffic data on the Project roads.	(1). Location of traffic count and O-D Survey stations in the Study Area	Yes	Thimphu	PWD
	(2) Traffic volume by type of vehicle.	Yes	Thimphu	PWD
	(3) Registered number of vehicles by district	Yes	Thimphu	Stastical Year Book of Bhutan
	(4) Record of traffic accidents(type, causes, location, etc.	Yes	Thimphu	"
	5. Vehicle O-D matrices.			
5. Hydrological data.	1. Hydrological data of rivers related with Project Road and Bridge.	Yes	Thimphu	Power Division & 8FYPD
	2. Location of water level recording stations in rivers related with Project Road and Bridge.	Yes	Thimphu	Power Division & 8FPD
6. Land use plans and maps				
7. Specification and standard	1. Geometric standard	Yes	Thimphu	Road Design Manual
	2. Bridge standard	Yes	Thimphu	IRC Bridge Code
	3. Pavement standard	Yes	Thimphu	Road Design Manual
	4. Environment standard.	Yes	Thimphu	NEC Standards
	5. Maintenance manual	Yes	Thimphu	PWD Mtc Manual
	6. Others.			

8. Road and Bridge related cost.	1. Construction cost by type of road, bridge and location. 2. Maintenance cost by type of road. Bridge and location. 3. Construction materials costs 4. Unit costs for major work items.	Yes Yes Yes Yes	Thimphu Thimphu Thimphu Thimphu	PWD Office PWD Office BSR/PWD Office PWD office
9. Maps to be used for field investigation	1. Topographic maps covering the study area(most accurate)	Yes	Thimphu	PWD office
10. Availability of aerial photos and topographic maps.	1. Aerial photos(1/~~10,000~~ 15,000) (Year) 2. Topographic maps(1/50.000) 3. Topographic maps(1/25.000), etc.	~~Yes~~ No. Yes	Thimphu Thimphu	Bhutan Survey PWD
11. Geological data	1. Geological maps covering the study area 2. Existing report about data/information such as: - Location of soft ground - Results of geological/soil investigation such as boring data and results of soil test at the bridges sits.	Yes	Thimphu	Gelogy & Mines
12. Geodetic data	1. Triangulation point network 2. Bench mark network 3. Points description(Control point, Bench mark) 4. Triangulation point data lists.			
13. Meteorological data	1. Monthly rainfall data(daily rainfall data, if possible) 2. Temperature 3. Others.	Yes Yes	Thimphu Thimphu	Power Division Power Division
14. Earthquake data.	1. List of recorded earthquake			

1986-1987
S of India

2. SOCIO-ECONOMIC DATA/INFORMATION

Item	Description	Availability		Name of Materials
		Availability	Place of Availibility	
1. Latest socio-economic indices	1. GNP and GDP	Yes	Thimphu	SYB/8fyp of Bhutan
	2. Population by district	Yes	Thimphu	SYB/8fyp of Bhutan
	3. Past and future population growth rate	Yes	Thimphu	SYB/8fyp of Bhutan
	4. Industrial, agricultural and mining products(by main sort)	Yes	Thimphu	SYB/8fyp of Bhutan
	5. Foreign trade(quantity and value)	Yes	Thimphu	SYB/8fyp of Bhutan
	6. Tourism development plans	Yes	Thimphu	SYB/8fyp of Bhutan
	7. Others.			
2. Existing development plans and report.	1. Economic development plans	Yes	Thimphu	Bhutan 8th Five Year Plan Documents
	2. Transportation development plan	Yes	Thimphu	
	3. Industrial development plans	Yes	Thimphu	
	4. Mining and agricultural development plans	Yes	Thimphu	
	5. Forecast of socio-economic indicators.	Yes	Thimphu	

3.ENVIRONMENTAL ISSUES

Item	Description	Avalability		Name of Materials
		Availability	Place	
1. Legislation	1. Law/guidelines Environmental Impact Asst asse	Yes	Thimphu	NEC office
	2. Quality Standards			
2. International Convention on environmental conservation	1. Bilateral convention	?		
	2. Multilateral convention			
3. Information on present situation of the project area.	1. Socio-Economic environment			
	- Main industry of source of income of the residents.	Yes	Thimphu	Stastical Year Book of Bhutan & 8FYP Documents
	- Location of the community which might be spilt by the project.			
	- Number and distribution of schools, hospitals, religious facilities.	Yes		
	- Cultural property or archaeological site.			
	- Use of river/lake water, i.e domestic, industrial and agricultural.	Yes		
	- Existence of common land.			
	2. Natural environment			
	- Availability of meteorological data	Yes		
	- Availability of hydrological data	Yes		
	- Availability of land use and vegetation map	yes		
	- History of natural disaster, landslide, earthquake and flood.			
	- Areas affected by soil erosion			
	- Location of environmentally vulnerable areas such as wetland(swamp)			
	- Species of Valuable animals and plants living in the project area.	yes		
	- Location of particular areas officially protected such as national parts and wildlife reserve.			
	- Distribution of important landscape or scenery for tourism.			
	- EIA report(road construction or restoration)			
	3.Quality of life.			
	- Present air quality.			
	- Regulation on emission gas			
	- Present water quality	Yes with NEC in draft form.		
	- Regulation on effluent			
	- Present condition of soil contamination			
	- Regulation for prevention of soil contamination			
	- Present condition of noise and vibration			
	- Regulation for prevention of noise and vibration			

4. OTHER INFORMATION

Item	Description	Availability		Name of Materials
		Availability	Place of Availability	
1. Availability of the Government's equipment/instruments/apparatus for the Study.	1. List up equipment/instruments/apparatus which are available for the Study by the following category with the following information: a) Category - instrument for topographical survey - Apparatus for geological/soil investigation. - Apparatus for traffic survey - Computer - Services Vehicle - Others b) Information - Make - Model - Characteristics (for capacity) - Number of unit - Conditions	 yes yes yes yes No		
2. Local Consultants. 1. Please provide list of registered consulting firms or relevant organizations. Also please recommend five main consultants by specialization for sub-contractor.	- Traffic Survey - Environmental survey - Geological survey - Topographical survey - Socio-economic survey	 No No No No No		

ITEM	Description	ailability		Name of Material
		Availibility	Place	
2. Bidding Rate	-Traffic engineer	yes	Thimphu	Rate US$600
	-Assistant Traffic engineer	yes	Thimphu	Rate US$500
	-Traffic Surveyor	yes	Thimphu	Rate US$300
	-Geological Surveyor	yes	Thimphu	Rate US$600
	-Topographic Surveyor	yes	Thimphu	Rate US$300
	-Economist	yes	Thimphu	Rate US$600
3. Please provide us cost estimate for field survey from local consultants under the following conditions	a. Sectional traffic count for 12hrs at 10 stations	shown in map		Rate US$300
	b. Road side O-D survey at 5 station above			Rate US$300
	c. Topographic Survey			Rate US$500
	i. Scale 1:200 at every bridge site			
	a) 50m x 50m			
	b) 100m x 50m			
	d. Boring at bridge site 20m in depth			US$7000 per Bridge (for 2 Boring)
	e. Environmental Survey for Bridge site			US$ 200 per Bridfge

Sl. No.	Description of Equipment	Model/Make	Total
1.	Truck	A/land	4
2.	Truck	Tata	45
3.	Truck	Canter	21
4.	Truck	Hino	2
5.	Truck	Nissan	11
6.	VT-250	Air Compressor	3
7.	KG-Khosla	-do-	4
8.	CPS400	-do-	5
9.	VT-6	-do-	2
10.	M6	Motor grader	3
11.	PL/916	Payloader	5
12.	PL/930	-do-	3
13.	PL/910	-do-	4
14.	PL/510	-do-	1
15.	TL/963	T loader	1
16.	CS551	Road Roller	1
17.	Vsha/Roller	-do-	1
18.	J/Roller	-do-	2
19.	J	-do-	4
20.	AJ	-do-	4
21.	BG-1-0027	-do-	1
22.	J	J/Roller	1
23.	VR751	V/Roller	2
24.	SV91	-do-	2
25.	BG-4-0007	-do-	1
26.	BG-2-0153	W/D Tank	1
27.	HMP	Hot Mix	1
28.	SC	Stone Crusher	1
29.	D6D	Dozer	1
30.	TD8	Dozer	2
31.	TD20	Bull Dozer	1
32.	TD12	Dozer	3
33.	TD20	-do-	6
34.	D7G	-do-	1
35.	D4H	-do-	2
36.	IH640	Excavator	2
37.	PL60	-do-	1
38.	EXV-320	-do-	1
39.	BG-1-0113		
	BG-2-0066	Tractor	2

出典：PWD

List of Totally Protected Wild Animals

SCHEDULE - I

Sl. No.	Common Name	Scientific Name
1.	Asian Elephant	Elephas maximus
2.	Clouded Leopard	Neofelis nebulosa
3.	Golden Langur	Presbytis geei
4.	Musk Deer	Moschus chrysogaster
5.	Pangolin	Manis crassicaudata
6.	Pigmy Hog	Sussylvanicus
7.	Snow Leopard	Panthera uncia
8.	Takin	Budorcas taxicolor
9.	Tiger	Panthera tigris
10.	Wild Buffalo	Bubalus bubalis
11.	Black-Necked Crane	Grus nigricollis
12.	Monal Pheasant	Lophophorus impejenus
13.	Peacock Pheasant	Polyplectron bicalcaratum
14.	Raven	Corvus corax
15.	Rufous-Necked Hornbill	Aceros nepalensis
16.	Golden Mahseer	Tor tor
17.	Spotted deer	Axis axis
18.	Gaur	Bos gaurus
19.	Leopard	Panthera pardus
20.	Leopard Cat	Felis bengalensis
21.	Himalayan Black Bear	Selenarctos thibetanus
22.	Red Panda	Ailurus fulgens
23.	Serow	Capricornis sumatraensis

List of Totally Protected Plants

SCHEDULE - I

Sl. No.	Local Name	Common Name	Botanical Name
1.	Agar/agaru	Eagle Wood/ Indian Aloe Wood	Aquilaria malaccensis
2.	Yartsa-guenboop	Chinese catapillar	Cordyceps sinensis
3.	Pang-gen metog		Gentiana crassuloides
4.	Snow down lily		Lloydia yunnanensis
5.	Tsher-ngeon	Blue poppy	Meconopsis grandis
6.	Kirang-shing	Yew	Taxus baccata
7.	Bhreeng-gee-ra-dza	Ginseng	Panax pseudo-ginseng

Road Maintenance Questionnaire

1. INSTITUTIONAL CAPABILITY

1.1 Legal powers

1.1.1. Is the responsibility for road maintenance legally defined? Yes
1.1.2. Are all roads the responsibility of the maintenance department? Yes
1.1.3. Are the legal powers understood?Yes
1.1.4. Are the powers adequate?Amendments & addition required

1.2 Administration

1.2.1. Is there an administrative structure capable of maintaining roads?Yes
1.2.2. Is there an unambiguous chain of command?Yes
1.2.3. Are responsibilities defined?Yes
1.2.4. Are staff aware of their responsibilities?Yes
1.2.5. Are decisions independent of the influence of negatism, favoritism, graft or corruption?Independent of all these elements

1.3. Human Resources

1.3.1. Are there sufficient personnel available?Just bare minimum
1.3.2. Are they adequately trained?Need training
1.3.3. Are they adequately motivated?Yes
1.3.4. Is there an internal training scheme?On very few & elementary areas only
1.3.5. Are there operations manuals?Yes

1.4 Budget

1.4.1. Is a budget awarded?Yes
1.4.2. Is it adequate?adequate commensurate with institutionall capacity
1.4.3. Can it be relied upon?Fairly only
1.4.4. Are operations independent of foreign exchange constraints?Yes

1.5. Financial Control

1.5.1. Does full financial control reside within the maintenance authority? Yes
1.5.2. Are accounts independently audited? Yes

2. MANAGERIAL CAPABILITY

2.1. Inventory

2.1.1. Does it exist?being introduced of late
2.1.2. Is it up-to-date?yes
2.1.3. Does it cover location and classification of all roads and structures?yes

2.2. Planning and Programming

2.2.1. Is work programmed according to defined priorities?yes
2.2.2. Are the costs and benefits of programs assessed?yes for externally funded projects
2.2.3. Is programming done within a plan designed to preserve or enhance the network in the medium/long term? yes

2.2.4. Are there specifications for work?yes
2.2.5. Are specifications achieved in practice?yes within limitted time & constraints

2.3 Budgeting

2.3.1. Is there a regular and formal budgeting process?yes
2.3.2. Is this related to actual costs and the ability to disburse?yes

2.4 Cost Control

2.4.1. Is work done measured and costed?yes
2.4.2. Are costs realistic in terms of overheads, equipment, materials and labor?yes
2.4.3. Is cost information collected centrally and used for budgeting purposes?yes
2.4.4. Is there a physical inspection and audit of work done?yes
2.4.5. Is productivity measured?to certain extent. A fool proof system need to be developed

2 .5. Plan and Equipment

2.5.1. Is there a fleet of plant and equipment of the size and composition required?yes but very limitted Nos
2.5.2. Is the availability adequate?No
2.5.3. Is the utilization adequate?Yes
2.5.4. Are the workshops and stores adequate to support it?Need to be strengthened
2.5.5. Is there an organization capable of managing the fleet cost effectively?Yes but capability is being developed
2.5.6. Is adequate financial provision made for replacement and repair?Repair yes, but for replacement doubtful

2.6 Supplies

2.6.1. Are materials available as required?Needs to be imported
2.6.2 . Does an adequate system exist for ordering and stockpiling road maintenance materials? Yes but needs more streamlining

3. TECHNICAL CAPABILITY

3.1. Planning Criteria

3.1.1. Are the criteria upon which road maintenance planning is based constantly under review? Yes
3.1.2. Do strong links exist between those responsible for road maintenance planning and those responsible for:Yes
3.1.2.1. design and construction?Yes
3.1.2.2. traffic surveys and forecasting?Yes
3.1.2.3. road safety?Yes

3.2. Materials

3.2.1. Are the properties of materials used fully understood?To appreciable degree
3.2.2. Are there adequate testing facilities?Needs improvement but adequate as of now
3.2.3. Are materials of the right quality available?Yes
3.2.4. Are appropriate materials always used?Yes (as far as possible)
3.2.5. Are testing methods appropriate and carried out at the appropriate frequency?Yes, given under limitted facilities.

3.3 Quality Control

3.3.1. Is quality control of products and materials adequate?fairly OK
3.3.2. Is quality control on site adequate? Yes

3.4. Condition Measurement

3.4.1. Are roads inspected systematically to determine maintenance requirements?To appreciable degree
3.4.2. Are physical measurements made of road conditions to determine maintenance requirements?yes

3.4.3. Are condition measurements made using sophisticated or high-speed instruments?using traditional simple measuring tapes

3.5. Field Monitoring

3.5.1. Is there any systematic monitoring of:

3.5.1.1. quality of work?Yes
3.5.1.2. material quantities used?Yes
3.5.1.3. man-hours spent on job?Yes

3.5.2. Do the results of any monitoring feedback into the future planning process? Yes

3.6. Research and Information

3.6.1. Is there adequate access to current work on road maintenance from other maintenance organizations or international research centers?No
3.6.2. Is research on road maintenance currently carried out within the organization?No
3.6.3. Are new techniques and practices introduced as a result of research results?No

Schedule 1

	Fees payable for Licenses and Certificates	
	Category of Licenses or certificates	Amount in Nu.
1	New Licenses and Annual Renewal Fees	
	Category of Commercial Vehicles	
	· Commercial public bus for passengers	1,500/route/year
	· Tourism buses	200/vehicle/year
	· Private School buses	150/vehicle/year
	· Taxis	500/vehicle/year
2	New Certificates and annual renewal fees	
	· Driver certificate	500 for 5 years
	· Conductor's certificate	250 for 5 years
3	Issue of Duplicate License or Certificate	
	· Applicable to all above	300 for each issue

* This will also be called the Route Operating fee.

付属資料６．第８次５ヶ年計画・道路セクターの抜粋

CHAPTER 17. ROADS

Basic Situation

As a land-locked country, Bhutan's socio-economic development depends largely on an efficient and reliable road network. Road infrastructure development has therefore been given priority in all the past five year plans. There is now over 3,200 km length of road in the Kingdom serving almost all district headquarters and a large proportion of the rural settlements (see Map 17.1).

Structure

Road infrastructure falls under the Public Works Division of the Ministry of Communications. There are ten field divisions including a Central Workshop at Gaylephu and Central Stores at Phuntsholing.

Constraints

The country's steep and fragile terrain as well as the lack of trained and skilled manpower combined with budgetary limitations presents a serious challenge to the construction and maintenance of road.

Review of Past Performance

Objectives of the 7FYP

The seventh plan objective was to construct and maintain the road network and bridges to facilitate efficient movement of goods and services.

Strategies

Expansion of the road network was limited to ensure sustenance of the capacity for essential maintenance. As far as possible, road construction and maintenance works were privatized.

Achievements

A total of 41 km length of new road and 450 km length of resurfacing were completed during the 7FYP. Five private companies were engaged in the latter activity. A nation-wide road network is portrayed in Map 17.1.

Three degree level training slots were implemented, as well as in-country training for middle and lower level technicians.

Objectives and Strategies of 8FYP

Objectives

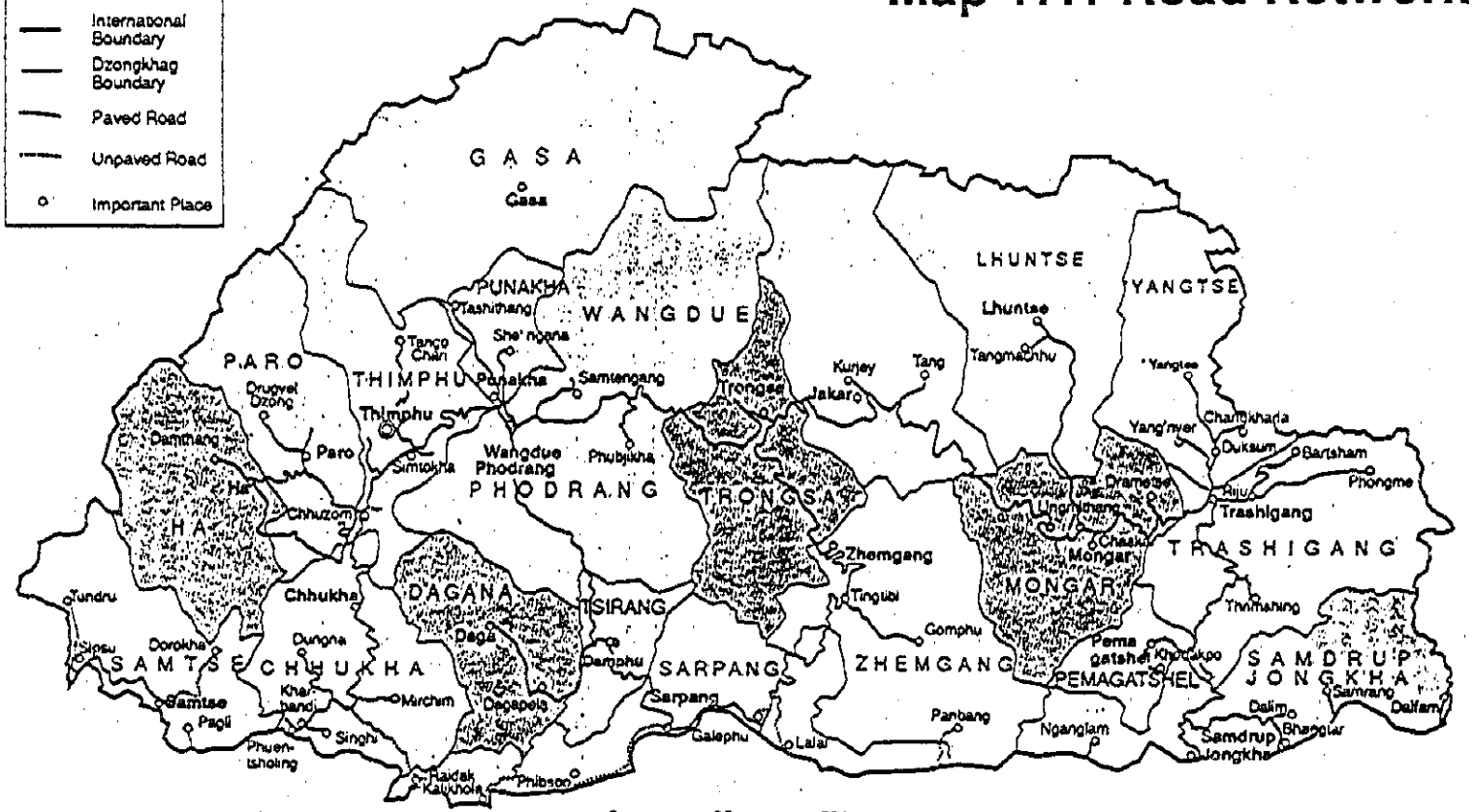
- Develop a sustainable and regionally balanced road network that is safe, convenient and economical to use;
- Preserve the past capital investment in road, reduce cost of vehicle operation and the travel time of road users, and develop road construction and maintenance (resurfacing) capabilities in the private sector.

Strategies

- Apart from promoting privatization, the Public Works Division will gradually withdraw from direct involvement in road works and concentrate increasingly on design, estimates, supervision and quality control specifically through,

出典；Eighth Five Year Plan (1997-2002)

Map 17.1 Road Network



- Development of a long term comprehensive road master plan to guide future road development;
- Preparation of an inventory of the existing road network;
- Development of a suitable pavement maintenance management system;
- Improvement of geometric features so as to reduce accidents;
- Timely resurfacing of existing road to reduce vehicle operating costs;
- To reduce travel time, possibilities of shortening existing road, in particular the trade routes, will be explored;
- The institutional capacity will be strengthened through further training;
- Locally available materials will be utilized wherever possible in place of imported materials.

Programmes for the 8FYP

New Road Construction

From the ongoing road construction programme, 15 km of formation cutting and 10 km of permanent works on Mathanguri - Panbang is likely to spill over to the 8FYP. The emphasis of road construction shall therefore be on completing the spill-over works. This is estimated to cost Nu. 7.972 million.

Requests for over 1000 kilometers of new road for 8FYP were received from various dzongkhags. Considering the limited capacity of both PWD and private contractors and using population density, agricultural and industrial potentials and accessibility criteria, prioritization has been done and 313.5 km length of new road constructions up to formation cutting level have been earmarked for the 8FYP. Construction of these road will be considered in order of priority subject to the availability of funds amounting to Nu. 952.867 million.

Road Maintenance Programme

Resurfacing

Timely maintenance is essential to prolong the life of road and to preserve the past capital invested in them. In the past, for financial and other reasons, timely resurfacing was not carried out and it is now overdue for almost all road. During the 8FYP, the resurfacing programme for 1040 km of road has been based on the existing capacity of the private companies as well as that of PWD. This cost amounts to almost Nu. 360 million.

Routine Maintenance/Monsoon Damages Restoration

Routine maintenance and monsoon damage restoration are annual and seasonal features in road maintenance. The entire stock of road infrastructure will require annual routine maintenance, while the extent of monsoon damage restoration will depend on the amount of damage caused during the monsoons. Based on past annual expenditure, the cost of monsoon damage restoration is estimated at Nu.225 million. The cost of routine maintenance, amounting to Nu 300 million is reflected under the recurrent cost. This does not include an estimated maintenance cost of Nu. 226.324 m for the next five years for the 735 km of road currently maintained by Project Dantak.

Widening and Improvement

In response to the increasing volume of traffic and the need to improve safety, a total of 204 km of geometric

improvement and widening will be carried out in 8FYP at a cost of Nu. 547 million.

Realignment

To reduce travel time and costs, realignment of 27 km of road on the Thimphu-Phuntsholing highway will be carried out during the 8FYP at a cost of Nu.134 million.

Bridges

Many bridges on the highway are temporary steel bailey bridges. These were built long ago and have outlived their design life. In view of the increasing traffic volume, and for safety, it is urgent that some of the critical ones be replaced by permanent RCC bridges. During the 8FYP, 10 such bridges will be replaced at a cost of Nu. 229.500 million of which Aie, Rongkhola and Sarpang bridges under Sarpang dzongkhag will be undertaken by the Government of India.

Institutional Capacity Building

At present, there are no specialized engineers in the road sector. During 8FYP, provision for in-service training will be made on a selective basis for specialized training abroad, priority being given to structural engineering, pavement and maintenance management, geotechnical, survey and design. For middle level engineers, in-country training as well as training in the region will be organized. Seventeen slots of 18 mm each are included in the RCSC HRD Programme for specialization in the above- mentioned fields.

Road Sector Master Plan

In the past, in the absence of any framework within which to plan surface transport, development of road infrastructure has been largely ad-hoc. In order to guide future investment in road over the next twenty years in line with national development priorities, sectoral requirements and socio-economic realities, the preparation of a Road Sector Master Plan will receive priority during the 8FYP. The exercise is estimated to cost around Nu.9 m, involving 36-40 man-months of specialized consultancy input.

Mechanization of Road Works

In view of the rugged terrain and the shortage of both skilled and unskilled labour, mechanization of road works is important to increase productivity and output. Continuation of the existing mechanization programme requires replacement of the old road construction and maintenance equipment, at a cost of Nu. 84 million in the 8FYP.

The present annual output of the PWD Central Workshop does not justify the cost involved, and during 8FYP an attempt will be made to manage the workshop on commercial lines, possibly with a management contract, so that costs are met out of income. Overall responsibility for the workshop will need to remain, however, with the PWD.

Privatization of Road Works

During 7FYP, five companies were involved in resurfacing of the lateral highway, while two large companies were engaged in new road construction. Several other individual private contractors were involved in routine maintenance and monsoon restoration works. Further, private sector participation will be encouraged during the 8FYP.

Financial and Manpower Requirements

(Nu. in Millions)

	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	Total
Capital Cost	718.505	685.213	503.212	362.071	280.338	2549.339
Recurrent	130.092	130.092	130.092	130.092	130.092	650.46
Total cost	848.597	815.305	633.304	492.163	410.43	3199.799
Manpower	-	-	-	-	-	-
TA	-	-	-	-	-	-

Project MOC 05: New Roads Construction

Project Summary:

1. Location: Nationwide
2. Sector: Roads
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division and Private contractors
5. Estimated Cost:
   Recurrent : Nu.0.00 million
   Capital: Nu.960.839 million
   Total: Nu. 960.839 million
6. Funds Secured: Nu. 0.00 million
7. Financing Gap: Nu. 960.839 million
8. External Finance Required: Nu. 960.839 million
9. Duration: 5 Years
10. Implementation date: July, 1997
11. Status: New
12. Documents available: 8FYP Document

Project Objectives

Increase accessibility of rural communities to markets, educational, health, agricultural facilities etc, through expansion of district and feeder roads network.

Project Description

The majority of the people of Bhutan live at least half a day's walking distance from motor road. Some communities are even more remote, being 4 - 5 days walk from the nearest road head. Gasa, one of the 20 districts of the country, for example, has got only 1.5 km of road infrastructure even though it has got the largest area amongst the districts. There are three categories of publicly maintained road in Bhutan, national highways, district roads and feeder roads. The standard of roads to be constructed under this project will be district and feeder roads categories. The project aims at constructing 328 kms of road at the rate of Nu. 2.20 million per km for feeder roads and Nu. 4.1874 million per km for district roads. The following new constructions of roads for the various Dzongkhags will be taken up during the 8FYP under this project:

No.	Name of Dzongkhag/road	Length(km)	Tentative Cost (m)	Remarks
1.	Haa	15	34.000	Proposed to GOI
2.	Wangdue Phodrang	20	45.000	Proposed to GOI
3.	Lhuntse	20	45.000	Proposed to GOI
4.	Trashigang	30	67.000	Proposed to GOI
5.	Samdrup Jongkhar	35.5	79.000	Proposed to GOI
6.	Pemagatshel	25	56.00	Proposed to GOI
7.	Gasa	10	23.00	-
8.	Bakuli-Daifam	63	264.000	-
9.	Dakpai-Buli	30	67.000	Is under proposal with SNV/ISDP
10.	Gomphu-Panbang Road	65	272.867	-
11.	Mathanguri-Panbang Road	14.5	7.972	7FYP Spillover
	Total	328	960.839	

The length of Bakuli-Daifam road is 128 km. Construction of the remaining 65 km of this road estimated at Nu. 272.867 million will be taken up if donor assistance can be secured.

Project Impact

It will bring about a balanced regional development.

Project Management

Road Sector, Public Works Division, under the Ministry of Communications.

Financing Detail

	1997/98	1998/99	1999/00	2000.01	2001/02	Total
Capital	285.860	238.217	194.628	146.912	95.222	960.839
Recurrent	0.00	0.00	0.00	0.00	0.00	0.00
Total	285.86	238.217	194.628	146.912	95.222	960.839

Manpower Requirement

None

Equipment

None

Technical Assistance

None

Project MOC 06: Improvement of National Highways

Project Summary:

1. Location: Nationwide
2. Sector: Road
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division and Private contractors
5. Estimated Cost:
   Recurrent : Nu.0.00 m
   Capital: Nu.547.000 m
   Total : Nu.547.000 m
6. Funds Secured: Nu. 0.00 m
7. Financing Gap: Nu.547.000 m
8. External Finance Required: Nu. 547.000 m
9. Duration: 5 Years
10. Implementation date: July, 1997
11. Status: New
12. Documents available: 8FYP Document

Project Objectives

Minimize road accidents, enhance road safety and save travel time.

Project Description

The National Highways included in this project are amongst the most heavily used of Bhutan's national highways. They were originally constructed to a basic standard, with sharp curves, narrow carriage way, comparatively steep gradients and a thin bitumen seal. As traffic has increased, it has become necessary, for economic and safety reasons, to upgrade these roads.

The types of works envisaged under this project are: widening, geometric improvements, permanent works, resurfacing etc. The unit cost of widening per km is estimated at 2.484 million for this project. The existing Jhumja - Tala road (7 Km) forms a part of Sorchen-Bypass road. This feeder road will be upgraded to national highway standard to cater to the expected traffic increase once the bypass road becomes operational. Resurfacing of Semtokha-Kurichu highway (100 km), Trongsa-Gelephu highway (15 km) and Sarpang-Tsirang highway (10 km) will also be carried out at the rate of Nu. 0.343 million per kilometres in addition to widening, geometric improvement and permanent works.

The following national highways are included under this project:

Sl.. No.	Name of Highways	Length (km)	Tentative Cost (m)	Remarks
1.	Semtokha-Kurichu Highway	100	283.000	Under discussion with Govt. of Japan
2.	Trongsa-Gelephu Highway	15	43.000	
3.	Sarpang-Tsirang	10	28.000	
4.	Thimphu-Paro Highway	72	179.000	Is included under proposal to GOI
5.	Jhumja-Tala road	7	14.000	
	Total	204	547.000	

Project Impact

Reduction in road accidents and casualties with improvement of geometric features and better visibility at the curves.

Project Management

Road Sector, Public Works Division, under the Ministry of Communications.

Financing Detail

	1997/98	1998/99	1999/00	2000/01	2001/02	Total
Capital	164.099	136.747	109.396	82.046	54.712	547.000
Recurrent	0.000	0.000	0.000	0.000	0.000	0.000
Total	164.099	136.747	109.396	82.046	54.712	547.000

Manpower Requirement

None

Equipment

None

Technical Assistance

None

Project MOC 07: Realignment of Roads

Project Summary:

1. Location: Chhukha
2. Sector: Roads
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division and Private contractors
5. Estimated Cost:
   - Recurrent : Nu.0.00 m
   - Capital: Nu.134.00 m
   - Total : Nu.134.00 m
6. Funds Secured: Nu. 0.00 m
7. Financing Gap: Nu.134.00 m
8. External Finance Required: Nu.134.00 m
9. Duration: 2 Years
10. Implementation date: July, 1997
11. Status: New
13. Documents available: 8FYP Document

Project Objectives

Shorten the distance by realigning to save travel time and to reduce transportation and maintenance cost.

Project Description

Most of the roads on the highways are unnecessarily lengthy and time consuming which add to the transportation costs of goods and services. This also entails considerable expenditure on the three levels of road maintenance; resurfacing, routine maintenance and monsoon restoration works. The existing Thimphu-Phuntsholing Highway (174 km) can be shortened by about 15 to 20 km by realigning it from Taamchu to Chhukha under Chhukha Dzongkhag. In the long run, substantial savings would accrue to maintenance and road user costs due to the reduction in length.

The work under this project is to realign the existing Taamchu-Chhukha Highway, so that traveling distance can be shortened. The unit cost per kilometre for road realignment programme has been estimated at Nu. 4.968 million.

Project Impact

Reduced cost of the transportation of goods and services and also travel time of road users.

Project Management

Road Sector, Public Works Division, Ministry of Communications.

Financing Detail

		1997/98	1998/99	1999/00	2000/01	2001/02	Total
	Capital	40.199	33.499	26.799	20.099	13.404	134.000
	Recurrent	0.000	0.000	0.000	0.000	0.000	0.000
	Total	40.199	33.499	26.799	20.099	13.404	134.000

Manpower Requirement

None

Project MOC 08: Master Plan for Road Sector

Project Summary:

1. Location: Nationwide
2. Sector: Roads
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division and Private contractors
5. Estimated Cost:
   Recurrent : Nu.0.00 m
   Capital: Nu.9.00 m
   Total: Nu.9.00 m
6. Funds Secured: Nu. 0.00 m
7. Financing Gap: Nu.9.00 m
8. External Finance Required: Nu.9.00 m
9. Duration: 3.5 Years
10. Implementation date: July, 1997
11. Status: New
12. Documents available: 8FYP Document

Project Objectives

To draw up a comprehensive Roads Sector Master Plan consistent with national development plans and priorities.

Project Description

Development of roads infrastructure has so far been on an ad hoc basis. There is no proper frame- work guiding the expansion of roads network. Such practices present problems in allocating the scarce resources in a more efficient and rational manner. It is highly important that roads infrastructure development over the next 20 years proceeds in line with national development priorities, sectoral requirement and socio-economic realities.

The Master Planning exercise would involve:

a) Review of existing data and reports in Bhutan including the computerized road maintenance management system and pre-study report for the Roads Sector Master Plan,
b) Undertaking traffic surveys sufficient to predict transport flows,
c) Review of traffic generating sources including likely future agriculture and industrial requirement,
d) Review of road maintenance including existing resources, financial needs and determining future policy statements with regard to sectors overall financial priorities for routine and periodic maintenance,
e) Investigating developments to the existing roads network by improvements of existing roads and by addition of new roads. This should include identification, evaluation and priority ranking of the proposed improvements including bridges for each of the various categories of roads. This investigation should provide for approximately 15 years works,
f) Investigating funding needs and suggesting basis for distribution of funds for (e) above and in particular to the road categories of national highways, district roads, feeder roads and tracks,
g) Determining suitable standards for road construction and maintenance for each of the road categories,
h) Review of traffic management to ensure that traffic operations on the available roads network are conducted as safely, effectively and efficiently as possible, and assessing the needs and preparation of recommendations for ongoing training to strengthen institutional and human resources capability will also be involved,
i) Preparation of detailed operational plan.

Project Impact

Provision of a long-term comprehensive roads master plan to guide formulation of a regionally balanced road network in the subsequent plans.

Project Management

Roads Sector, PWD and Policy and Planning Division, Ministry of Communications.

Financing Detail

		1997/98	1998/99	1999/00	2000/01	2001/02	Total
	Capital	4.000	3.000	2.000	0.000	0.000	9.000
	Recurrent	0.000	0.000	0.000	0.000	0.000	0.000
	Total	4.000	3.000	2.000	0.000	0.000	9.000

Manpower Requirement

None

Equipment

None

Technical Assistance

None

Project MOC 09: Mechanization of Road Works

Project Summary:

1. Location: Nationwide
2. Sector: Roads
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division
5. Estimated Cost:
   - Recurrent : Nu 0.00 m
   - Capital: Nu.84.00 m
   - Total: Nu.84.00 m
6. Funds Secured: Nu. 0.00 m
7. Financing Gap: Nu.84.00 m
8. External Finance Required: Nu 84.00 m
9. Duration: 2 Years
10. Implementation date: July, 1997
11. Status: New
12. Documents available: 8FYP Document

Project Objectives

Enhance road construction and maintenance capability of the Public Works Division.

Project Description

Bhutan's terrain presents considerable difficulties in road building and maintenance. This problem is further aggravated by severe shortage of both skilled and unskilled labour force. Mechanization of road works therefore is important. Mechanization of road works involves investment in equipment, machineries and training. Public Works Division has about 450 nos. of road construction and maintenance equipment of various makes. By the beginning of 8FYP period about 45 % of this equipment will be overdue for major overhaul due to their continued use. Some of them would be uneconomical to retain in terms of maintenance costs and the amount of down time for repair. Although the replacement of such equipment should, in the long run, fall under the recurrent budget of the RGOB, donor funding is sought as an interim measure because of the high foreign exchange costs involved and the budgetary constraints faced by the Royal Government. The project is expected to provide for the replacement and upkeep of the following equipment and auxiliary facilities:

Sl. No.	Description	Quantity	Approx. Rate	Cost (m)
1.	Air Compressor	5	0.18	0.900
2.	Bull Dozer	3	4.60	13.800
3.	Crane	1	2.50	2.500
4.	Excavator	2	5.60	11.200
5.	Fuel Tanker	1	1.20	1.200
6.	Jack Hammer	35	0.03	1.050
7.	Pay loader	3	5.00	15.000
8.	Road Roller	3	2.50	7.500
9.	Tipper/long body	5	0.65	3.250
10.	Tractor	2	0.20	0.400
11.	Trailer (20 ton)	1	7.20	7.200
12.	Water Pump	4	0.80	3.200
13.	Water tanker	2	1.10	2.200
14.	Improvement of Field Workshop			4.500
15.	Major Overhaul of existing equipment			10.00
	Total			83.9

Project Impact

Enhanced roads maintenance and construction capabilities of roads sector through appropriate mechanization and optimized utilization of the existing machineries.

Project Management

Mechanical Cell, Public Works Division.

Financing Detail

		1997/98	1998/99	1999/00	2000/01	2001/02	Total
	Capital	42.00	42.00	0.00	0.00	0.00	84.00
	Recurrent	0.00	0.00	0.00	0.00	0.00	0.00
	Total	42.00	42.00	0.00	0.00	0.00	84.00

Manpower Requirement

None

Equipment

As shown in the project description.

Technical Assistance

None

Project MOC 10: Construction of Permanent Bridges

Project Summary:

1. Location: Nationwide
2. Sector: Road
3. Executing Agency: PWD, Ministry of Communications
4. Implementing Agency: Roads Division
5. Estimated Cost:
   Recurrent: Nu.0.00 m
   Capital: Nu.229.50 m
   Total: Nu.229.50 m
6. Funds Secured: Nu. 0.00 m
7. Financing Gap: Nu.229.50 m
8. External Finance Required: Nu.229.50 m
9. Duration: 5 Years
10. Implementation date: July, 1997
11. Status: New
12. Documents available: 8FYP Document

Project Objectives

Safeguard and enhance Bhutan's existing investment in roads infrastructure by improving or replacing bridges that are no longer adequate for traffic levels or which have outlived their design life. At the same time, indigenous capacity for this specialized element of roads construction and maintenance will be developed.

Project Description

Bhutan's terrain requires all roads to make frequent river crossings. Many of the bridges built in the 1960s are already being used only with reduced tonnage, and may soon be good enough only for light vehicles. In addition, several crossings on newly-built roads are without bridges.

The project aims to replace a total of 11 temporary bridges by permanent bridges during the 8FYP. In addition to this, a 120 metre span permanent bridge will be constructed at Bhur on the Gelephu-Sarpang highway.

The project is envisaged to meet the cost of construction of the following bridges:-

Sl. No.	Name of Bridges	Span (metres)	Tentative cost (m)	Remarks
1.	Aie Bridge	120	36.00	Sl.. No. 1 to 3 are spillover from 7FYP GOI commitment.
2.	Rongkhola Bridge	45	13.50	
3.	Sarpangkhola Bridge	45	13.50	
4.	Wangduephodrang Bridge	104	31.20	Included under proposal to SDC/Helvetas
5.	Mangdechu Bridge	120	36.00	Sl.. No.5 to 8 are under discussion with the Govt. Of Japan
6.	Bjee Bridge	50	15.00	
7.	Chamkhar Bridge	45	13.50	
8.	Kurizampa	50	15.00	
9.	Sankosh Bridge	93	27.90	
10.	Tangmachu Bridge	93	27.90	
	Total	765	229.50	

The two existing temporary bridges listed below in the order of priority will have to be replaced by permanent bridges should donor funding be available. The cost of replacement of these bridges is estimated at Nu. 66 million.

1. Bhurkhola Bridge (120 metre span)
2. Wakhleytar bridge (100 metre span)

Project Impact

Improved safety and high load bearing bridges

Project Management

Bridge Cell, Public Works Division, Ministry of Communications

Financing Detail

		1997/98	1998/99	1999/00	2000/01	2001/02	Total
	Capital	57.375	114.750	57.375	0.000	0.000	229.50
	Recurrent	0.000	0.000	0.000	0.000	0.000	0.000
	Total	57.375	114.750	57.375	0.000	0.000	229.50

Manpower Requirement

None

Equipment

None

Technical Assistance

None

付属資料7. Bridge Inventory

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM

BRIDGE INVENTORY

Report Type: FULL INVENTORY REPORT

Total Length	Total Number	Condition Rating	Print Date:	14-Apr-97
4,965.00 m	161	ALL	Print Time:	02:22 PM

Division Name	Dzongkhag	Road Name	Number	Bridge Name	Section From	Section To	Location	Condition Rating	Type	Length (m)	Width (m)	Load (T)	Spans(m)	Last Maintained	Year of Completion	Controlled By	Constructed By	Comments
Lobeysa	Punakha	Punakha-Tashithang	BR24-01	Tshoringmo	20	28	23000	1	Wooden	13	3.76	18	1	1995	1994	PWD	PWD	
Lobeysa	Punakha	Punakha-Tashithang	BR26-01	Rabteihang	20	28	25000	1	Wooden	17	3.76	18	1	1995	1994	PWD	PWD	
Lobeysa	Wangdue	Tashigang-Semtokha	BR403-01	Nika Bridge	380	450	402750	1	RC T Beam	28	4.5	40	1		1982	PWD	DANTAK	
Lobeysa	Wangdue	Tashigang-Semtokha	BR469-01	Wachey	450	470	468000	1	DSR Bailey	37	3.76	18	1	1995	1969	PWD	DANTAK	
Lobeysa	Wangdue	Tashigang-Semtokha	BR473-01	Chuzomsa	470	475	472000	1	RC T Beam	28	4.5	40	1		1988	PWD	DANTAK	
Lobeysa	Wangdue	Tashigang-Semtokha	BR483-01	Wangduezam	475	485	482000	1	SS,DS,TD,SS Bail	103	3.76	15	4	1995	1969	PWD	DANTAK	
Lobeysa	Wangdue	Wangdue-Tsirang	BR03-01	Hesothangka	1	5	2500	1	SS Bailey	10	3.76	24	1	1995	1986	PWD	PWD	
Lobeysa	Wangdue	Wangdue-Tsirang	BR09-01	Lawakha	5	10	8900	1	DSR Bailey	33	3.76	24	1	1995	1988	PWD	PWD	
Lobeysa	Wangdue	Wangdue-Tsirang	BR14-01	Basochu	10	15	13600	1	SSR Bailey	20	3.76	18	1	1995	1985	PWD	PWD	
Lobeysa	Wangdue	Wangdue-Tsirang	BR17-01	Runchu	15	20	16500	1	SS Bailey	17	3.76	18	1	1995	1987	PWD	PWD	
Lobeysa	Wangdue	Wangdue-Tsirang	BR25-01	Baychu	20	25	24050	1	SS Bailey	17	3.76	18	1	1995	1985	PWD	PWD	
Lobeysa	Daga	Wangdue-Tsirang	BR33-01	Kamichu	25	35	32000	1	SS Bailey	20	3.76	18	1	1995	1986	PWD	PWD	
Lobeysa	Daga	Wangdue-Tsirang	BR53-01	Naraychu	35	55	52000	1	DS Bailey	33	3.76	24	1	1998	1992	PWD	PWD	
Lobeysa	Tsirang	Wangdue-Tsirang	BR55-01	Wakleytar	35	55	54000	1	Bailey Suspension	80	3.76	18	1	1995	1987	PWD	PWD	
Lobeysa	Tsirang	Wangdue-Tsirang	BR60-01	Mechikhola	55	60	59000	1	Wooden	18	3.76	18	1	1995	1990	PWD	PWD	
Lobeysa	Tsirang	Wangdue-Tsirang	BR70-01	Burichu	60	70	69000	1	DS Bailey	30	3.76	24	1	1995	1985	PWD	PWD	
Lobeysa	Tsirang	Wangdue-Tsirang	BR75-01	Chanchey	70	75	75000	1	TS Bailey	40	3.76	24	1	1995	1988	PWD	PWD	
Phuentsholing	Chhukha	Kharbandi-Singhi	BR05-01	Bhalujhora	1	10	4500	1	RCC Slab	126	7.5	40		1995	1987	PWD	PWD	
Phuentsholing	Chhukha	P/ling Urban Road	BR01-01	Dhutikhola	0	5	1000	1	RC T Beam	15	4.75	25	1	1995		PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR04-01	Chamurchi	1	5	3000	1	DDR Bailey	127	3.76	24	2	1995	1990	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR09-01	Diana	5	10	8500	1	Bailey Suspension	127	3.76	15	1	1995	1990	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR14-01	Chungpateng	10	15	13500	2	Wooden	37	3.76	18	1	1995	1986	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR21-01	Khuchi Diana	15	25	20500	1	Wooden	43	3.76	18	4	1995	1985	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR30-01	Lengthey	25	30	29500	1	Wooden	17	3.76	18	1	1995	1989	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR32-01	Gathia	30	35	31000	1	Wooden	27	3.76	18	3	1995	1985	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR30-01	Jiti"A"	35	39	38400	1	DS Bailey	23	43.76	24	1	1995	1982	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR40-01	Jiti"B"	30	40	39000	1	DD Bailey	47	3.76	24	1	1995	1981	PWD	PWD	
Phuentsholing	Samtse	Samtse-Sipsu	BR42-01	Sipsu	40	49	41000	1	DS Bailey	33	3.76	18	1	1995	1981	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR01-01	N/R	0	5	190	0	Composite	9	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR02-01	N/R	0	5	1070	1	Composite	9	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR02-02	N/R	0	5	1870	1	RCC T Beam	8	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR10-01	Bhurkhola	5	10	9030	1	Composite	9	4.5	40	1		1973	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR13-01	N/R	10	18	12260	1	Composite	9	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR15-01	N/R	10	18	14150	1	Composite	9	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR15-02	Rateykhola	10	18	14740	1	Composite	9	4.5	40	1		1965	PWD	DANTAK	
Sarpang	SARPANG	Gelephu-Sarpang	BR21-01	Dholkhola	18	28	20000	1	DSR Bailey	0	3.76	24	1	1995	1991	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR23-01	N/R	18	28	22500	1	Submersible	51	7.5	40	1		1993	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR24-01	Kalikhola	18	28	23500	1	Submersible	31	7.5	40	1		1994	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR26-01	Leopani	18	28	25000	1	Submersible	51	4.5	40	1		1991	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR26-02	N/R	18	28	25800	1	Submersible	51	7.5	40	1		1993	PWD	PWD	
Sarpang	SARPANG	Gelephu-Sarpang	BR27-01	N/R	18	28	26100	1	RCC T Beam	13	4.5	40	1		1966	PWD	DANTAK	
Sarpang	SARPANG	Sarpang-Tsirang	BR04-01	Sarpangkhola	1	5	3500	1	DD Bailey	45	3.76	18	1	1995	1965	PWD	PWD	
Sarpang	SARPANG	Sarpang-Tsirang	BR21-01	Lonngkhola	5	64	20000	1	DDR Bailey	53	3.76	24	1	1995	1992	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR01-01	Sunkosh	0	5	100	1	Bailey Suspension	93	3.76	24	1	1995	1982	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR08-01	Budachu	5	10	700	1	SS Bailey	13	3.76	24	1	1995	1990	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR26-01	Dagakhola	10	30	25000	1	DS Bailey	33	3.76	24	1	1995	1989	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR37-01	Ampikhola	30	40	36000	1	Wooden	10	3.76	18	1	1995	1990	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR43-01	Panakhola	40	45	42000	1	SS Bailey	13	3.76	24	1	1995	1987	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR53-01	Bhalekhola	45	55	52000	0	Wooden	18	3.76	18	1	1995	1990	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR58-01	Zirangay	55	65	57800	1	SS Bailey	17	3.76	24	1	1995	1994	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR61-01	Lemichu	55	65	60000	1	Wooden	17	3.76	18	1	1995	1990	PWD	PWD	
Sarpang	Daga	Sunkosh-Daga	BR78-01	Darachu	65	87	77000	1	DS Bailey	30	3.76	24	1	1995	1985	PWD	PWD	
Tashigang	Monggar	Chaskar Feeder	BR05-01	Japragyey	0	12	5000	1	Wooden	17	3.76	18	1		1993	PWD	PWD	
Tashigang	Monggar	Chaskar Feeder	BR06-02	Jophon	0	12	5500	1	Wooden	17	3.76	18	1		1992	PWD	PWD	
Tashigang	Monggar	Chaskar Feeder	BR07-01	Gudan	0	12	6500	1	Wooden	17	3.76	18	1		1991	PWD	PWD	
Tashigang	Tashiyangtshi	Chazam-Tashiyangtsi	BR10-01	Tshergomzam	0	10	9500	1	SS Bailey	37	3.76	18	2		1995	PWD	PWD	

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY

Report Type: *FULL INVENTORY REPORT*

Total Length	Total Number	Condition Rating	Print Date:	15-Apr-97
4,965.00 m	161	ALL	Print Time:	10:49 AM

Division Name	Dzongkhag	Road Name	Number	Bridge Name	Section From	Section To	Location	Condition Rating	Type	Length (m)	Width (m)	Load (T)	Spans(m)	Last Maintained	Year of Completion		Controlled By	Constructed By	Comments
Dantak	Paro	Confluence-Haa	BR55-01	N/R	10	60	54630	0	RC T Beam	11	4.5	40	1		1965		DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR75-01	N/R	60	80	74200	0	RC T Beam	11	4.5	40	1		1966		DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR78-01	Haachu	60	80	77500	0	DS Bailey	33	3.76	24	1		1977		DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR80-01	Haachu	60	80	79460	0	DS Bailey	40	3.76	17	1		1974		DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR83-01	Haachu	80	95	82780	0	DS Bailey	30	3.76	30	1		1977		DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR89-01	N/R	80	95	88340	0	Hamilton & Steel	17	7.5	16	1				DANTAK	DANTAK	
Dantak	Haa	Confluence-Haa	BR91-01	N/R	80	95	90830	0	RC T Beam	10	4.5	16	1				DANTAK	DANTAK	
Dantak	Paro	Confluence-Paro	BR01-01	Wangchu	0	25	60	0	Prestressed Concr	100	7.5	70	1		1991		DANTAK	DANTAK	
Dantak	Paro	Confluence-Paro	BR08-01	Ishina	0	25	7950	0	Composite	71	7.5	70	1		1993		DANTAK	DANTAK	
Dantak	Paro	Confluence-Paro	BR16-01	Bondey	0	25	17860	0	Composite	71	7.5	70	1		1993		DANTAK	DANTAK	
Dantak	Paro	Confluence-Paro	BR19-01	Parochu	0	25	18820	0	Composite	11	4.5	30	1				DANTAK	DANTAK	
Dantak	Samdrup Jongkha	Deothang-Bhangtar	BR14-01	Damphuchu	0	20	13000	0	Wooden	14	3.76	16	1		1989		DANTAK	DANTAK	
Dantak	Samdrup Jongkha	Deothang-Bhangtar	BR20-01	Marthangchu	0	20	19000	0	DS Bailey	30	3.76	24	1		1982		DANTAK	DANTAK	
Dantak	Samdrup Jongkha	Deothang-Bhangtar	BR29-01	Demolchu	20	40	24500	0	Wooden	14	3.76	16	1		1967		DANTAK	DANTAK	
Dantak	Thimphu	India House Approach	BR02-01	Thimphuchu	0	2	1500	0	SS Bailey	13	3.76	40	1		1973		DANTAK	DANTAK	
Dantak	Thimphu	India House Approach	BR02-02	Thimphuchu	0	2	1660	0	TS Bailey	47	3.76	16	1		1974		DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR68-01	N/R	65	70	67560	0	Composite	9	4.5	30					DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR70-01	N/R	65	70	69400	0	RC T Beam	9	30	4.5					DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR82-01	N/R	70	85	81300	0	RC T Beam	9	4.5	30					DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR83-01	Wangchu	70	85	82410	0	Prestressed Concr	74	7.5	70					DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR114-02	N/R	85	115	113150	0	RC T Beam	10	4.5	30					DANTAK	DANTAK	
Dantak	Chhukha	P'ling-Thimphu	BR114-01	Tenalum	85	115	113150	0	Prestressed Concr	74	7.5	70					DANTAK	DANTAK	
Dantak	Thimphu	P'ling-Thimphu	BR144-01	Horongchu	115	150	143260	0	Composite	10	4.5	30					DANTAK	DANTAK	
Dantak	Thimphu	P'ling-Thimphu	BR162-01	Babesa	150	170	161900	0	Composite	12	4.5	30					DANTAK	DANTAK	
Dantak	Thimphu	P'ling-Thimphu	BR167-01	Olaranechu	150	170	166780	0	Composite	10.5	4.5	30					DANTAK	DANTAK	
Dantak	Thimphu	P'ling-Thimphu	BR179-01	Wangsang	170	179	178360	0	SS Bailey	30	3.76	40	1		1972		DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR01-01	S/Jongkar	0	10	600	0	Hamilton & Steel	60	7.5	70					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR05-01	Dasho Lonchen Zam	0	10	4400	0	Composite	16	4.5	40	1		1964		DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR06-01	N/R	0	10	5400	0	Composite	10	4.5	40					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR08-01	Druk Gee Zam	0	10	7530	0	RC T Beam	22	7.5	70					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR08-02	N/R	0	10	7630	0	Composite	12	4.5	40					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR09-01	N/R	0	10	8210	0	Composite	8	4.5	40					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR09-02	N/R	0	10	8250	0	Composite	13	4.5	40					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR10-01	N/R	0	10	9660	0	Composite	10	4.5	40					DANTAK	DANTAK	
Dantak	Samdrup Jongkha	S/jongkhar-Tashigang	BR52-01	Jegenamen Zam	10	60	51210	0	RC T Beam	16	7.5	40					DANTAK	DANTAK	
Dantak	Tashigang	S/jongkhar-Tashigang	BR122-01	Stein Bridge	60	160	121800	0	RC T Beam	11	4.5	40					DANTAK	DANTAK	
Dantak	Tashigang	S/jongkhar-Tashigang	BR126-01	Jenchu Bridge	60	160	125500	0	RC T Beam	19	7.5	40					DANTAK	DANTAK	
Dantak	Tashigang	S/jongkhar-Tashigang	BR176-01	Bamichu	160	180	176000	0	Hamilton & Steel	20	7.5	70					DANTAK	DANTAK	
Dantak	Tashigang	Tashigang-Samtokha	BR11-01	Chazam	5	15	10000	0	Bailey Suspension	60	3.76	15			1965		DANTAK	DANTAK	
Dantak	Tashigang	Tashigang-Samtokha	BR17-01	Roiongchu	15	20	16200	0	RC T beam	13	4.5	40			1959		DANTAK	DANTAK	
Dantak	Mongger	Tashigang-Samtokha	BR26-01	Rovngni	20	30	27600	0	RC T Beam	10	4.5	40			1982		DANTAK	DANTAK	
Dantak	Mongger	Tashigang-Samtokha	BR55-01	Senchu	30	45	34000	0	Hamilton & Steel	40	7.5	16			1972		DANTAK	DANTAK	
Dantak	Mongger	Tashigang-Samtokha	BR43-01	Goeanchu	30	45	42000	0	RC T beam	13	4.5	40			1962		DANTAK	DANTAK	
Dantak	Mongger	Tashigang-Samtokha	BR117-01	Kunzampe	45	200	116000	0	TSR Bailey	47	3.76	16			1971		PWD	DANTAK	
Lingmethang	Mongger	Monger-Lhuntsi	BR01-01	Gangolechu	0	10	600	1	RC Slab	10	4.5	30			1988		PWD	PWD	
Lingmethang	Mongger	Monger-Lhuntsi	BR15-01	Rewanchu	10	20	15000	1	SS Bailey	20	3.76	16	1	1995	1981		PWD	PWD	
Lingmethang	Lhuntshi	Monger-Lhuntsi	BR29-01	Phewenchu	20	30	28000	1	SS Bailey	10	3.76	16	1	1995	1981		PWD	PWD	
Lingmethang	Lhuntshi	Monger-Lhuntsi	BR43-01	Rongmachu	30	45	42000	1	Wooden	16	3.76	16	1		1988		PWD	PWD	
Lingmethang	Lhuntshi	Monger-Lhuntsi	BR51-01	Tangmachu	45	62	50000	1	Bailey Suspension	93	3.76	16	1	1995	1982		PWD	PWD	
Lingmethang	Lhuntshi	Monger-Lhuntsi	BR55-01	Gorgoengchu	52	67	54000	1	Wooden	16	3.76	16	1		1992		PWD	PWD	
Lingmethang	Mongger	Tashigang-Samtokha	BR211-01	Gayzam	200	215	210000	1	RC T Beam	60	4.5	40	1		1983		PWD	PWD	
Lobeysa	Wangdue	Mendegang-Samangk	BR01-01	Samdingkha	0	12	5000	1	Wooden	17	3.76	16	1	1995	1997		PWD	PWD	
Lobeysa	Punakha	Missene-Punakha	BR06-01	Missene Zam	0	12	5000	1	SS Bailey	20	3.76	16	1	1995			PWD	PWD	
Lobeysa	Punakha	Punakha Dzong	BR01-01	Geomarap Zam	0	2	100	1	DO SS Bailey	60	3.76	24	2		1995		PWD	PWD	
Lobeysa	Punakha	Punakha-Teshrinang	BR10-01	Singangchu	1	10	9500	1	SS Bailey	17	3.76	16	1	1995	1984		PWD	PWD	
Lobeysa	Punakha	Punakha-Teshrinang	BR17-01	Rimchu	10	20	16400	1	SS Bailey	23	3.76	16	1	1995	1985		PWD	PWD	

出典：PWD

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY

Report Type: *FULL INVENTORY REPORT*

Total Length	Total Number	Condition Rating	Print Date:	14-Apr-97
4,965.00 m	161	ALL	Print Time:	02:22 PM

Division Name	Dzongkhag	Road Name	Number	Bridge Name	Section From	Section To	Location	Condition Rating	Type	Length (m)	Width (m)	Load (T)	Spans(m)	Last Maintained	Year of Completion		Controlled By	Constructed By	Comments
Tashigang	Tashiyangtshi	Chazam-Tashiyangtsi	BR15-01	Duksumzam	10	15	14300	1	DS Bailey	40	3.75	18	1	1995	1977		PWD	PWD	
Tashigang	Tashiyangtshi	Chazam-Tashiyangtsi	BR05-01	JamkhangrangZam	0	10	31200	1	RCC Slab	10	4	30	1		1973		PWD	PWD	
Tashigang	Tashiyangtshi	Chazam-Tashiyangtsi	BR32-01	BuayangZam	30	45	31200	1	RCC Slab	9.3	3.94	30	1		1992		PWD	PWD	
Tashigang	Tashiyangtshi	Chazam-Tashiyangtsi	BR35-01	Chumduzam	30	45	34500	1	RCC Slab	7.2	4.85	30	1		1982		PWD	PWD	
Thimphu	Thimphu	Approach to Gidakom	BR01-01	Wangchu	0	3	150	1	RC T Beam	25	4.5	30	1				PWD	DANTAK	
Thimphu	Thimphu	Approach to Semteling	BR03-01	Semteling Zam	0	4	2000	1	SS Bailey	14	3.76	24	1	1995			PWD	PWD	
Thimphu	Thimphu	D.chholing-Berjana	BR06-01	Berjana Zam	0	12	5000	1	DS Bailey	27	3.76	18	1	1995			PWD	PWD	
Thimphu	Thimphu	East West Highway	BR546-01	Semtokha Flyover	540	546	546000	1	RC T Beam	15	4.75	30	1				PWD	DANTAK	
Thimphu	Paro	Paro Market-Teadzon	BR01-01	Jangsa Bridge	0	4	200	1	Composite	100	5.5	40	4		1995		PWD	DNC JAPAN	
Thimphu	Paro	Paro Market-Teadzon	BR02-01	Doochu	0	2	1500	1	RC T Beam	32	4.5	30	1				PWD	DANTAK	
Thimphu	Thimphu	P'ling-Thimphu	BR176-01	Langpakha	170	178	175000	1	RC T Beam	28	7.5	70	1		1995		PWD	DANTAK	
Thimphu	Thimphu	P'Ling-Thimphu	BR174-01	Lungtenzampa	170	178	173000	1	RC T Beam	190	7.5	70	7		1995		PWD	DANTAK	
Thimphu	Serpang	P'Ling-Thimphu	BR174-01	Lungtenzampa	170	178	173000	1	DS Bailey	47	3.76	18	1	1995	1992		PWD	PWD	
Trongsa	Trongsa	Gelephu-Trongsa	BR225-01	Buota	200	225	224650	1	DS Bailey	20	4.5	40	1		1990		PWD	DANTAK	
Trongsa	Trongsa	Gelephu-Trongsa	BR234-01	Tanchu	225	235	233430	1	Steel/hamilton	25	4.5	40	1		1982		PWD	DANTAK	
Trongsa	Trongsa	Gelephu-Trongsa	BR242-01	Talegangchu	235	244	241360	1	RC T Beam	25	4.5	40	1		1987		PWD	PWD	
Trongsa	Bumthang	Tang-Approach	BR07-01	Pangshing	1	17	6000	1	Wooden	17	3.76	18	1		1947		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR234-01	Lingam	215	250	233200	1	RC T Beam	60	4.5	40	1		1947		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR274-01	Tangchu	250	275	273450	1	RC T Beam	21	4.5	40	2	1995	1989		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR284-01	Chamkharchu	275	285	283520	1	DS Bailey	37	3.76	18	1		1973		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR302-01	Chumeychu	285	315	301000	1	RC T Beam	27	4.5	40	1		1982		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR302-02	Pangchu	285	315	301130	1	RC T Beam	8	4.5	40	1		1982		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR305-01	Hurchichu	285	315	304860	1	RC T Beam	11	4.5	30	1		1982		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR310-01	Gomkarchu	285	315	309370	1	RC T Beam	18	4.5	30	1		1982		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR311-01	Gyetsezam I	285	315	310000	1	RC T Beam	18	4.5	30	1		1981		PWD	DANTAK	
Trongsa	Bumthang	Tashigang-Semtokha	BR319-01	Gyetsezam II	315	320	318690	1	RC T Beam	17	4.5	30	1		1981		PWD	DANTAK	
Trongsa	Trongsa	Tashigang-Semtokha	BR359-01	Bjeezam	320	360	358600	1	TSR Bailey	47	3.76	18	1	1995	1969		PWD	DANTAK	
Trongsa	Trongsa	Tashigang-Semtokha	BR377-01	Nagnichu	360	380	376130	1	RC T Beam	17	4.5	30	1		1982		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR01-01	N/R	0	1	850	1	RC T Beam	6	4.5	40	1		1965		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR04-01	N/R	1	5	3350	1	RC T Beam	8	4.5	40	1		1965		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR04-02	N/R	1	5	3900	1	Composite	12	4.5	30	1		1965		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR06-01	Logna	5	8	7500	1	Hamilton & Steel	40	7.5	24	1		1970		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR11-01	Ase	8	15	10580	1	Bailey Suspension	107	3.76	9	1	1995	1963		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR21-01	Kalley I	15	21	20020	1	Composite	11	4.5	40	1		1964		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR23-01	Kalley II	21	23	22860	1	Hamilton & Steel	11	4.5	40	1		1964		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR25-01	Kalley III	23	25	24950	1	RC T BEam	25	4.5	40	1		1981		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR37-01	Rongkhola	25	37	35600	1	DS Bailey	40	3.76	15	1	1995	1963		PWD	DANTAK	
Zhemgang	Serpang	Gelephu-Trongsa	BR39-01	Beini Bridge	37	46	38850	1	RC T Beam	25	4.5	40	1		1967		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR54-01	Chepleskhola	46	55	53250	1	RC T Beam	22	4.5	40	1		1967		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR63-01	Suborong	55	65	62270	1	RC T Beam	13	4.5	40	1		1967		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR99-01	Mangdichu	65	100	98000	1	Bailey Suspension	107	3.76	12	1	1995	1965		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR108-01	Lower Phusing	100	120	108300	1	Composite	12	4.5	30	1		1973		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR156-01	Wangdigang	120	165	155600	1	DS Bailey	37	3.76	15	1	1995	1969		PWD	DANTAK	
Zhemgang	Zhemgang	Gelephu-Trongsa	BR169-01	Panlachu	165	170	166770	1	RC T BEam	17	4.5	40	1		1981		PWD	DANTAK	
Zhemgang	Trongsa	Gelephu-Trongsa	BR170-01	Panyumteri	165	170	169000	1	SSR Bailey	30	3.76	18	1		1995		PWD	PWD	
Zhemgang	Trongsa	Gelephu-Trongsa	BR189-01	Dungdung	170	190	186750	1	RC T Beam	25	4.5	40	1		1983		PWD	DANTAK	
Zhemgang	Trongsa	Gelephu-Trongsa	BR199-01	Yoormu	190	200	198650	1	RC T Beam	23	4.5	40	1		1984		PWD	DANTAK	
Zhemgang	Zhemgang	Tingtibi-Gomphu	BR06-01	Yaogangchu	1	6	5380	1	RC T Beam	23	4.5	70	1		1993		PWD	DANTAK	
Zhemgang	Zhemgang	Tingtibi-Gomphu	BR14-01	Indayangchu	6	15	10800	1	RC T Beam	23	4.5	70	1		1993		PWD	DANTAK	
Zhemgang	Zhemgang	Tingtibi-Gomphu	BR24-01	Changdachu	15	40	20790	1	RC T Beam	13	4.5	40	1		1993		PWD	DANTAK	

NO. 2

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR284-01		
Bridge Name	Chamkharchu		
Road Name	Tashigang-Semtokha	Location :	283520
Bridge Authority		Print Date:	14-Apr-97
PWD		Print Time:	01:45 PM

BRIDGE DETAILS

Division	Trongsa	Dzongkhag	Bumthang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	37	Location	Chamkharchu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	0	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden Premix carpet
Superstructure	Steel	Pier(s)	nil
Designed By	DANTAK	Year of Completion	1973
Abutments	Cr Masonry Bank Seat		
Foundation Type	Open		
Movement	Free & Fixed		
Services Carried	nil		
Road Signs	30kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

no.3

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM

BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR359-01		
Bridge Name	Bjeezam		
Road Name	Tashigang-Semtokha	Location	358600
	Bridge Authority	Print Date:	14-Apr-97
	PWD	Print Time:	01:44 PM

BRIDGE DETAILS

Division	Trongsa	Dzongkhag	Trongsa
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	47	Location	Mangdichu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden Premix carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	DANYAK	Year of Completion	1969
Abutments	Cr Masonry Bank Seat		
Foundation Type	Open		
Movement	Free		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR99-01		
Bridge Name	Mangdichu		
Road Name	Gelephu-Trongsa	Location	98000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	02:43 PM

BRIDGE DETAILS

Division	Zhemgang	Dzongkhag	Zhemgang
Map	0	Reference	0
Road Classification	National Highway	Over/Under	Over
Length (m)	107	Location	Mangdichu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigible
Load Restriction (T)	12	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden Premix carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	DANTAK	Year of Completion	1965
Abutments	CR Masonry Bank seat		
Foundation Type	Open		
Movement	Free at both ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	DANTAK		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM

BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR156-01		
Bridge Name	Wangdigang		
Road Name	Golephu-Trongsa	Location	155600
Bridge Authority	PWD	Print Date:	24-Apr-97
		Print Time:	02:45 PM

BRIDGE DETAILS

Division	Zhemgang	Dzongkhag	Zhemgang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	37	Location	Wangdigangchu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigible
Load Restriction (T)	15	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden Premix carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	DANTAK	Year of Completion	1969
Abutments	CR Masonry Bank seat		
Foundation Type	Open		
Movement	Free at both ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	DANTAK		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR170-01		
Bridge Name	Panjurmani		
Road Name	Gelephu-Trongsa	Location	169000
Bridge Authority	PWD	Print Date:	24-Apr-97
		Print Time:	02:46 PM

BRIDGE DETAILS

Division	Zhemgang	Dzongkhag	Trongsa
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	30	Location	Kartigangchu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigible
Load Restriction (T)	18	Height Restriction	None
Last Maintained	0	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden Premix carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1995
Abutments	CR Masonry Bank seat		
Foundation Type	Open		
Movement	Free at both ends	Note: Washed out in 1995 by flash flood.	
Services Carried	nil		
Road Signs	5Kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR03-01		
Bridge Name	Hesothangka		
Road Name	Wangdue-Tsirang	Location	2500
Bridge Authority	PWD	Print Date:	24-Apr-97
		Print Time:	01:40 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Wangdue
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	110	Location	H/thankachu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1985
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR09-01		
Bridge Name	Lawakha		
Road Name	Wangdue-Tsirang	Location	8900
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:42 PM

BRIDGE DETAILS			
Division	Lobeysa	Dzongkhag	Wangdue
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	33	Location	Lawakhachu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed
CONSTRUCTION DETAILS			
Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1988
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	*BR14-01*		
Bridge Name	*Basochu*		
Road Name	*Wangdue-Tsirang*	Location	13800
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:44 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Wangdue
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	20	Location	Basochu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1985
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR17-01		
Bridge Name	Rurichu		
Road Name	Wangdue-Tsirang	Location	16500
Bridge Authority	PWD	Print Date:	24-Apr-97
		Print Time:	01:46 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Wangdue
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	17	Location	Rurichu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1987
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR25-01		
Bridge Name	Baychu		
Road Name	Wangdue-Tsirang	Location	24050
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:47 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Wangdue
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	17	Location	Baychu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1985
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR33-01		
Bridge Name	Kamichu		
Road Name	Wangdue-Tsirang	Location	32000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:48 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Daga
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	20	Location	Kamichu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	16	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1986
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	*BR53-01*		
Bridge Name	*Naraychu*		
Road Name	*Wangdue-Tsirang*	Location	52000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:50 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Daga
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	33	Location	Ngaraychu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1992
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR55-01		
Bridge Name	Wakleytar		
Road Name	Wangdue-Tsirang	Location	54000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:52 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Tsirang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	80	Location	Sunkosh
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1987
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR60-01		
Bridge Name	Mechikhola		
Road Name	Wangdue-Tsirang	Location	59000
Bridge Authority		Print Date:	24-Apr-97
PWD		Print Time:	01:53 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Tsirang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	18	Location	Michikhola
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1990
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR70-01		
Bridge Name	Burichu		
Road Name	Wangdue-Tsirang	Location	69000
Bridge Authority	PWD	Print Date:	24-Apr-97
		Print Time:	01:53 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Tsirang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	30	Location	Burichu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1985
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR75-01		
Bridge Name	Chanchey		
Road Name	Wangdue-Tsirang	Location	75000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	01:54 PM

BRIDGE DETAILS

Division	Lobeysa	Dzongkhag	Tsirang
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	40	Location	Chancheychu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden, Premix Carpet
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1986
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free at both Ends		
Services Carried	nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS
PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR21-01		
Bridge Name	Loringkhola		
Road Name	Sarpang-Tsirang	Location	20000
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	02:39 PM

BRIDGE DETAILS			
Division	Sarpang	Dzongkhag	SARPANG
Map	0	Reference	0
Road Classification	National Highway	Over\Under	Over
Length (m)	53	Location	Loringkhola
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed
CONSTRUCTION DETAILS			
Span(s)	1	Running Surface	Wooedn, Premix Carpet
Superstructure	Steel	Pier(s)	nil
Designed By	PWD	Year of Completion	1992
Abutments	CR Masonry Bank Seat		
Foundation Type	Open		
Movement	Free		
Services Carried	Nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM
BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR01-01		
Bridge Name	Sunkosh		
Road Name	Sunkosh-Daga	Location	100
	Bridge Authority	Print Date:	24-Apr-97
	PWD	Print Time:	02:41 PM

BRIDGE DETAILS

Division	Sarpang	Dzongkhag	Daga
Map	0	Reference	0
Road Classification	District Road	Over/Under	Over
Length (m)	93	Location	Sunkosh
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	24	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooedn, Premix Carpet
Superstructure	Steel	Pier(s)	nil
Designed By	PWD	Year of Completion	1982
Abutments	CR Masonrr Bank Seat		
Foundation Type	Open		
Movement	Free		
Services Carried	Nil		
Road Signs	5kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF COMMUNICATIONS

PUBLIC WORKS DIVISION

ROAD MAINTENANCE MANAGEMENT SYSTEM

BRIDGE INVENTORY - BRIDGE DATA TABLE

Bridge Number	BR51-01		
Bridge Name	Tangmachu		
Road Name	Mongar-Lhuntsi	Location	50000
	Bridge Authority	Print Date:	14-Apr-97
	PWD	Print Time:	01:48 PM

BRIDGE DETAILS

Division	Lingmethang	Dzongkhag	Lhuntshi
Map	0	Reference	0
Road Classification	District Road	Over\Under	Over
Length (m)	93	Location	Tangmachu
Width of Carriageway (m)	3.76	Navigational Restriction	Not Navigable
Load Restriction (T)	18	Height Restriction	None
Last Maintained	1995	Abnormal Vehicle	Not allowed

CONSTRUCTION DETAILS

Span(s)	1	Running Surface	Wooden
Superstructure	Steel truss	Pier(s)	nil
Designed By	PWD	Year of Completion	1982
Abutments	CR Masonry		
Foundation Type	Open		
Movement	Free at both ends		
Services Carried	no		
Road Signs	5 kmph		
Constructed By	PWD		
Construction Cost (Nu)	0		

LOCATION PLAN

PHOTOGRAPHS

地域	南西アジア	調査団等名称	調査の種類		作成部課	
国名	ブータン	ブータン国橋梁整備計画調査（事前調査・S/W協議）	現地調査期間	97年4月10日～'97年5月3日	担当者氏名	

番号	資料の名称	発行年	型版	形態	ページ数	Original／Copy	部数	収集先名称又は発行機関
1	STATISTICAL YEARBOOK OF BHUTAN／1994	1996	A4	製本	153	Original	1	Central Statistical Organization, Ministry of Planning
2	EIGHTH FIVE YEAR PLAN (1997-2002) VOL. I	1996	A4	〃	211	〃	1	Ministry of Planning
3	EIGHTH FIVE YEAR PLAN (1997-2002) VOL. II	1996	A4	〃	235	〃	1	Ministry of Planning
4	THIMPHU TO TASHIGANG NATIONAL HIGHWAY FINAL REPORT／JUNE'93	1993	A4	ファイル	442	Copy	1	Dept. of Roads, Ministry of Communication , ADB
5	STANDARD SPECIFICATION AND CODE OF PRACTICE FOR ROAD BRIDGES	1977	A5	製本	34	Original	1	The Indian Roads Congress
6	ROAD DESIGN MANUAL	?	A5	〃	65	〃	1	Public Works Dept., Ministry of Social Services
7	FIELD MANUAL OF ROAD MAINTENANCE	?	A5	〃	139	〃	1	〃
8	SURVEY MANUAL	?	A5	〃	45	〃	1	〃
9	ROAD CONSTRUCTION MANUAL	?	A4	〃	219	〃	1	Public Works Department
10	DRAFT ENVIRONMENT IMPACT ASSESSMENT SECTORAL GUIDELINES	1996	A4	ファイル	104	Copy	1	National Environment Commission
11	FOREST AND NATURE CONSERVATION ACT OF BHUTAN／1995	1995	B5	製本	46	Original	1	〃
12	LAND ACT	1991	B5	製本	174	Original	1	Survey of Bhutan
13	MINES AND MINERALS MANAGEMENT ACT	1995	B5	製本	26	Original	1	Department of Geology and Mines
14	ENVIRONMENT AND SUSTAINABLE DEVELOPMENT	1990	A4	〃	51	〃	1	UNDP
15	BHUTAN TRUST FUND／ANNUAL REPORT'95-'96	1996	A4	〃	28	〃	1	Bhutan Trust Fund for Environmental Conservation
16	BHUTAN AND ITS NATURAL RESOURCES	1991	A5	〃	149	〃	1	VIKAS PUBLISHING HOUSE PVT LTD
17	FLOW DATA	1997	A4	クリップ	36	Copy	1	HYDROMETEOROLOGICAL NETWORK
18	ATLAS OF MINERAL RESOURCES OF THE ESCAP REGION VOL. 8	1991	A4	製本	56	Original	1	UNITED NATIONS
19	RMMS／OPERATIONS AND MANAGEMENT MANUAL／APPENDICES	1995	A4	クリップ	251	Copy	1	Ministry of communications, Public Works Division、ADB
20	INVENTORY—ROADS, BRIDGES, SLOPES	1997	A4	〃	92	〃	1	PWD
21	BRIDGE INVENTORY／August 1995	1995	A4	クリップ	29	Copy	1	Public Works Division, Ministry of Communication
22	REVISED FARE CHART／1994	1994	A4	クリップ	77	Copy	1	Surface Transport Division, Ministry of Communications
23	TECHNO-ECONOMIC FEASIBILITY REPORT ON BRIDGE CONSTRUCTION PROJECT	1988	A4	〃	268	〃	1	Asian Development Bank
24	Detailed Project Report for Construction of Three Bridges in Bhutan, Inception Report	1994	A4	〃	30	〃	1	Government of India, Ministry of External Affairs
25	RESTRUCTION OF THE SURFACE TRANSPORT SECTOR STUDY	1996	A4	〃	232	〃	1	UNDP
26	BHUTAN SCHEDULE OF RATES／1996-1997	1996	A4	製本	113	Original	1	Ministry of Communications Roads, Works and Housing
27	1:50000土地利用図　78E/15,16-78I/2,3,4,6,7,10,11,12-78M/2,3,7　計15葉	1997	A1	地図	15	Original	1	Survey of Bhutan
28	1：50000　SPOT　衛星写真　78I/2,78I/11,78I/12,78I/14,78M/43　計5葉	1991	A1	衛星写真	5	Original	1	Survey of Bhutan