社会開発調査部報告書

No. 32

THE MASTER PLAN STUDY ON IMPROVEMENT AND REHABILITATION OF ROAD NETWORK IN ULAANBAATAR IN MONGOLIA

FINAL REPORT

MAIN REPORT

March 1999

PACIFIC CONSULTANTS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF INFRASTRUCTURE DEVELOPMENT
OF GOVERNMENT OF MONGOLIA
ULAANBAATAR CITY GOVERNMENT

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The following exchange rate is applied in this report:
US$ 1.00 = Tug 838.46 = Yen 140.45
Yen 1.00 = Tug 5.97
(July 1, 1998)

PREFACE

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct the Master Plan Study on Improvement and Rehabilitation of Road Network in Ulaanbaatar in Mongolia and entrusted to study to the Japan International Cooperation Agency (JICA).

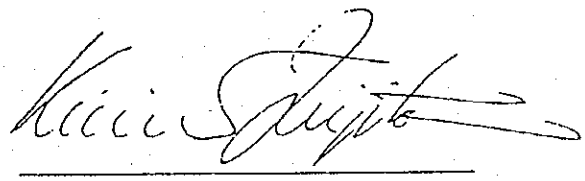
JICA selected and dispatched a study team headed by Mr. Koki Kaneda of Pacific Consultants International and consisting of PCI and Yachiyo Engineering Co., Ltd. to Mongolia, between January 1998 and March 1999.

The team held discussions with the officials concerned of the Government of Mongolia and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and completed this final report.

I hope that this report will contribute to the realization of recommended projects and to the enhancement of friendly relationship between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Mongolia for their close cooperation extended to the study team.

March 1999



Kimio Fujita
President
Japan International Cooperation Agency

March 1999

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

Letter of Transmittal

Dear Sir:

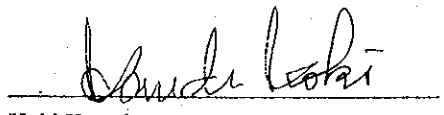
We are pleased to submit herewith the Final Study Report of the Master Plan Study on Improvement and Rehabilitation of Road Network in Ulaanbaatar in Mongolia. The study was conducted by the team of Pacific Consultants International and Yachiyo Engineering Consultant Co., LTD during the months from January 1998 to March 1999 under the contract with Japan International Cooperation Agency.

Generally, the road network plan should be prepared based on the City Master Plan. The previous Ulaanbaatar city master plan is under review by the city government and the revised plan is expected to be finalized after the completion of this road master plan study. The Mongolian side and the study team formulated the socio-economic frameworks for the target year of 2020. The road development master plan for 2020 was determined in those frameworks. Then, feasibility studies were conducted for projects selected from the master plan, and prioritized projects with their technical and economic viability were proposed.

In view of the necessity of the road network development, we recommend that the Government of Mongolia will implement the selected projects at the earliest opportunity.

We wish to express our sincere gratitude to your Agency, Ministry of Foreign Affairs, Ministry of Construction, and Ministry of Transport of Japan. We also wish to express our deep gratitude to the officials concerned of Ministry of Infrastructure Development of Mongolia, the Road Department and Ulaanbaatar City of Mongolia as well as to the Embassy of Japan and JICA Office in Mongolia for close cooperation and assistance extended to the study team.

Very truly yours,



Koki Kaneda
Team Leader
Master Plan Study on Improvement and Rehabilitation
of Road Network in Ulaanbaatar in Mongolia

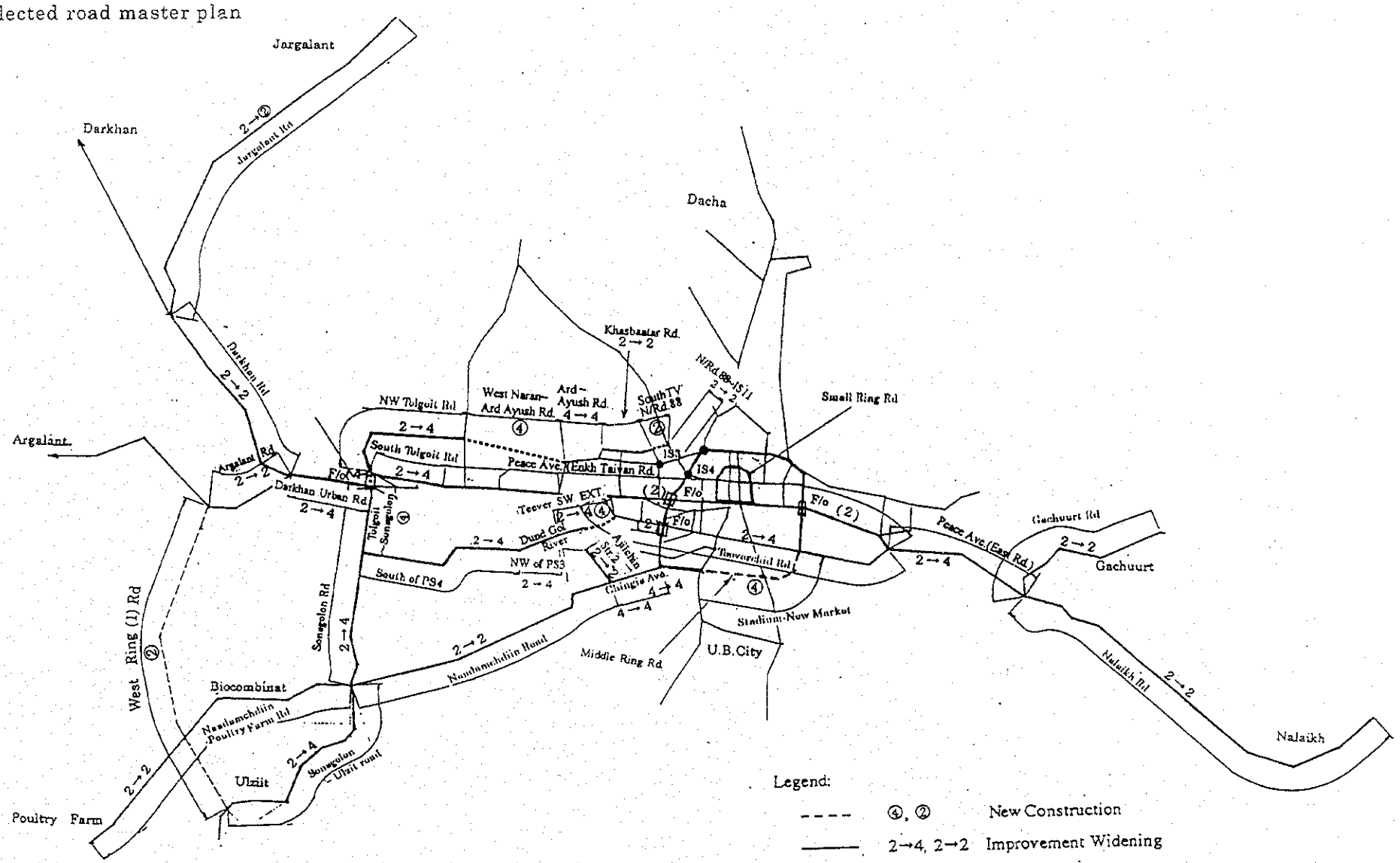
Location Map

PROJECT SUMMARY

Name of Study	The master plan study on Improvement and Rehabilitation of Road Network in Ulaanbaatar in Mongolia
Counterparts Agency	Road Department and Ulaanbaatar City Government
Objectives	Determine a **road development master plan** for 2020 and **feasibility study** of high priority projects
Study area	Greater Ulaanbaatar area for the master plan and urban streets for the feasibility study

Traffic in 1998	The maximum volume was 35,000 vehicles per day on the central section of Peace Avenue
Traffic in 2020	The maximum volume will be 65,000 vehicles per day at the same section. Traffic congestion will be found in the west and south parts of the city.
Public transport	Passengers on service of bus & trolley will increase 1.54 times (1.97% per annum) in 2020. An amount of US$23 million was estimated for years by 2005 for vehicle replacement.

The selected road master plan



Required Traffic Lane for Best Alternative R7 Future Road Network in 2020

Projects under the feasibility study (Cost in 1998 Prices)

Route	Construction	Fin. cost	B/C ratio	EIRR	NPV
Central	2 Years.	5.6 million	1.54	14.7 %	2.1 million
North	4	35.3	0.71	6.4 %	-6.7
South	6	46.7	1.10	11.3 %	2.9
Ring	3	18.4	1.03	10.5 %	0.4

PRIORITY PROJECTS

Priority projects were selected by taking into consideration of various factors including financial constraints in the country, changes in land use along the route, opening of the new central market.

Priority projects	Fin. Cost in 1998 prices
1.The western part of Central Route in railway crossing and adjacent roads toward the north	5.6 million
2.The widening of the Teeverchid Rd. for 8.4km in South Route	17.0
3.A fly-over construction at East Cross Intersection of Ring Road	2.4
Total	US$ 25.0 million

Recommendations

Technical matters

1. Increase revenues by raising taxes on fuels and vehicle registration by stage
2. Develop a routine maintenance system of roads in Ulaanbaatar
3. Strengthen of quality control and supervising system in works on roads
4. Restructure in road administration of Ulaanbaatar
5. Improve contractors in technical performance and assets and equipment
6. Develop the road inventory filing system with its periodic reviewing
7. Restructure public corporation of bus and trolley, including staged increases of user fares
8. A request for ADB, World Bank or JICA in financial aid for having advisors in Transport Coordination Department of the city government

Political matters

1. Develop a master plan of roads in long term, maintain right of ways for the future and set up legal background in land acquisition
2. Utilization of empty lands for temporary water ponds subject for exemption from land taxes with legislative supports.
3. The government of Mongolia should clarify procedures to determine the priority of projects in road network improvement in Ulaanbaatar among other feasible projects claimed by respective agencies.

OUTLINE OF THE STUDY

Name of Study	: The Master Plan Study on Improvement and Rehabilitation of Road Network in Ulaanbaatar in Mongolia
Study Period	: January 1998 – March 1999
Counterpart Agency	: Road Department in Ministry of Infrastructure Development and City Government of Ulaanbaatar

1. Background

The Greater Ulaanbaatar (GUB) comprises of Ulaanbaatar City and 6 satellite towns extending the territory for 4,700 sq. km with a population of 630,000 (1998). Most part of the territory is occupied by mountains and hills with the elevation of 1,300 - 2,000 m above sea level. The territory of urbanized Ulaanbaatar (UUB) is stretching for 30km in east to west in the area of 150 sq. km (about 3% of that of GUB) with 540,000 inhabitants (about 86% of that of GUB). Transport in UUB depends, mainly, on vehicles.

2. Objectives

Since 1993, the vehicles registered have increased at an annual growth rate of 7%. After the collapse of the USSR in 1989, the country's economy is facing difficulties and the maintenance of roads was not carried out properly during the last 10 years. The objectives of the Study are to establish a long-term road development plan for year 2020, and to conduct a feasibility study (F/S) for high priority projects in order to implement the most appropriate long term road network plan.

3. Study Area

The study area covered GUB including satellite towns of Nalaikh, Gachuurt, Ulziit, Biocombinat, Poultry Farm and Jargalant. However, roads in Urbanized Ulaanbaatar were taken in the master plan study and feasibility study.

. Study Outlines

4.1 Basic Approach

Using the existing road master plan, a super long term road development plan (R1) was first determined. Examining the R1, six alternative master plans (R2-R7) were produced and evaluated, resulting in the selection of the plan (R7) for 2020. Feasibility study was carried out for project components of R7. As the amount was too heavy for the realization by Mongolian government. priority projects were selected from FS projects and recommended for earlier implementation.

4.2 Process to the Determination of the Long Term Master Plan

(1) Road Inventory Surveys

Roads in Ulaanbaatar were classified as right:

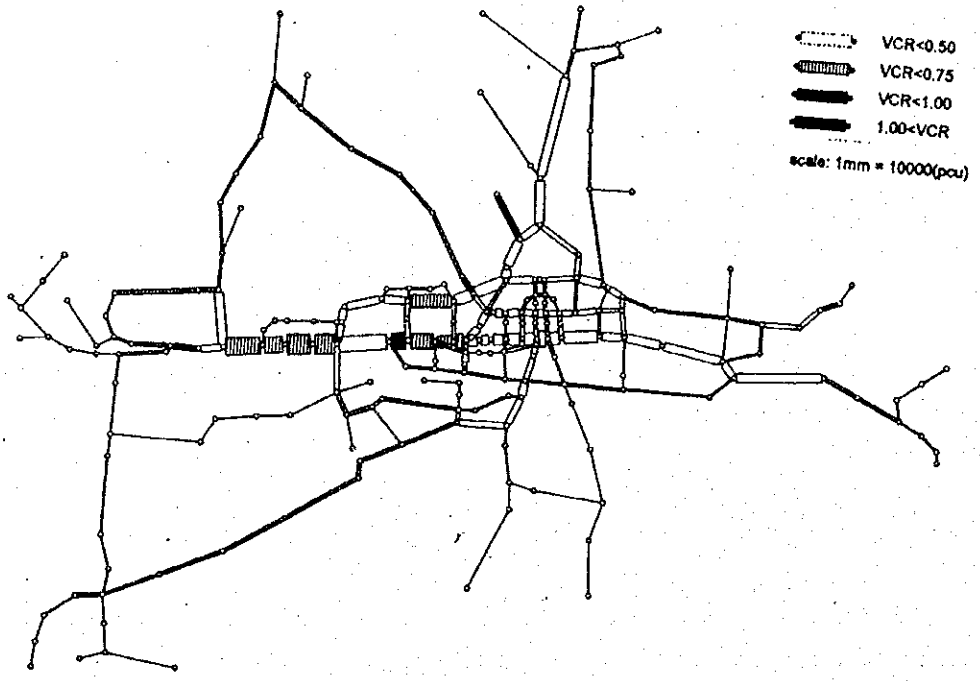
National Road	76.5
Regional Road	78.0
City Road	168.8
Others	94.9
Total	418.2

Inventory surveys were conducted for roads of 227 km, bridges of 32 and intersections of 10. They were grouped in four categories by referring to HDM methods. Of roads 227 km in total surveyed, 20 km were recorded as in 'bad condition'. Deterioration of roads were accelerating during the months of the study.

Most bridges were constructed by RCT type, while only 3 bridges were made of PC type. Of those, 4 bridges were found in bad conditions.

(2) Traffic Surveys

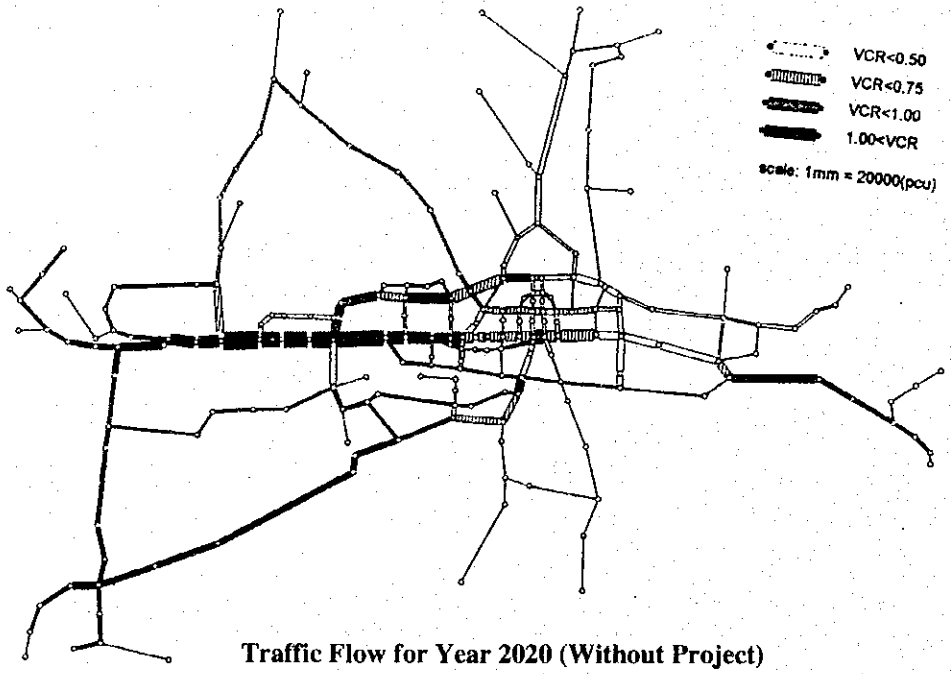
Traffic surveys of 8 types were conducted in May – June 1998. The largest traffic volume was counted on a section of Peace Avenue at 35,000 vehicles per day.



Traffic Flow for Year 1998

(3) Traffic Forecast

The study area was delineated into 52 zones and traffic forecasts were conducted. The traffic flow in 1998 showed no congestions. While roads in 1999 assuming the opening of the new central market showed increases in traffic on Teeverchid Road and other adjacent roads, but heavy congestion was not forecast. The forecast in 2020 showed a volume of 65,000 on the central section of Peace Avenue and traffic congestion was found on roads in the west and south part of Ulaanbaatar.



Traffic Flow for Year 2020 (Without Project)

(4) Public Transport in Future

At present, passengers on the public transport service occupy 80 % of the total person trips. The public transport users in 2020 were forecast to increase by 1.54 times than 1998, which means the annual average rate of increase at 1.97 % during those years. In order to sustain the service, two vehicle replacement plans were proposed and EIRR was calculated. The plan which incorporated in a gradual phase out of trolleys showed a higher return of 34% with an estimated cost of $104.6 million in 1998 prices. When the first stage up to 2005 of this plan is taken up, renewal of 150 buses, 53 trolleys and rehabilitate power lines on roads of 18km is necessary with a total cost of US$23.3 million.

(5) Design Standards

Mongolia adopted the standards originated from the Russians in the past. It was agreed to use some from AASHTO and the Japanese ones. The maximum design speed on roads in the urban area was determined at 60km, lane numbers were set at 2, 4and 6 with the traffic volume of 9,000, 37,000 and 56,000 respectively.

(6) Cost Estimate of Alternative Long Term Plans

Alternative long term road plans (R2-R7) were formulated with different plans of new construction and improvement for years up to 2020. Financial cost (million US$) was estimated for each plan.

	Outline	Financial cost
R2	Principal road network plan for long term period. All main roads are expanded to be 4 lanes	246
R3	Reduced the northern route to 2 lanes. New road at the south side of TV stations. Improvement of Rd No 88 for 0.4 km	228
R4	Reduce the southern route at 2 lanes.	230
R5	Reduce the Naadamchidiin road at 2 lanes	231
R6	Reduce the Naadamchidiin road at 2 lanes. Northern route will connect from west Naran to Ardayush by 4 lanes. Expand Teeverchid street to Peace avenue at the west end. The roads of South of PS4 and PS3 are 2 lanes	238
R7	Modification of R6 Khasbaatar road shall be 2 lanes	226

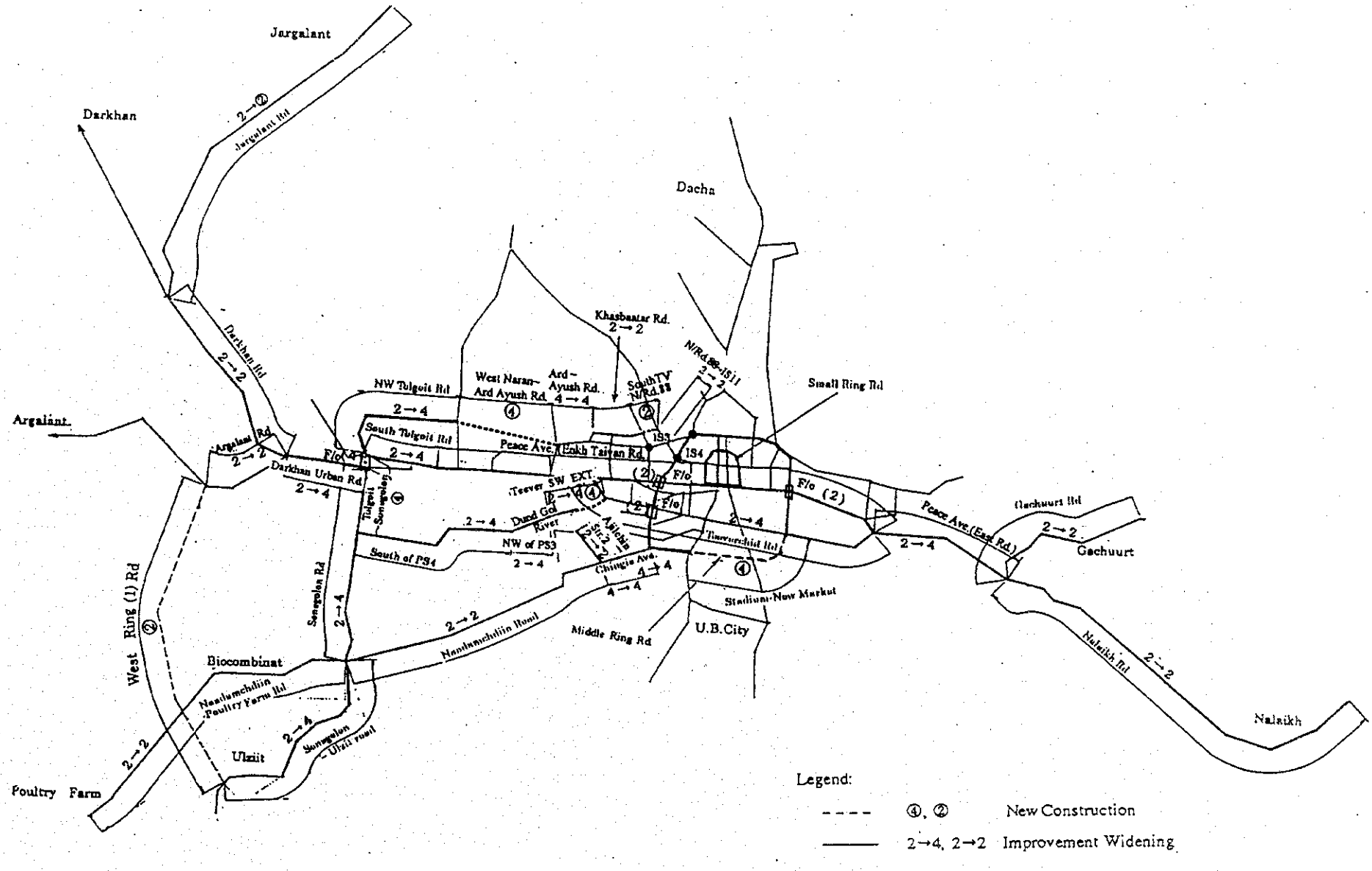
(7) Economic Evaluation and Others

Economic evaluation was conducted for 6 alternative plans in terms of forecast traffic in 2020 and the average annualized cost. Evaluation in other aspects including the relocation problem of habitants in the corridor was also conducted.

Evaluations of Alternative Plans (R2 - R7) (Unit million US $)

Future Road Network	Total Economic Cost	Annualized Economic Cost	Annual Economic Benefit			General Assessment		
			VOC Savings	Time Savings	Total Savings	Economic Cost	B/C ratio	Environ & Relocation
R2	236.1	27.7	33.3	3.1	36.4	D, largest	D, 1.311	D, least
R3	218.9	25.7	32.8	3.1	35.9	B, normal	B, 1.396	B, normal
R4	220.4	25.9	33.2	3.1	36.3	B, normal	B, 1.402	A, better
R5	221.8	26.1	31.8	3.0	34.8	C, lager	D, 1.336	C, less
R6	228.0	26.8	33.7	3.2	36.8	D, largest	C, 1.374	C, less
R7	216.8	25.5	33.1	3.1	36.2	A, least	A, 1.423	B, normal

Notes: Rank , A; Good, B; Fair, C; Poor, D; Bad (Costs and Benefits are in US$'000)



Required Traffic Lane for Best Alternative R7 Future Road Network in 2020

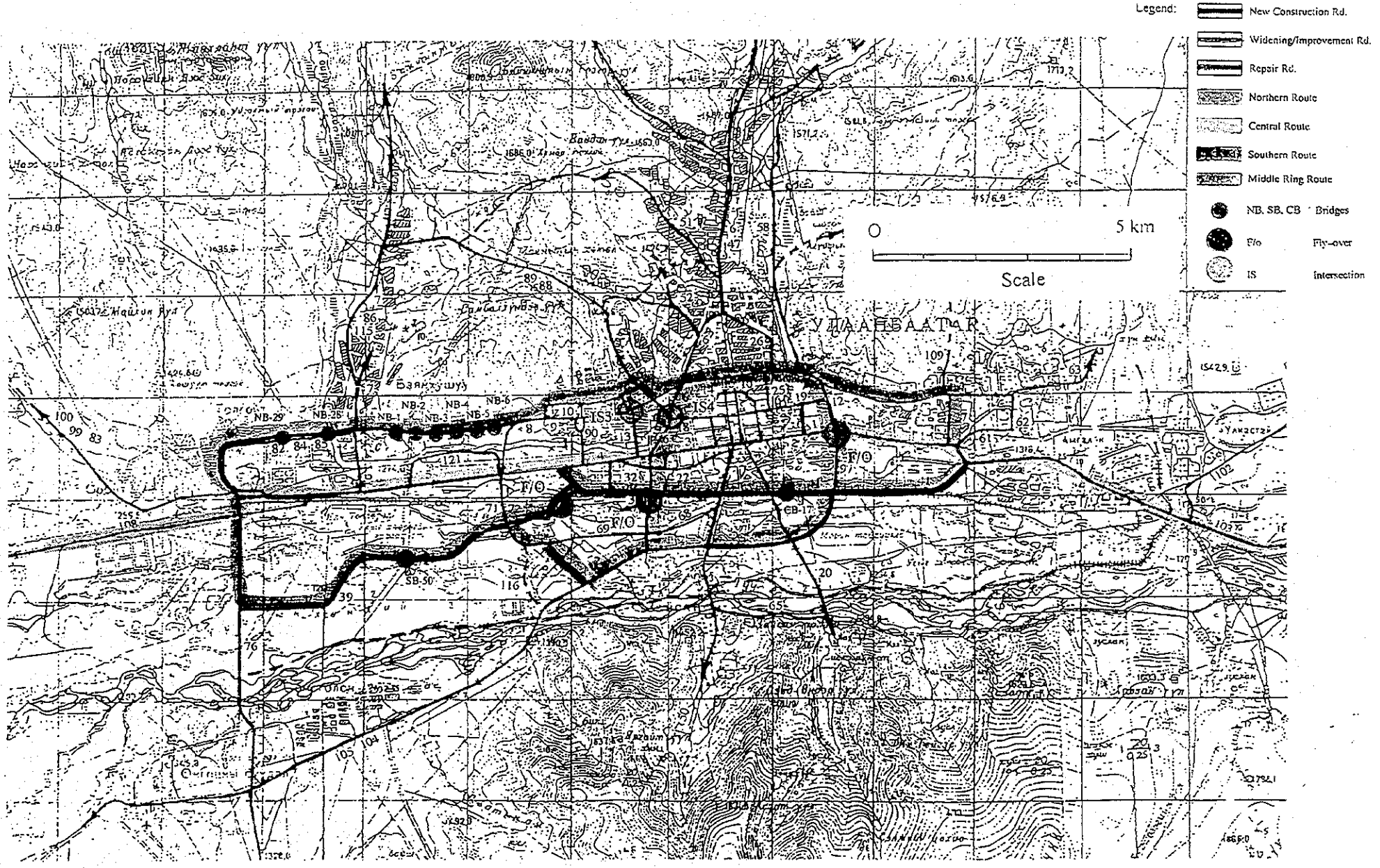
(8) Funding Sources for Road Development

In 1997, revenue of the Mongolian budget was US$267 million and her expenditure was US$366 million. From that, US$ 5 million were allocated as the road budget and 10% of which US$ 0.5 million were received by UB city. The amounts are too short to cover maintenance activities.

Budgets for the country and roads are estimated for years in future under some assumptions and it is thought there will be surplus over the expenditure with which the country can pay back new loans for roads annually.

4.3 Feasibility Study for the Selected Plan R7

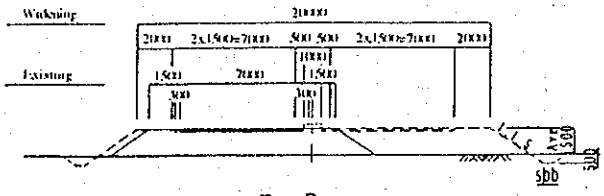
Feasibility study was conducted for the components of the long term plan R7, in which basic approach was to utilize mostly the existing road facilities. Improvement and rehabilitation were considered, while new construction was included in minimum necessity.



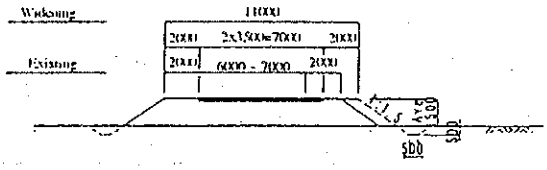
Location Map for FS Project

(1) Preliminary design

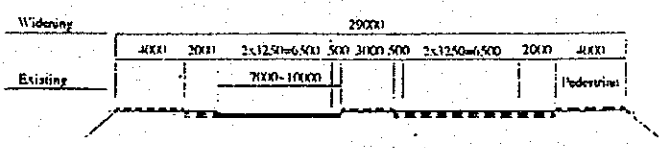
Improvement and Widening of roads were designed by using the criteria agreed with Mongolian side, and quantities were calculated. Existing bridges subject for widening would remain after repair works, while a new 2 lane bridge was designed to be constructed in parallel. Drainage system in the city was found decreasing the capacity because of negligence of maintenance and cleaning. Open side drains were designed at places necessary, particularly on roads in newly developing areas.



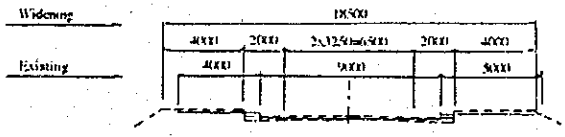
Type D
for category A Regional Road (2 - 4 Lanes)



Type E
for category A Regional Road (2 - 2 Lanes)



Type F
for category B Primary Road (2 - 4 Lanes)



Type G
for category B Primary Road (2 - 2 Lanes)

Cross Section for Improvement and Widening

(2) Machines and Equipment

Most of machine and equipment supplied in previous aid projects from Japan. could be utilized for implementation of projects under this study, however equipment for concrete work and cranes are necessary.

(3) Construction Period

Construction Schedule for All Projects

	Cost (MUS$)	Ratio	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
Central Route	5.6	5.3%	~~10.0%~~	35.0%	55.0%					
			0.5%	1.9%	2.9%					
North Route	35.3	33.3%				~~10.0%~~	10.0%	30.0%	30.0%	20.0%
						3.3%	3.3%	10.0%	10.0%	6.7%
South Route	46.7	44.1%		~~5.0%~~	10.0%	20.0%	~~20.0%~~	20.0%	15.0%	10.0%
				2.2%	4.4%	8.8%	8.8%	8.8%	6.6%	4.4%
Ring Road	18.4	17.4%			~~10.0%~~	5.0%	35.0%	50.0%		
					1.7%	0.9%	6.1%	8.7%		
Total	106.1	100.0%	0.5%	4.1%	9.1%	13.0%	18.2%	27.5%	16.6%	11.1%

Notes ~~——~~ Design ~~————~~ construction

(4) Cost Estimation for F/S Projects

Summary of Cost of F/S Projects (Unit: million US$)

	F/S Project	Total Length (km)	Local Currency Portion	Foreign Currency Portion	Total Cost
1	Central Route	25.43	1.3	4.3	5.6
2	Northern Route	26.26	6.7	28.6	35.3
3	Southern Route	28.76	9.1	37.6	46.7
4	Middle Ring Route	16.48	3.3	15.1	18.4
	(Sub-Total for All Routes)	96.93	20.1	84.6	104.7
5	Repair of Ajilchin Street 2	1.10	.1	.4	.6
6	Intersection Improvement	(10places)	.1	4.3	4.4
7	New Drainage Facilities	1.10	1.9	2.8	4.6
8	Construction and rehabilitation of bus stops	(2places)	.4	.3	.7
9	Environmental Protection		.1	1.2	1.2
	(Sub-Total)		2.5	9.0	11.5
	Total		22.6	93.6	116.2

(5) Economic Evaluation of F/S Projects

It can be seen from this table that all the routes (except the Northern Route) are economically feasible. The economic performance of Central Route is highest followed by the Southern Route.

Summarized Results of Economic Evaluation

Route	Economic Cost (in MUS$)	B/C	IRR	NPV
Central Route	4.9	1.54	14.7%	2.1
Northern Route	31.6	0.71	6.4%	-6.7
Southern Route	41.6	1.10	11.3%	2.9
Middle Ring Route	16.4	1.03	10.5%	0.4
All Routes	93.4	0.94	9.3%	-3.1

B/C : Benefit-Cost Ratio ;IRR : Internal Rate of Return ;
NPV : Net Present Value in million US$

(6) Environmental Impact Assessment

Mitigation of air pollution is necessary to enforce reducing exhaust gas from vehicles, to act traffic demand management and to establish greenbelts along the road. For reducing noise and vibration during the construction, noise cover for machines and low noise producing equipment such as vibrator driver (instead of pile driver) should be used, where the additional cost was estimated at US$43,000.

(7) Road Maintenance

Annual maintenance cost was estimated for different road groups as in the followings.

Priory	Length of road	Expected yearly maintenance cost (Assumed: $5/ m2-year:width 10m)
1. The roads for public bus routes	158km	1,580,000*5= US$7.9 million
2. Busy roads	About 60km	600,000*5= US$3.0 million
3. Political important roads	About 20km	200,000*5= US$1.5 million
4. District roads	95km	950,000*5= US$4.7 million

(8) High Priority Projects

High priority projects were selected from the result of F/S for the components of the long term plan, R7, at a cost of US$25 million in 1998 prices.

Projects	Cost/Term	Reasons	Remarks
Improvement of irregular Cross section with railway at western part of Enkh Taivan and development of road for the access to northern route.	US$ 5.6 million 3years	The largest efficiency is ensured by small cost. It will contribute to solve the forecasted traffic congestion in the Central route and to prevent accidents with railway.	The efficiency may become larger after the completion of the northern route in future. **EIRR=14.7%**
Widening of Teeverchid Road (Length:8.4km)	US$ 17.0 million 4years	First, this widening is effective for the solution of traffic congestion immediately due to the opening of new central market in 1999. Second, this project has a position as the part 1 of Southern route, which should be completed as the alternative route of the congested central route in 2020.	Recently the development of the land along the road is in good progress and the acquisition of land is becoming difficult. **EIRR=11.3%**
Fly-over on East cross intersection	US$ 2.4 million 3years	This is a part of Middle Ring Road and the flyover will contribute to the solution of traffic congestion due to the opening of new central market.	Although the B/C of Middle Ring Road reaches minimum requirement, the East Cross intersection is considered in urgent need of improvement for reducing the future traffic congestion in city center area. **EIRR=10.5%**
Total Cost	US$ 25.0 million		

(9) Public Transport System

The followings are recommended to sustain the public transport system in future.

1. Re-organization between companies and within each company.
2. Raising of fare step by step. Reduction of the scope of people applicable to free bus service. Actions by conductors to delete the nonqualified passengers.
3. Introduction of new ticket system for allowing free transfer among routes and others.
4. Sale of the existing and new bus routes to private sectors should be considered.
5. Government and city office should take measures to increase the efficiency of bus operation. (e.g. bus exclusive lane, improvement of bus stop, etc.)

(10) Recommendations

1) Technical Matters

1. Increase revenues by raising taxes on fuels and vehicle registration by stage
2. Develop a routine maintenance system of roads in Ulaanbaatar
3. Strengthen of quality control and supervising system in works on roads
4. Restructure in road administration of Ulaanbaatar
5. Improve contractors in technical performance and assets and equipment
6. Develop the road inventory filing system with its periodic reviewing
7. Restructure public corporation of bus and trolley, including staged increases of user fares
8. A request for DAB, World Bank or JICA in financial aid for having advisors in Transport Coordination Department of the city government

2) Political Matters

1. Develop a master plan of roads in long term, maintain right of ways for the future and set up egal background in land acquisition
2. Utilization of empty lands for temporary water ponds subject for exemption from land taxes with legislative supports.
3. The government of Mongolia should clarify procedures to determine the priority of projects in road network improvement in Ulaanbaatar among other feasible projects claimed by respective agencies.

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ABBREVIATION

AADT	Average Annual Daily Traffic
ADB	Asian Development Bank
a.g. rate	annual growth rate
ave.	average
Ave.	Avenue
BCH	Vedomstvennye Stroitelnye Normy (Translated from Russian: Departmental Construction Norms)
BNbD..	Barilgyn Norm ba Durem (Translated from Mongolian: Construction Norms and Regulations)
BOD	Biochemical Oxygen Demand
Brg.	Bridge
CBD	Central Business District
CBR	California Bearing Ratio
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
Corp.	Corporation
D	Diameter
DCSCs	District Construction and Service Companies
DEIA	Detailed Environmental Impact Assessment
Dept.	Department
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
Fig.	Figure
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GUB	Greater Ulaanbaatar
HDM	Highway Design and Maintenance Standards Model
IBRD	International Bank of Reconstruction and Development
IEE	Initial Environmental Examination
IS	Intersection
LG	Local Government
M$	US$ in miilion
MER	Ministry of External Relations
MID	Ministry of Infrastructure Development
MNE	Ministry of Nature and Environment
MT	Tugrug in million
NO2	Nitrogen Dioxide
NUUTS	Company Name
OD	Origin-Destination
PS	Power Station
Pop.	Population
R1	Road Network Plan Alternative 1
R2	Road Network Plan Alternative 2
R3	Road Network Plan Alternative 3
R4	Road Network Plan Alternative 4
R5	Road Network Plan Alternative 5
R6	Road Network Plan Alternative 6
R7	Road Network Plan Alternative 7
RD	Road Department
Rd.	Road
SACO N&E	State Administrative Central Organization, Nature and Environment
SO2	Sulfer Dioxide
SniP	Stroitelnye Normy i Pravila (Translated from Russian: Construction Norms and Regulations)
Str.	Street
TCD	Transport Coordination Department, Government of Ulaanbaatar
TDS	Total Dissolved Solid
Tug, Tg, tug,	Tugrug (Mongolian Currency)
UB	Ulaanbaatar
UBCMO	Ulaanbaatar City Mayor's Office
UUB	Urbanized Ulaanbaatar Area
VCR	Volume Capacity Ratio
VOC	Vehicle Operation Cost
WB	World Bank

Chapter 1 Introduction

1.1 Background of the Study

(1) General

In response to the request of the Government of Mongolia, the Government of Japan decided to conduct the Master Plan Study on Improvement and Rehabilitation of Road Network in Ulaanbaatar (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, 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, undertook the Study in close relation with the authorities concerned of the Mongolia.

JICA organized the Study Team to conduct the Study. The Study Team carried out the study in close cooperation with the Mongolian authorities from January 1998 till March 1999.

This report comprises the results of the Study including analysis and recommendations for the road network and priority projects in Ulaanbaatar City.

(2) Ulaanbaatar

Ulaanbaatar (UB) city is the capital of Mongolia. The Greater UB (GUB) region, the study area, has a population of 630,000 in an area of 4,700 km2. The population corresponds approximately to a quarter of the whole Mongolian population. Most area consists of flat and moderate hilly and mountainous lands. The actual city area of Urbanized UB (UUB), about 150 km2, is located at the aIn response to the request of the Government of Mongolia, the Government of Japan decided to conduct the Master Plan Study on Improvement and Rehabilitation of Road Network in Ulaanbaatar (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The City Master Plan of GUB was prepared with the assistance of USSR in 1987. A railway was drawn in the center line of UB, and on the northern side with a width of 2-3 km of the railway, government offices, business center, factories and housings are arranged. On the southern side, industrial factories and power stations were located. The power stations would supply hot water and electricity to UUB. However, population has increased far beyond the plan, and the economy suffered from restructuring of the socialist planning system into the market economy in early part of the 1990s. Figure 1.1.1 shows the population of UB in recent years.

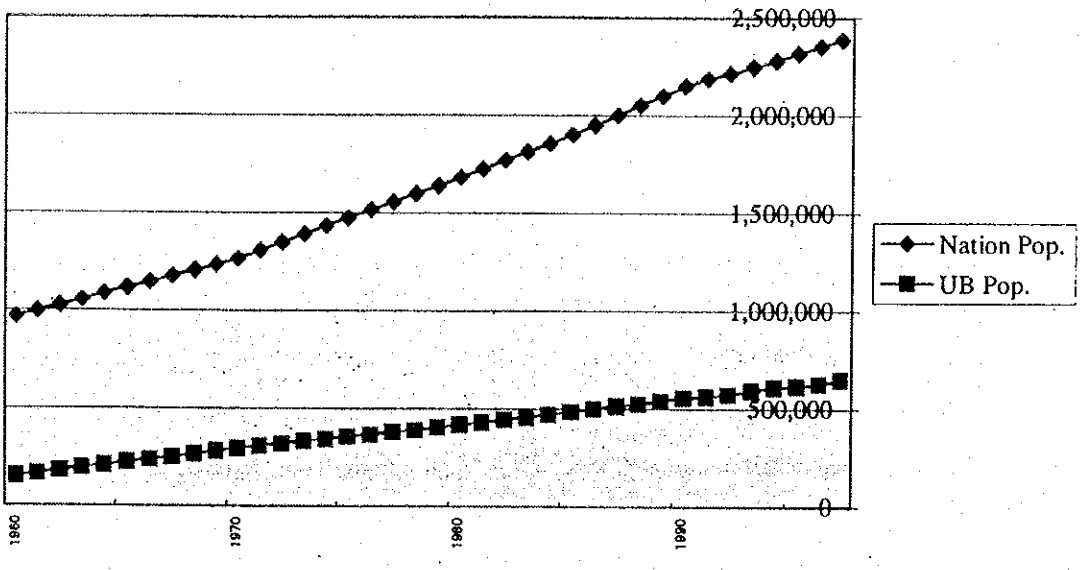

Figure 1.1.1 Population of Mongolia and UB, 1960-97

The transportation in UB depends mainly on vehicles, such as bus, trolley bus, private car and truck. Ratio of the public transportation is 80 % of the total demand in UUB. Railway is used only for inter-city services. The annual increasing ratio of the road traffic shows about 7% since 1993.

However, the development of road network, as the social infrastructure, is lagging behind the increasing of the vehicles after the collapse of USSR in 1989. National financial conditions were in distressing conditions and the budget for road maintenance was in very tight status. The damaged roads have not been repaired due to the lack of budget, and as a result the remedial cost is considered to be increasing rapidly compared with the cost of normal maintenance of adequate timing.

The requested items for this study by the Mongolian Government were as follows:

Reconnaissance of current condition of GUB.

Establishment of a Master plan which target year is 2020

Feasibility Study (FS) for the selected projects from the Master Plan

Proposals for the maintenance of road ways

It is important to develop the infrastructures of UB, especially road infrastructures with which the economic center of Mongolia may develop effectively.

1.2 Objectives of the Study

The objectives of the Study are :

1) to establish a long-term road development plan for year 2020;

2) to conduct a feasibility study (F/S) for high priority projects;

3) to pursue technical transfer of study procedures to counterparts.

1.3 Survey Area

The study area is limited to the city urban area (UUB), however the study of the following items includes the area of six satellite towns around UB (GUB), as shown in Figure 1.3.1 and 1.3.2*.

- Establishment of socioeconomic framework
- Forecast of future traffic demand
- Study of future roads to those satellite towns
- Long-term development plan of roads to those towns

*Note : Each location is shown by the coordinate on the location map as "(A3)".

General description of 6 satellite towns/villages are as described below:

	Location	Population and Main industries
Nalaikh	30 km to the east	20,000 people Coal mine and Glass factory
Gachuurt	19 km to the north-east	4,000 people Farms and meadows
Ulziit	29 km to the south-west	400 people Fur production
Biokombinat*	24 km to the west	4,000 people Bio preparation factories
Poultry Farm	37 km to the south-west	3,000 people Poultry
Jargalant	30 km to the north-west	6,000 people Agriculture

Note : Argalant is defined as one of 6 satellite towns in JICA specification. However, Argalant is the name of a district of UB which covers from 24 km to 150 km to the west of UB. Town of Argalant is located 100 km to the west of UB. Small station "Emeelt" with 100 people seems to correspond to JICA specification, and there is a bigger town called Biokombinat near this point. Study team defined this Biokombinat as one of 6 satellite towns instead of Argalant through the discussions with Mongolian side.

Figure 1.3.1 Study Area: Greater Ulaanbaatar

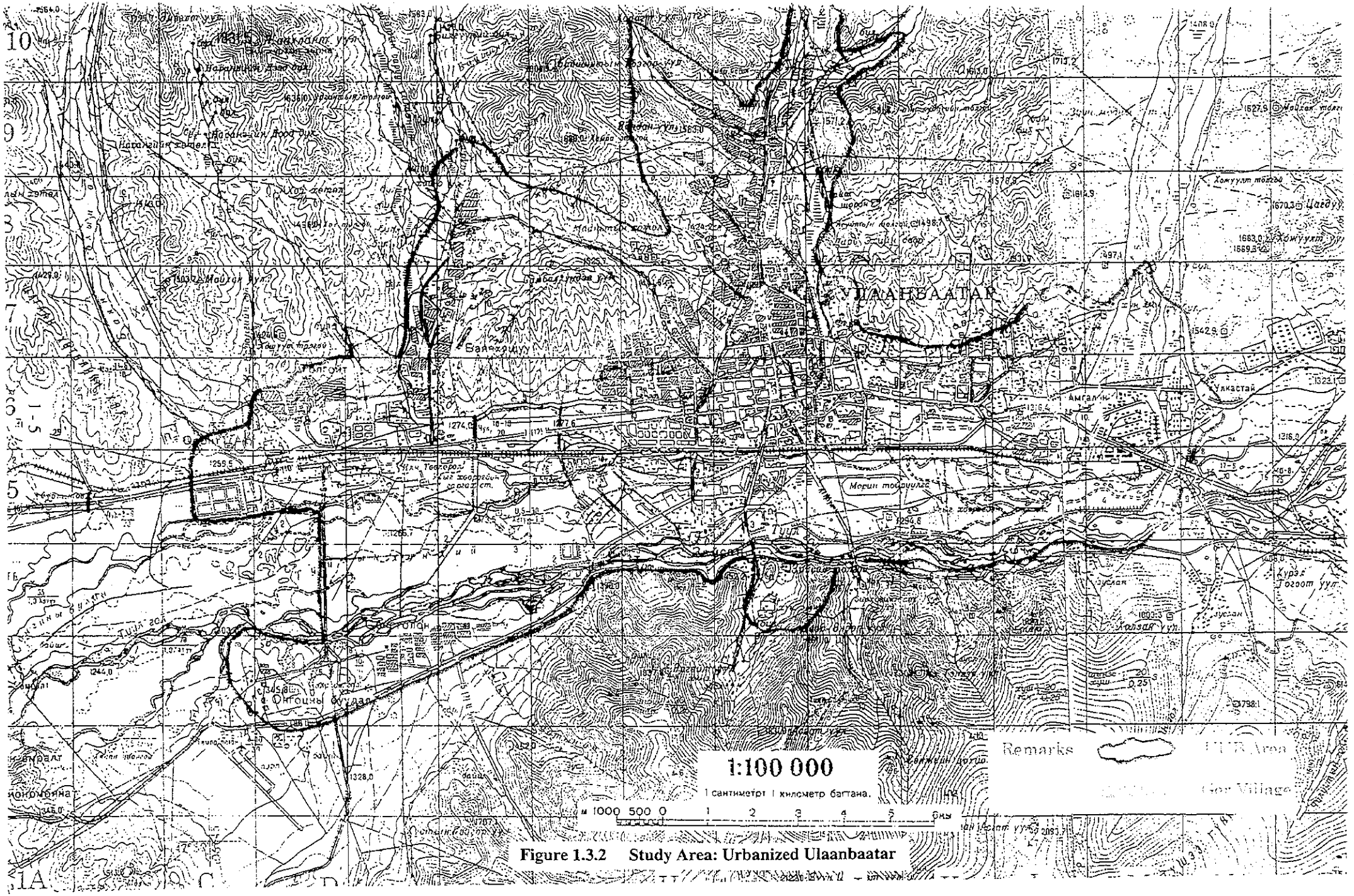

Figure 1.3.2 Study Area: Urbanized Ulaanbaatar

1.4 Scope of the Study

The scope of the study is divided into 3 phases as shown in Table 1.4.1. Study procedures are summarized in Figure 1.4.1.

Table 1.4.1 Phases of the Study

Phase	Study
Phase 1 (2 months) Determination of fhc Following researches	● Collection of data ● Review of the existing City Master Planning ● Agreement with the Mongolian side for the socio-economic frameworks in future. ● Zoning and setting of the frameworks ● Discussion of roads for road inventory study
Phase 2 (4 months) Various field surveys and studies of the road development master Plan.	● Traffic surveys and road inventory studies ● Alternative road network plans ● Economic evaluation ● Determination of the lon term road network plan
	● Public transport and existing services ● Future development Plans and cost estimates ● Economic evaluation and selection of a plan
	● Selection of projects for F/S ● Design standards of roads and structures ● Maintenance of roads, etc.
	● Financial conditions for roads ● Environmental study in IEE
Phase 3 (4 months) Feasibility studies and others	● Topographic survey and geological survey ● Determination of design stsndards ● Selection of high priority projects ● Cost estimates ● Economic evaluation and EIA

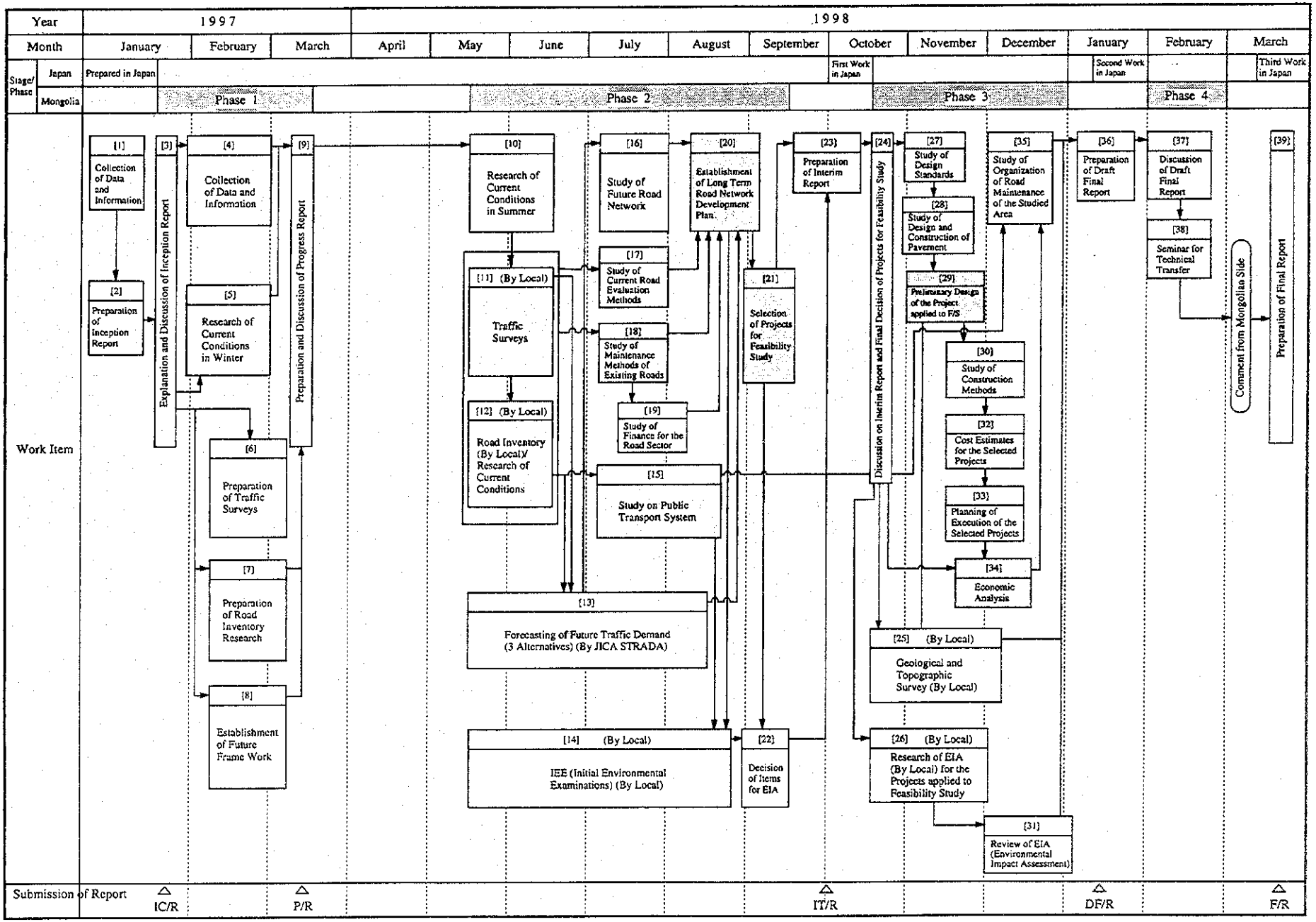

Figure 1.4.1 Flow Chart of the Study

1.5 Study Organization

The study was carried out by the study team organized by JICA. The team was headed by Mr. Koki Kaneda of PCI. A committee was set up respectively in Mongolia and Japan during the study period as shown in Figure 1.5.1.

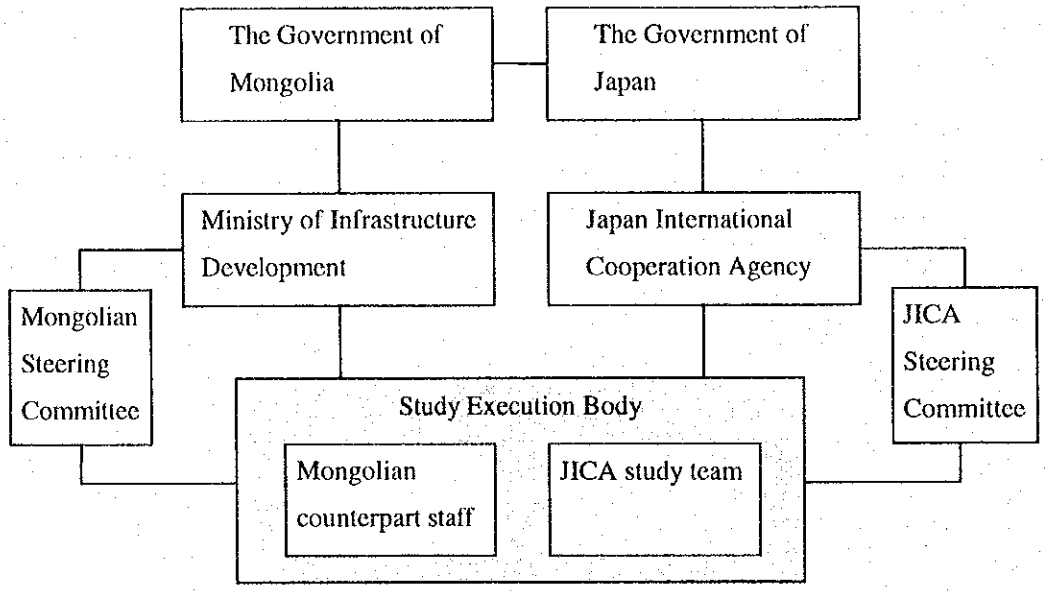

Figure 1.5.1 Study Organization

Members of the Mongolian steering committee, Mongolian counterpart staff, JICA advisory committee and the JICA study team are shown in the last page of this volume.

Chapter 2 Road Administration

2.1 Road Administration in Mongolia

Roads in Mongolia are administratively classified into the following four categories by the road law enacted in 1998:

- International roads are those connecting foreign countries under international agreements.
- National roads are those connecting the capital city with prefectural capitals (aimag centers), and prefecture capitals with other local towns and border.
- Local roads are those connecting districts, towns and villages within a prefecture (aimag).
- Industrial roads are roads inside areas owed by enterprise and organizations.

The Road and Transport Department of Ministry of Infrastructure Development is in charge of formulation of the road development policy in Mongolia as shown in Fig.2.1.1. The staff consists of 8 persons including the minister, a member of the Cabinet.

The Road Department is a government implementing agency responsible for planning and construction of international and national roads, their maintenance and management as well as drafting out of development policy.

The staff consists of 60 persons including 32 engineers (as of January, 1998). The organization charts of the Ministry of Infrastructure Development and Road Department (Government Agency) are shown in Fig. 2.1.2 and 2.1.3. (As of December, 98)

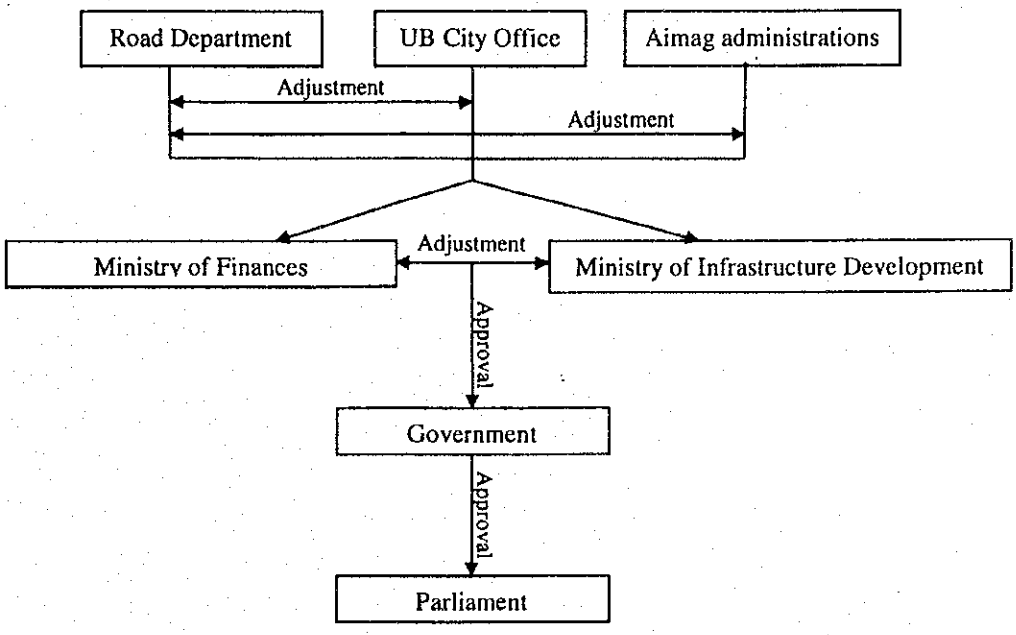

Figure 2.1.1 Formation of Road Planning

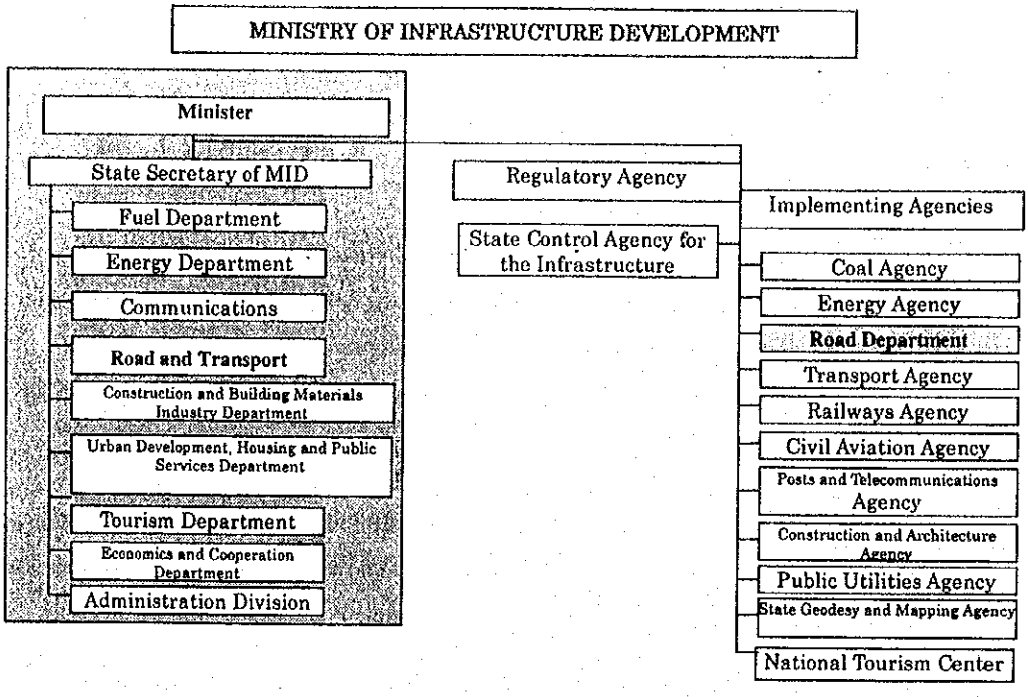

Figure 2.1.2 Organization Chart of the Ministry of Infrastructure Development

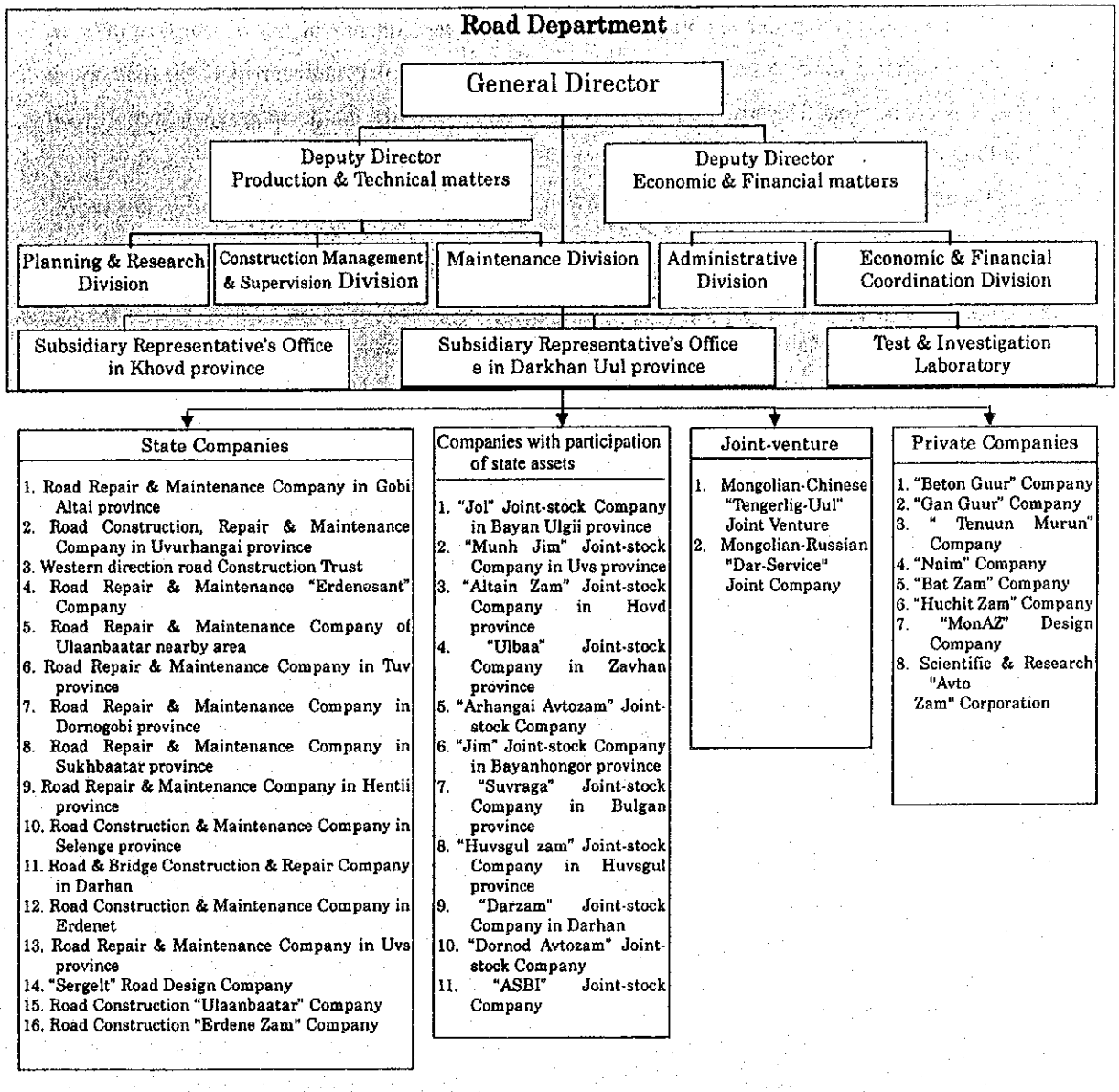

Figure 2.1.3 Organization Chart of the Road Department (Government Agency)

2.2 Road Administration in Ulaanbaatar

The Ulaanbaatar City Government conducts construction and maintenance of roads in Urbanized Ulaanbaatar city, Nalaikh and Baganuur. The Road Department which is in charge of the road fund extended some part of fund to Ulaanbaatar city roads until establishment of the road law in 1998. The Road Department is still giving technical advises via persons specialized in road field.

Therefore, some in the Road Department were nominated as the counter-part staff to this study.

The Ulaanbaatar City Government consists of two organizations except the city assembly, one is responsible for the determination of policies under a Vice Mayor and the other for their execution under a General Manager (refer to Fig. 2.2.1). Incidentally, just one person is in charge of road construction and maintenance works (*) in the city's execution organization.

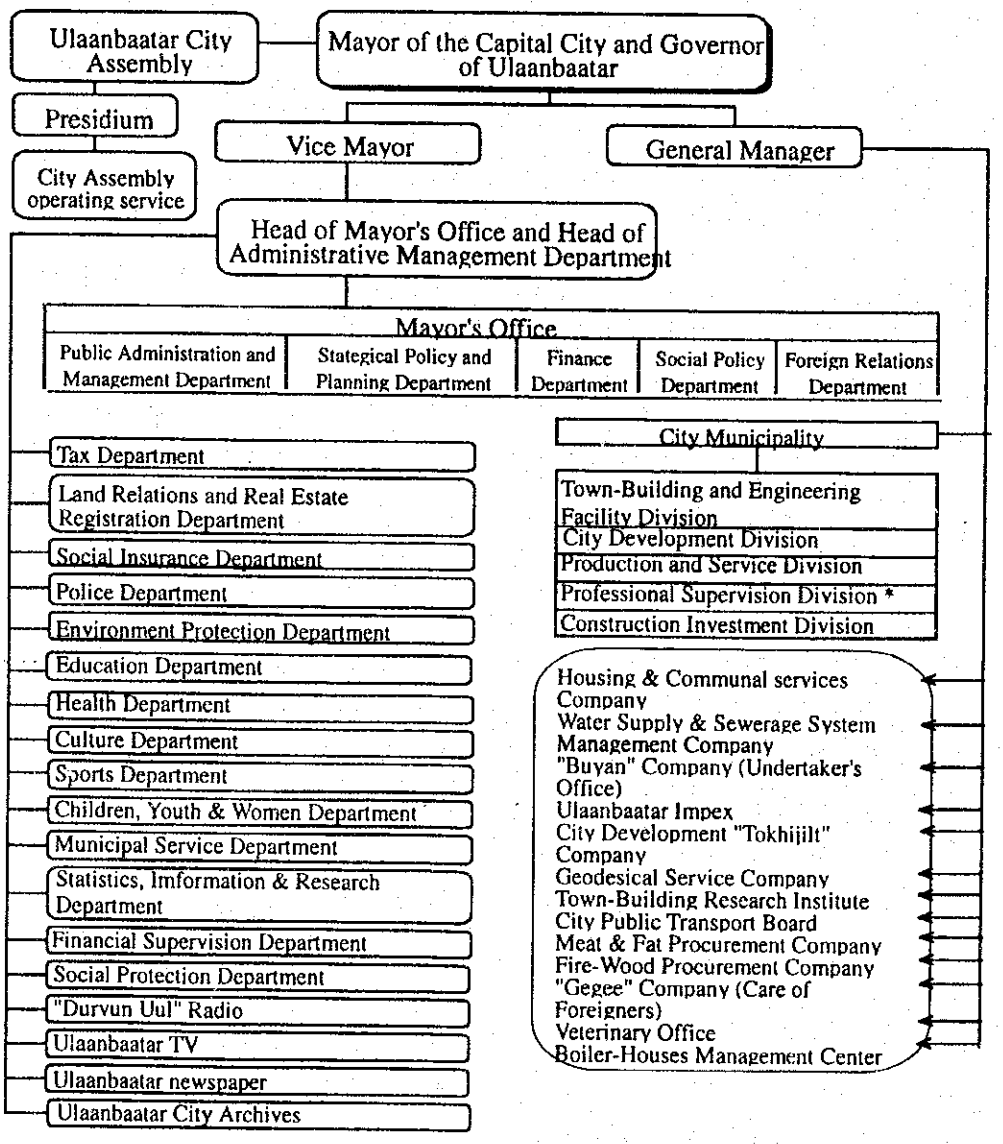

Figure 2.2.1 Organization Chart of Ulaanbaatar City