

The Study on The Road Network Development in The Kingdom of Cambodia

2nd Seminar

March 13, 2006

The JICA Study Team

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Study Schedule

	2005												2006											
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug						
Study Category	Master Plan												Pre-FIS											
Study in Cambodia	[Study in Cambodia]												[Study in Cambodia]											
Study in Japan	[Study in Japan]												[Study in Japan]											
Report	Δ	Δ					Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ						
Starting Committee (Proposed)	Δ	Δ					Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ						
Session																								

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Objectives of JICA Study

- 1) To formulate a road development master plan covering the whole country of Cambodia with a target year 2020 (including the study on institutional development of road maintenance),
- 2) To carry out a pre-feasibility study for high priority projects selected in the short-term plan (2010), and
- 3) To undertake a transfer of knowledge and technology.

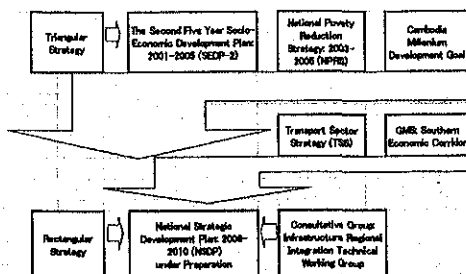
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(1) National Development Strategy

- 1) Basic Understanding
- 2) Vision
- 3) National Development Strategy
- 4) Socio-Economic Framework

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1) Basic Understanding (1) : in line with development plans



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1) Basic Understanding (2): Shift of Development Stage

Stage	National Economy	Road Development
Up-to-2004	Re-habilitation and Re-construction stage	1-digit roads: rehabilitated and improved
After 2004	Growth acceleration stage: Poverty & income gap reduction	2- and 3-digit roads: to be improved

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2) Vision

Toward Global Development

- **Economic prosperity** through economic integration with neighboring countries and the world
- **Economic development** with
Poverty reduction
Rural development

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3) National Development Strategy

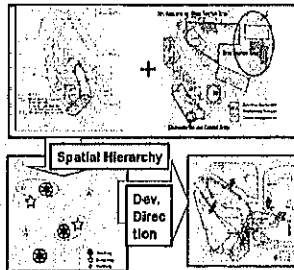
- Strategy 1: Multi-growth pole development**
- Strategy 2: International corridors**
- Strategy 3: Rural economic development**
- Strategy 4: National integration**
- Strategy 5: Poverty reduction**

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Strategy 1: Multi-Growth Pole Development

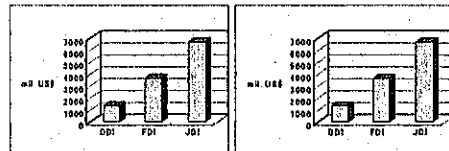
Road to support economic growth and its poles.

- 1) Spatial plan
- 2) Investment efficiency
- 3) Effective usage of scarce human resources

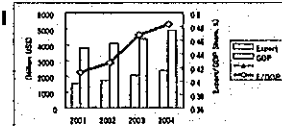


Strategy 2. International corridors Needs to guarantee stable trade by disaster-free roads

- 1) Role of Foreign Direct Investment: 50%



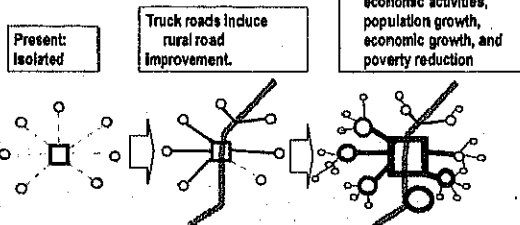
- 2) International Trade/ GDP



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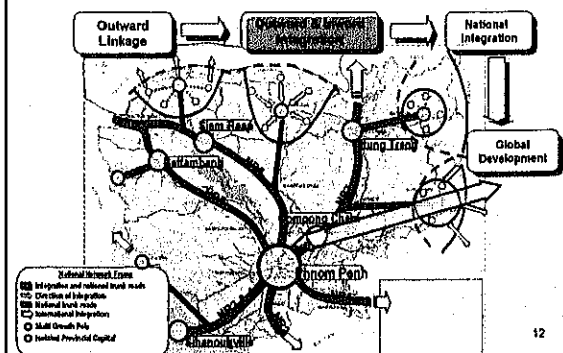
Strategy 3: Rural Economic Development

Economic development induced by truck road development



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Strategy 4: National Integration

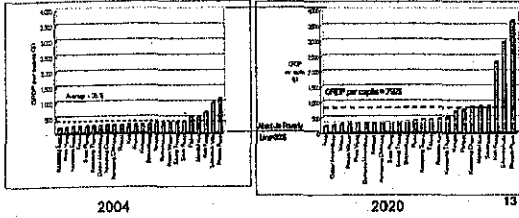


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Strategy 5: Poverty Reduction

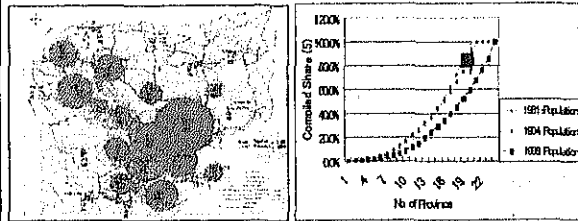
As an overall consequence and rural road development, poverty reduction will be induced.

(in collaboration with industrial policies)



4) Socio-Economic Framework

i) Population Distribution: Growth Center



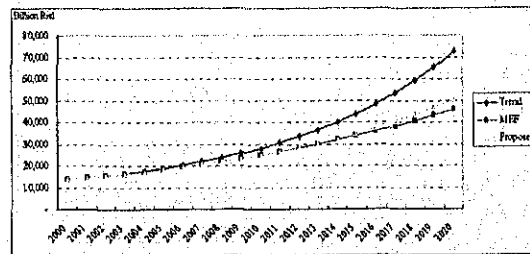
Population Distribution: 2004 and 2020

Population Dispersion to Rural 14

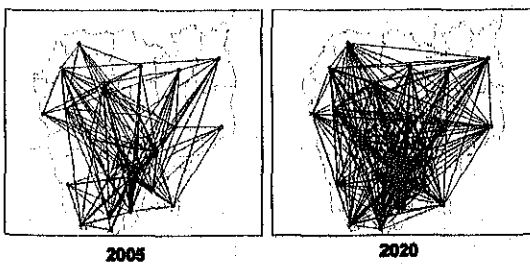
ii) GDP Projections

Scenario	2005-2010	2010-2015	2015-2020
Trend Scenario	8.2%	9.4%	10.6%
MEF Scenario	6.0%	6.3% (6.0%)	6.4% (6.0%)
JICA Team Scenario	6.0%	6.9%	7.8%

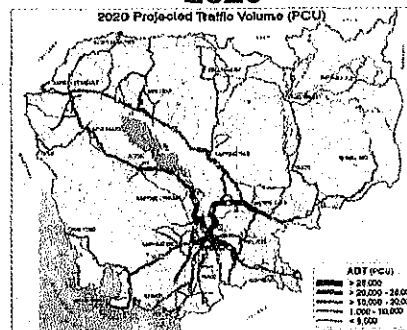
GDP Projections (Continued)

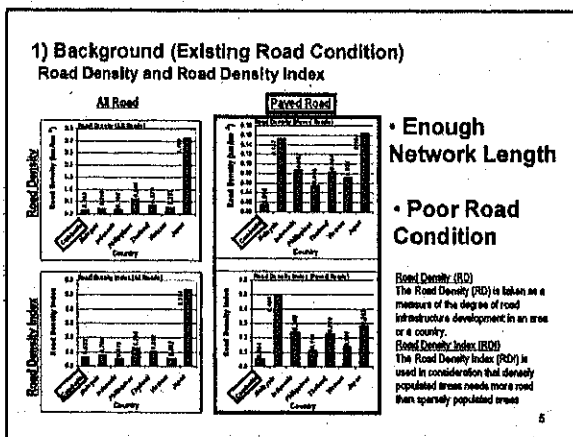
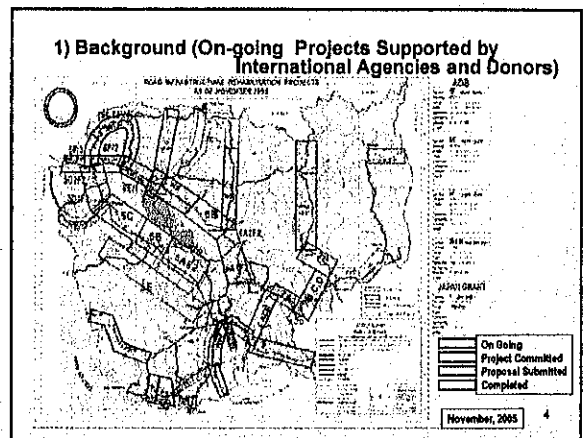
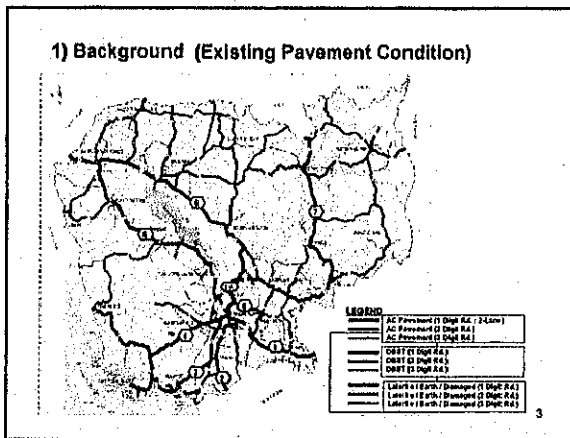
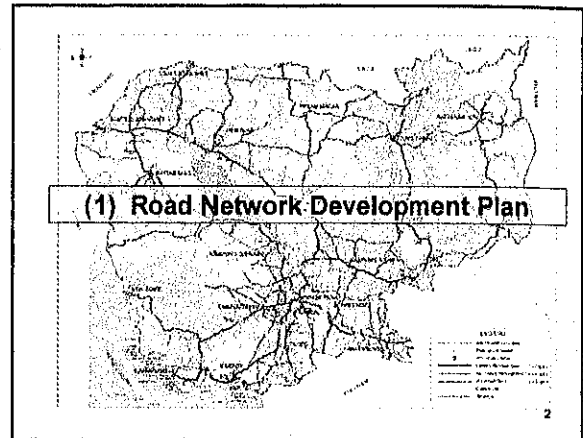
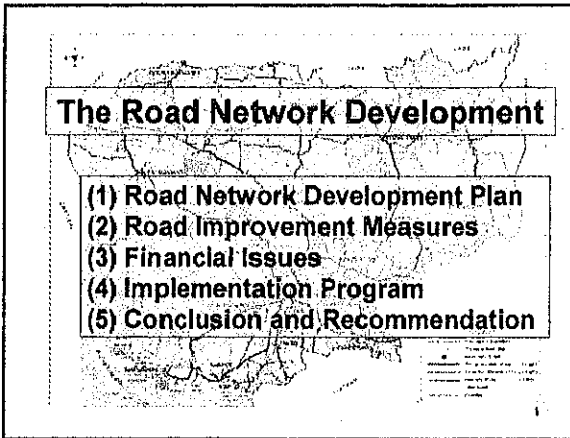


iii) Traffic Distribution in 2005 and 2020



iv) Traffic Volume on Major Road: 2020



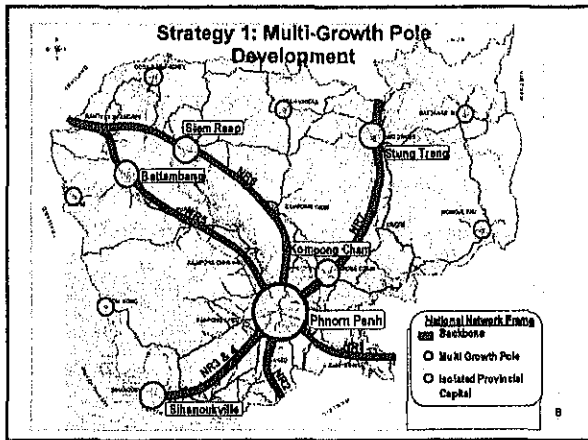


- ### 2) Road Development Principles
- Improvement of Existing Road Network
 - Use Existing Road Network
 - Improvement of Existing Road
 1. Pavement Upgrade for 1 & 2 Digit Roads
 2. Maintenance for 3 Digit & Rural Roads
 - Strengthening of Road Network and Capacity
 - 4 Lane Widening, Ring Road and Bypass
 - Reinforcement of Road Network
 - Alternative Route

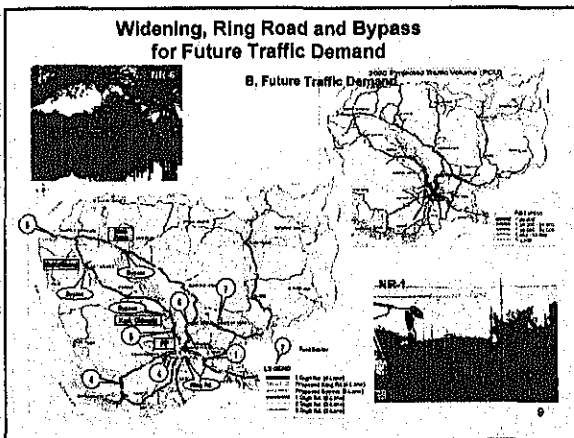
3) Road Network Development 5 Strategies

- Strategy 1: Multi-Growth Pole Development
- Strategy 2: Development of International Corridors
- Strategy 3: Enhancement of Rural Economic Development
- Strategy 4: National Integration
- Strategy 5: Regional Development for Poverty Reduction

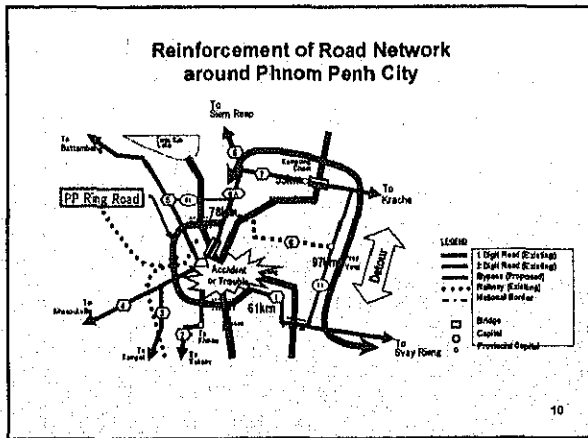
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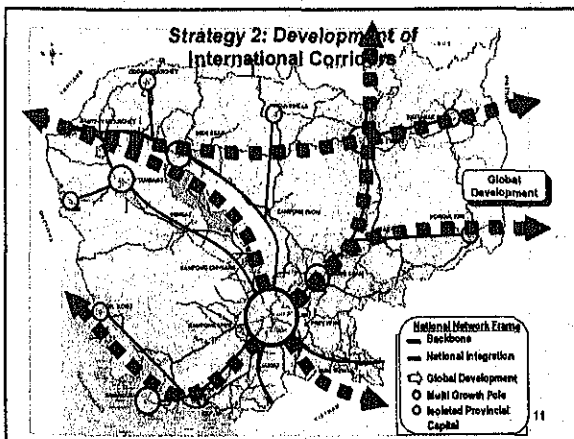
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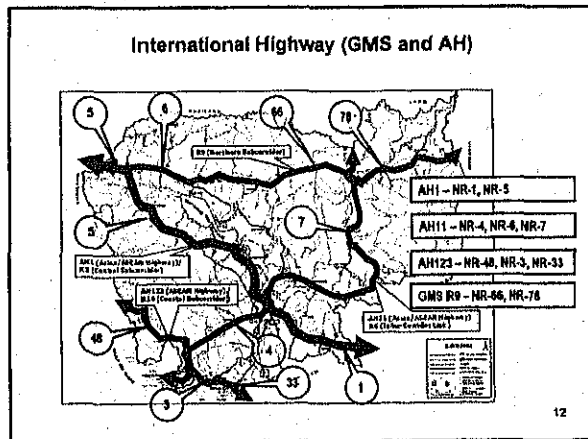
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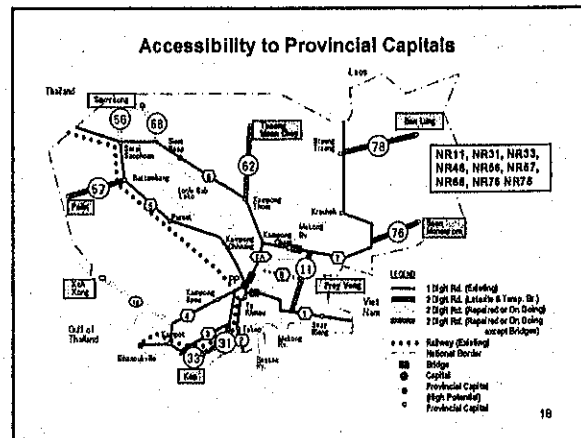
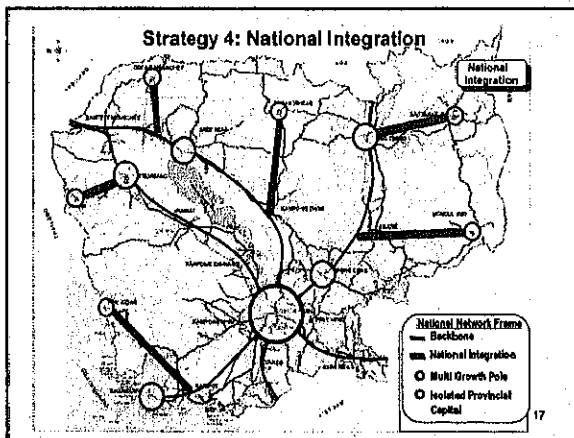
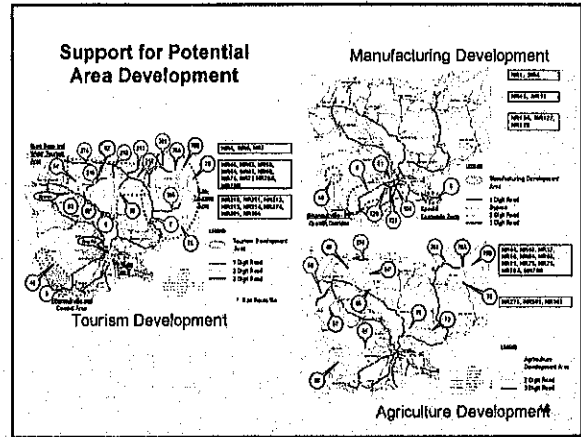
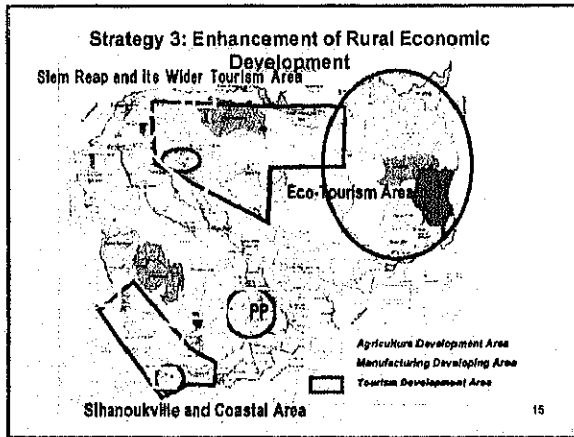
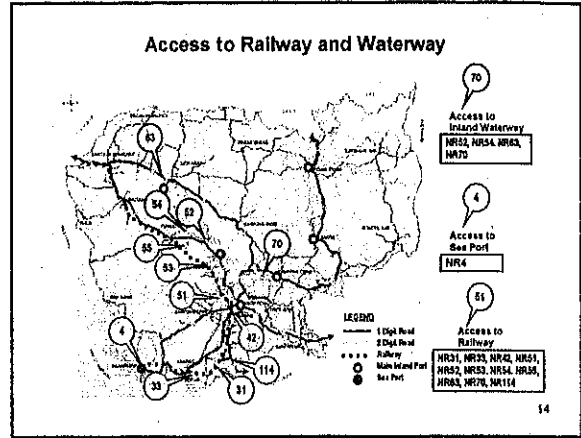
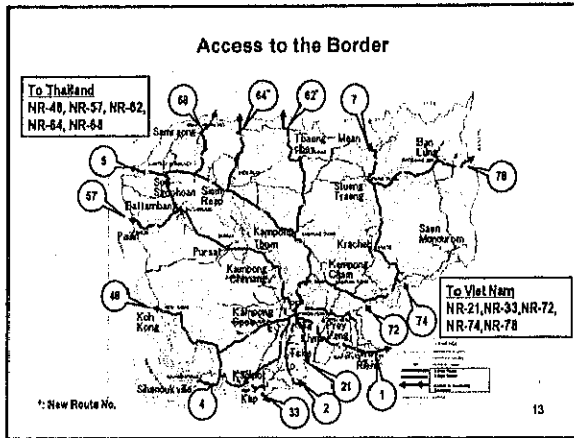
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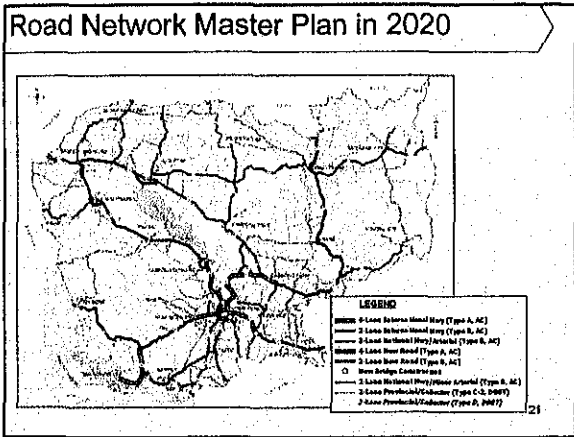
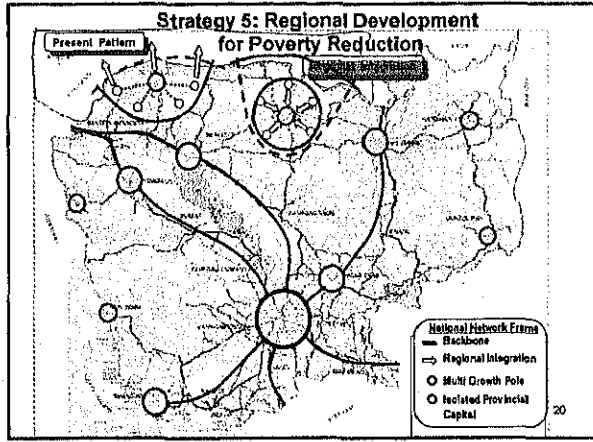
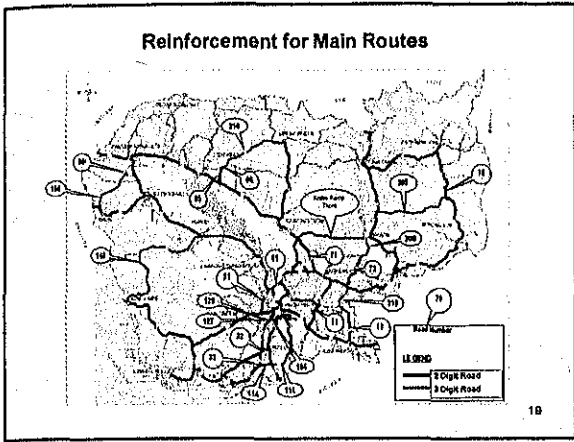


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THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

(2) Road Improvement Measures

Study Team

March 13, 2006

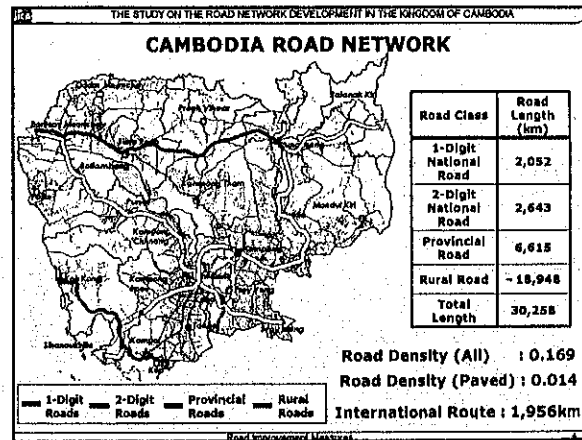
Road Improvement Measures

- THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA
- ### Basic Policy on Road Improvement Level
- 1-Digit National Roads → To improve the road level to be disaster-free and with sufficient capacity and standard for international corridor
 - 2-Digit National Roads → To improve the road to be highway class function and be all-weather condition by asphalt concrete pavement or DBST
 - Provincial and Rural Roads → To maintain the road function level with traffic demand by strengthening the road maintenance system
- Road Improvement Measures

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Cambodia Road Network

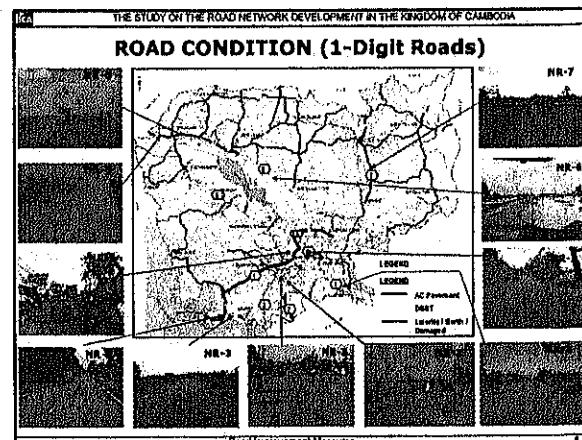
Road Improvement Measures

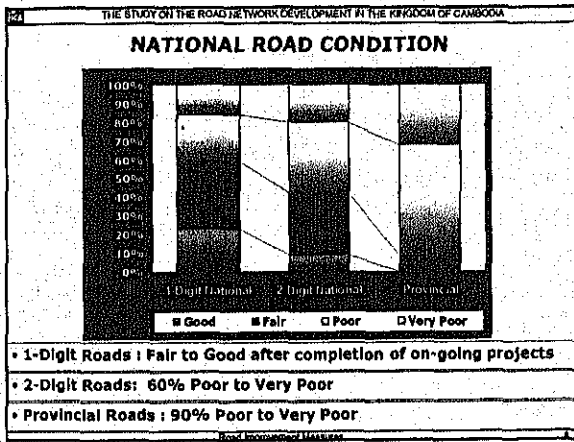
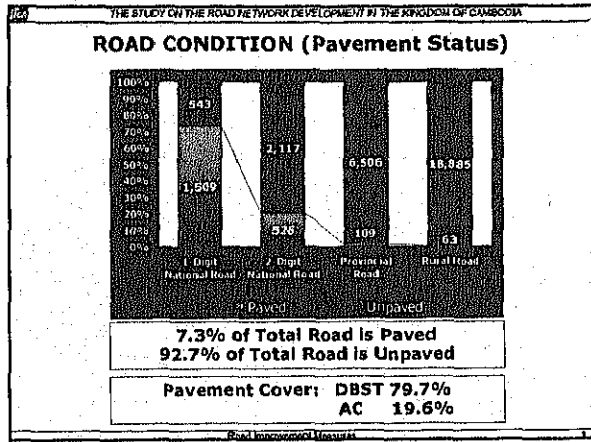
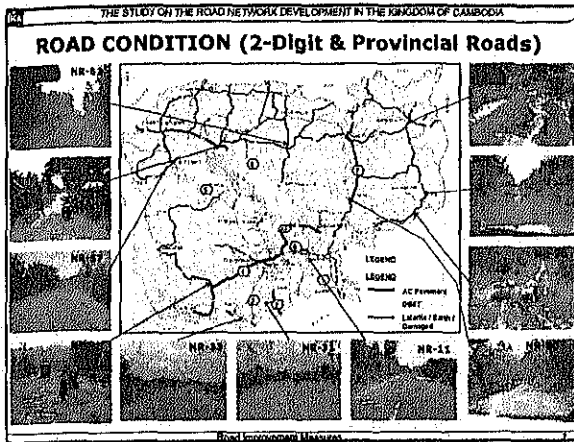


THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Understanding the Road Network

Road Improvement Measures



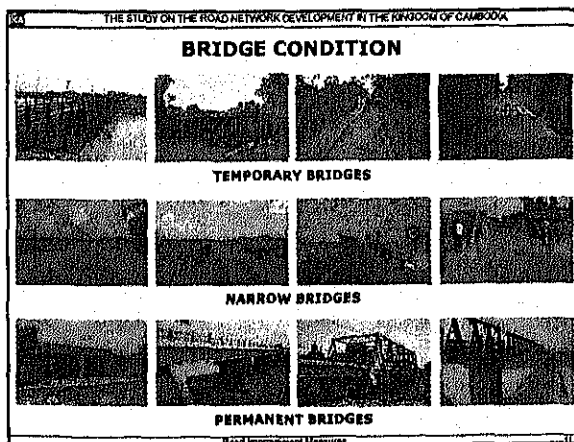


THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

STATUS OF INTERNATIONAL HIGHWAY ROUTE

A LOT OF WORK NEEDED TO REACH CLASS I & II LEVELS

Route No.	Road No.	Length (km)	Class II	Class III	Below Class III
AH 1	NR1, NR5	572.4	11.2	561.2	-
AH 11	NR4, NR6, NR7	755.0	364.0	391.0	-
AH 123	NR48, NR3, NR33	163.3	2.4	8.7	152.2
GMS	NR66, NR78	464.9	-	-	464.9
Total		1,955.6	377.6 (19.3%)	960.9 (49.1%)	617.1 (31.6%)



THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

BRIDGE CONDITION

BRIDGE INVENTORY DISTRIBUTION

Road Class	Permanent w>7m	Narrow w<7m	Temporary	No Bridge	Total
1-Digit	532 (90.3%)	31 (5.3%)	26 (4.4%)	-	589
2-Digit	127 (16.2%)	139 (17.6%)	409 (52.3%)	107 (13.7%)	782
Provincial	13 (1.2%)	499 (44.0%)	618 (54.5%)	3 (0.3%)	1,133
Total	672 (26.8%)	669 (26.7%)	1,053 (42.1%)	110 (4.4%)	2,504

NEED TO INCREASE PERMANENT BRIDGE RATIO

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

6. ROAD MAINTENANCE ISSUES

PRESENT CONDITION	MEASURES
<ul style="list-style-type: none"> Potholes/Cracks on Pavement Laterite/Gravel Road in Poor Condition Debris/Fallen Trees on Roads 	<ul style="list-style-type: none"> Maintenance Program Improvement Routine Maintenance Works (Cleaning, Repairs, Markings, Paintings, etc.)

Road Improvement Measures

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

SUMMARY OF ISSUES AND IMPROVEMENT MEASURES

Road in Poor Service Condition	⇒	Road Rehabilitation (All-weather Road)
Road Below Required Standard (CRDS/AHS)	⇒	Road Upgrading to Required Functional Standard
Bridge Improvement Issues	⇒	Bridge Rehabilitation & Improvement
Flood Hazard Problem	⇒	Road Improvement / Strengthening Against Flood
Traffic Capacity/Safety Issues	⇒	Traffic Capacity/Safety Improvement
Road Maintenance Issues	⇒	Road Maintenance Works

Road Improvement Measures

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

The Master Plan Road Network

Road Improvement Measures

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

PROPOSED MASTER PLAN ROAD NETWORK

LEGEND

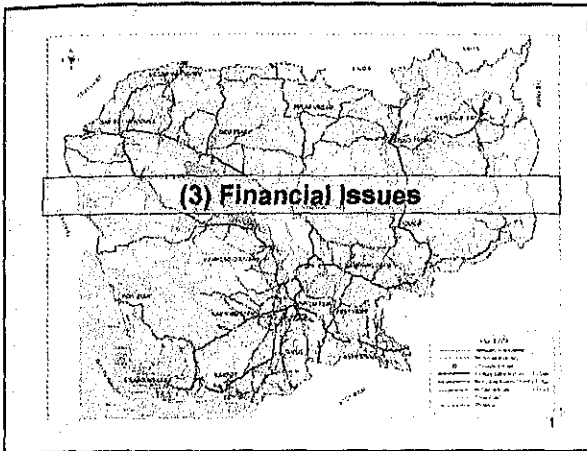
- 4 Lane International Hwy (AC)
- 2 Lane International Hwy (AC)
- 2 Lane National Hwy/Arterial (AC)
- 4 Lane Hwy Road (AC)
- 2 Lane Hwy Road (AC)
- Major Bridge Connections
- 2 Lane National Hwy/Arterial (AC)
- 2 Lane Provincial/Collector (DBRT)
- 2 Lane Provincial/Collector (DBRT)

Road Improvement Measures

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

End of Session Thank You

Road Improvement Measures



Alternative Set-out of Procurement Plan

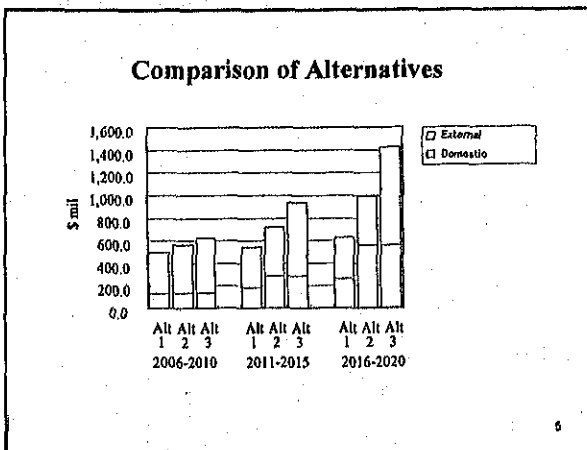
Alternative	Methodology	Expected Outcomes
Alt. 1 Present Pattern	- Added Tax (Objective Tax) at Present Level - External Assistance at Present Level	- Same Level of Achievement as Last Decade be attained. - Sustainable Development at Present Level - Increase in Foreign Debt at Moderate Rate
Alt. 2 Growth Pattern	- Maximum Procurement of Domestic Resources - Increase in Grant Aid	- Promote Infrastructure Development at Appropriate Pace - Increase in Foreign Debt at Moderate Rate
Alt. 3 Growth Acceleration	- Maximum Procurement of Domestic Resources - Large External Assistance	- Supporting Large Development Proposal - Acceleration of External Debt

Comparison of Domestic Fund

	Domestic Resource				Domestic Share	External Share	Remark
	Added Tax (Present Rate)	Added Tax (50% Hike)	Veh. Reg. Tax				
Alt1	Gasolin 2 cent/lit Diesel 4 cent/lit	05-20			35.0%	65.0%	
Alt2	Gasolin 2 cent/lit Diesel 4 cent/lit	06-14	Gasolin 3 cent/lit Diesel 6 cent/lit	15-20 \$25 annum	43.3%	56.7%	Perfect Control on Smuggling after 11
Alt3	Gasolin 2 cent/lit Diesel 4 cent/lit	06-14	Gasolin 3 cent/lit Diesel 6 cent/lit	15-20 \$25 annum	33.0%	67.0%	Perfect Control on Smuggling after 11

Comparison of External Assistance

	External Source	
Alt 1	Grant Loan	At 2000-2005 level At 2000-2005 level
Alt 2	Grant Loan	At 2006-2010 level At 2000-2005 level
Alt 3	Grant & Loan	Annual 6% increase of Alt 2



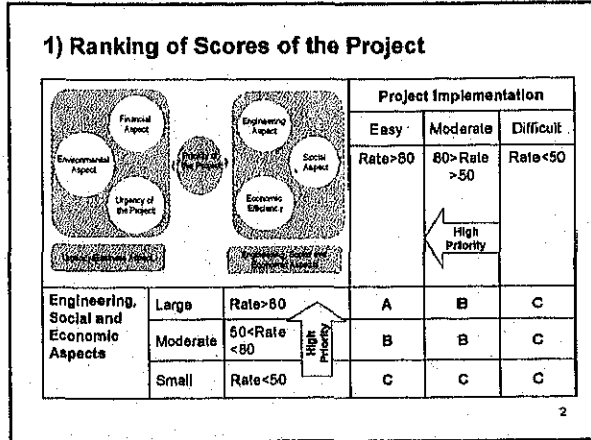
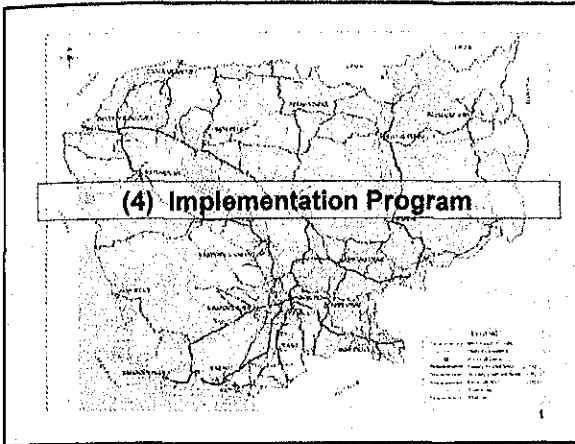
Comparison of Road Maintenance Cost and Revenue From Special Fund and Surplus

Unit \$ mil.

Year	Special Fund	Rd. Maint. Cost	Surplus of Fund (to be used for Road Construction)
2004	26	6	20
2010	30	27	3
2015	88	31	57
2020	117	34	83
2006-20	981	473	508

Improvement Measures for Road Financing

Category of Issue	Present Issues	Target of Improvement	Responsible Bodies	Procedure for Improvement	Effect on Improved Procurement of Road Maintenance Fund
Institutional	(1) Over-involvement in Road Maintenance Fund	Policy/Accountability of Budget	Planning Agency	Advising to the Council/Ministry	Controlled Management of Fund
	(2) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(3) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(4) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
Operational	(1) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(2) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
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	(4) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
Technical	(1) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(2) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(3) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities
	(4) Inadequate Allocation of Road Maintenance Fund to Local Authorities	Equitable Application of Resources Based on Road Maintenance Program	Planning Agency	Challenging to Local Authorities Council	Deposition of available Road Maintenance Fund to the concerned Local Authorities



2) Prioritization of Proposed Road

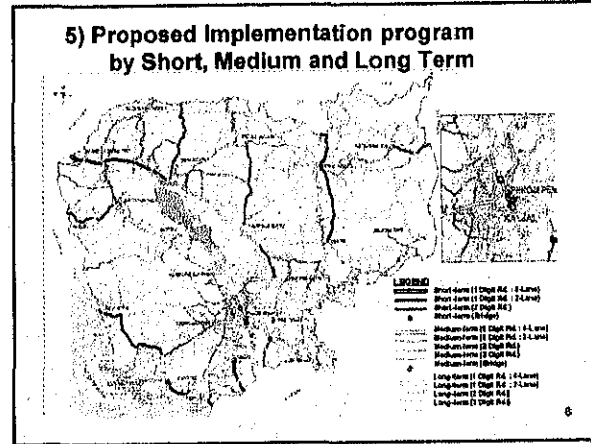
Program	1 Digit National Road	2 Digit National Road	3 Digit National Road
Short Term (2005-2010)	NR1-1 / NR1-2 / NR2-2 / NR3-2 / NR4-1 / NR5-1 / NR5-3 / NR6-4 / NR7-3 / NR7-4	NR33-2 / NR48 / NR50 / NR57 / NR62-1 / NR64 / NR65 / NR71 / NR72 / NR76-1 / NR78-2	Maintenance work only
Medium Term (2011-2015)	NR 4-3 / NR3-4 / NR6-1 / NR6-2 / PP Ring Road / 2nd Chruoy Changvar Bridge / 2nd Monibong Bridge / Siem Reap Bypass	NR 22 / NR66-1 / NR69 / NR73 / NR78-1 / NR78A / NR78B	NR104 / NR114 / NR127 / NR210
Long Term (2016-2020)	NR 1-1 / NR1-3 / NR2-1 / NR3-1 / NR 5-2 / NR5-3 / NR6-3 / NR7-1 / NR7-2 / NR8 / Battambang Bypass / Kamp. Chhang Bypass	NR11 / NR13 / NR21 / NR21A / NR31 / NR 32 / NR33-1 / NR33A / NR41 / NR42 / NR44 / NR46 / NR51 / NR52 / NR53 / NR54 / NR55 / NR59 / NR60 / NR 61 / NR63 / NR66-2 / NR 70 / NR74 / NR78-2 / NR78A / NR78B	PR 111 + Connecting to NR21 / PR2081, 2082, 2076 (NR59, NR160) / Siung Treng - Cham Khan / Kampong Thom - Kratie / NR210 A / NR212 / NR213 / NR274 / NR301, NR301-1, NR301-2 / NR305 / NR308 / NR 316 / NR146 & 148A / New Road connecting to NR 13 and NR 7

3) Base Frame of Implementation Program

	Short term Plan (2006-2010)	Medium term Plan (2011-2015)	Long term Plan (2016-2020)
1-Digit NR	All the on-going rehabilitation projects by international funding agencies and donors shall be completed.	All 1-Digit Roads become a disaster-free road having a high design standards with AC pavement and sufficient traffic capacity.	
	Urgent Bridge Rehabilitation Program		
	South-east Block and North-west Block	South-west Block and North-east Block	
2-Digit NR	All 2-Digit Roads linking to a provincial capital will be improved to a paved road with asphalt concrete resisting a disaster in rainy season.		Remaining 2-Digit Road will be improved to become a paved road with asphalt concrete or DBST
	Urgent Bridge Rehabilitation Program		
	South-east Block and North-west Block	South-west Block and North-east Block	
3-Digit NR And Rural Rd.	Among 3-Digit Road and Rural Road, 40% of roads will be passable in wet season owing to the proper maintenance work.	Among 3-Digit Road and Rural Road, 60% of roads will be passable in wet season owing to the proper maintenance work.	Among 3-Digit Road and Rural Road, 80% of roads will be passable in wet season owing to the proper maintenance work.
	Urgent Bridge Rehabilitation Program		
	South-east Block and North-west Block	South-west Block and North-east Block	

4) Summary of Implementation Program

Description	Total Amount (Million \$)	Short Term (2005-2010)	Medium Term (2011-2015)	Long Term (2016-2020)	Remarks
A. Fund to be Provided (Donor's Disbursement)	288.0	218.0	27.0	43.0	
International Fund	288.0	218.0	27.0	43.0	International Fund, Regional Loan, Credit
Domestic Fund	0.0	0.0	0.0	0.0	Government's Own Fund, Local Gov. Fund
Total(A)	288.0	218.0	27.0	43.0	
B. Implementation Program					
B1. Implementation/Rehabilitation					
1-Digit Road	1,156.4	206.4	337.0	613.0	Existing road/road of bypass (if road is 1.5km)
2-Digit Road	617.2	192.0	251.0	214.2	
3-Digit Road	1,024.4	0.0	1.0	1,023.4	Major roads will be done
Total(B)	2,800.0	398.4	589.0	1,812.6	
B2. Maintenance					
1-Digit Road	44.3	19.0	19.0	6.3	
2-Digit Road	13.1	6.0	6.0	1.1	
3-Digit Road	13.1	6.0	6.0	1.1	
Rural Road	11.0	6.0	5.0	0.0	
Total(C)	81.5	41.0	41.0	13.5	
Total(B+C)	2,881.5	439.4	630.0	1,826.1	
C. Improvement of Traffic Management					
1-Digit Road	38.0	8.0	18.0	12.0	
2-Digit Road	10.0	5.0	5.0	0.0	
3-Digit Road	10.0	5.0	5.0	0.0	
Rural Road	10.0	5.0	5.0	0.0	
Total(D)	68.0	23.0	43.0	12.0	
Total(B+C+D)	2,949.5	462.4	673.0	1,838.1	
E. Shortage of Fund					
Shortage of Fund (Total(B+C+D) - Total(A))	2,661.5	244.4	346.0	1,795.1	
Shortage of Fund (Total(B+C+D) - Total(A) - Total(D))	2,593.5	221.4	303.0	1,772.1	
F. Countermeasures against Shortage of Fund					
1. Call for private sector	117.4	27.0	65.0	25.4	
2. Security of a new source of revenue	142.1	147.4	140.0	154.7	

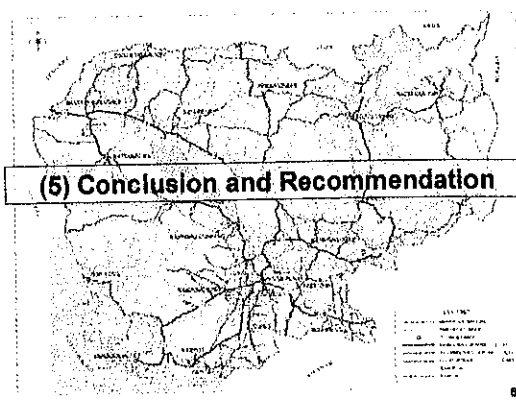


6) Necessary action to achieve the target

- Sustainable national budget system
- Self-reliance
- Efficient and sustainable road operation mechanism

7

(5) Conclusion and Recommendation



8

1) Conclusion and Recommendations

- Early implementation of the Projects:
 - Urgent Bridge Rehabilitation on 1 & 2 digit roads
 - Improvement of 2 digit road connecting to 6 provincial capitals
 - Ring Road and 2nd Bridges across Tonle Sab and Bassac Rivers
 - Bypass at Siem Reap

9

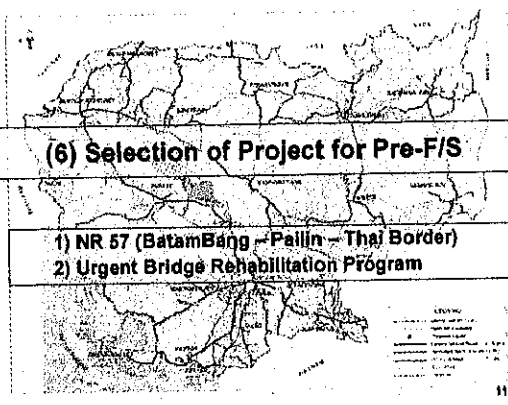
2) Summary of Proposed Investment

Components	Investment (US\$M)	Remarks
On-going or committed projects-	256.0	2nd Mekong Bridge Included
1 digit road (6 packages on 9 routes, 506km)	138.4	NR03, NR46, NR56 (study only), NR82, NR64, NR88 (bridges only), NR78
2 digit road (3 packages on 3 routes, 2,426km)	898.7	Phnom Penh Ring Road, 2nd Tonle Sap River Bridge, 2nd Bassac River Bridge, Battambang Bypass, Siem Reap Bypass Included
1 digit road (18 packages on 8 routes, 1,879km)	539.0	NR 11, NR 31, NR 57, NR 66 and other 27 routes of 2-digit road
2 digit road (37 packages on 21 routes, 1,903 km)	202.4	NR104, NR114, NR127, NR 210, NR 213, NR274, NR297, NR298, NR448 and other 5 routes
3 digit road (18 packages on 18 routes, 1,273.5 km)	472.0	Allocation of maintenance cost appropriately by each road
Road Maintenance	30.0	Dividing the whole country into 4 blocks, urgent bridge rehabilitation program is implemented
Urgent Bridge Rehabilitation Program	30.0	Reinforcement of law and regulation, vehicle registration, etc
Traffic Management	12.0	Signal installation, provision of a motorcycle lane, education, advertisement
Institutional Improvement of Road maintenance	12.0	Organizational improvement for administration ability, reinforcement of its promotional organization and personnel training (Capacity Building)
Total amount of investment	2,578.5	

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(6) Selection of Project for Pre-F/S

- 1) NR 57 (Batambang – Pailin – Thai Border)
- 2) Urgent Bridge Rehabilitation Program

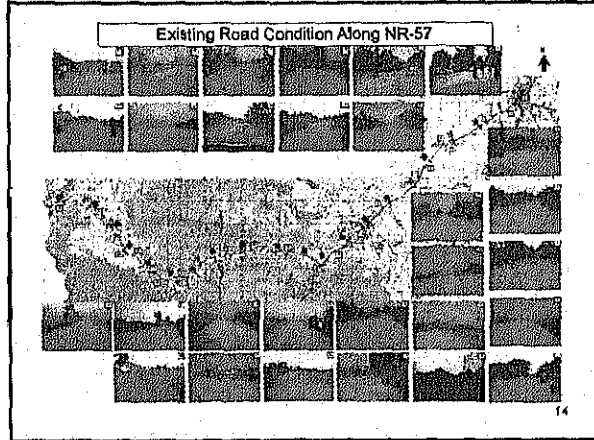
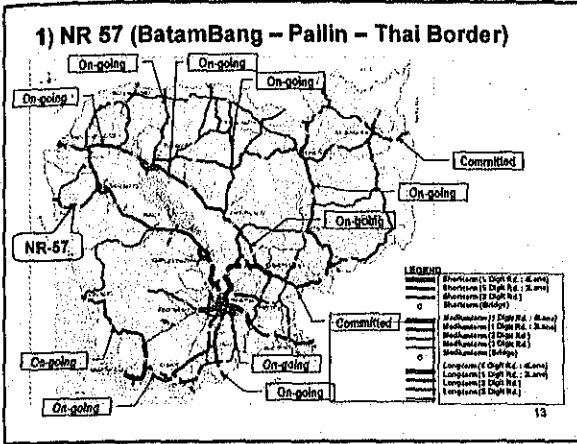


11

1) NR 57 (Batambang – Pailin – Thai Border)

- **Reasons for selection of NR57**
 - The Highest Rank Route in this Master Plan
 - The High Priority Route by the Cambodia Government
 - No international financing agencies and donor countries except Japan
- **Outline of the Project Road**
 - Section : Batambang – Pailin – Thai Border
 - Existing Road : 103 km long 2 lanes laterite road with 7.0 – 8.0 m width.
 - Improvement measures : Improvement to 2 lanes paved road with a permanent bridge.

12



2) Urgent Bridge Rehabilitation Program

Road Class	Existing Bri. No. (Length, m)	Temporary Bri. (Length, m)	Permanent Bri. (Length, m)		Improvement Ratio (Length)
			Width < 7.0m	Width ≥ 7.0m	
1 Digit	389 (17,643.3)	26 (608.1)	31 (602.2)	532 (16,433.0)	90.3% (93.1%)
2 Digit	782 (17,513.1)	516 (9,657.8)	139 (2,126.7)	127 (5,728.6)	16.2% (32.7%)
3 Digit	589 (10,913.0)	316 (6,121.0)	262 (4,609.6)	11 (182.4)	1.9% (1.7%)
4 Digit	544 (9,223.8)	305 (5,824.0)	237 (3,426.8)	2 (73.0)	0.4% (0.6%)
Total	2,504 (55,193.2)	1,163 (22,210.9)	669 (10,765.3)	672 (22,417.0)	26.8% (49.4%)

* On-going bridge project are included in the inventory as permanent bridges.
 ** Historical bridges and No Bridge section are included in the inventory as temporary bridges.
 *** 2nd Mekong Bridge is excluded in this inventory.
 **** Source: Study Team 2005 Inventory and Collected as-built and design drawings and RCS Inventory, 2004

2) Urgent Bridge Rehabilitation Program

The following four regions are classified depending on a geographical features and regional characteristic.

- Northeast Region (4 Provinces)
- Northwest Region (5 Provinces)
- Southeast Region (11 Provinces)
- Southwest Region (4 Provinces)

The Study team determined the priority order taking into account an economic effect and numbers of people taking benefit by restoration of bridge.

2) Urgent Bridge Rehabilitation Program

Lists of restoration bridges were requested by MPWT and DPWT.

Among the bridges, the Study team prepares a short list of bridge taking into consideration the following criteria:

- A bridge length is more than 30 m which may need a technological assistance of Japan.
- Improvement of basic human needs can be expected to a large number of people in and around the project area.
- It should meet the requirement of Japanese grant aid in terms of construction cost.

2) Urgent Bridge Rehabilitation Program

No.	Class	Length (m)	Year	Status	Notes
1	1 Digit	100	1980	Good	
2	1 Digit	150	1985	Good	
3	1 Digit	200	1990	Good	
4	1 Digit	250	1995	Good	
5	1 Digit	300	2000	Good	
6	1 Digit	350	2005	Good	
7	1 Digit	400	2010	Good	
8	1 Digit	450	2015	Good	
9	1 Digit	500	2020	Good	
10	1 Digit	550	2025	Good	
11	1 Digit	600	2030	Good	
12	1 Digit	650	2035	Good	
13	1 Digit	700	2040	Good	
14	1 Digit	750	2045	Good	
15	1 Digit	800	2050	Good	
16	1 Digit	850	2055	Good	
17	1 Digit	900	2060	Good	
18	1 Digit	950	2065	Good	
19	1 Digit	1000	2070	Good	
20	1 Digit	1050	2075	Good	
21	1 Digit	1100	2080	Good	
22	1 Digit	1150	2085	Good	
23	1 Digit	1200	2090	Good	
24	1 Digit	1250	2095	Good	
25	1 Digit	1300	2100	Good	
26	1 Digit	1350	2105	Good	
27	1 Digit	1400	2110	Good	
28	1 Digit	1450	2115	Good	
29	1 Digit	1500	2120	Good	
30	1 Digit	1550	2125	Good	

1st Selection

- (1) The lengths of No.2, 7, 13, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28 and 29 bridge are less than 30m.
- (2) New bridge is under construction in alternative route on behalf of No.3 bridge in NR-3
- (3) No.14 and No.19 bridge are located in old NR-7.

2) Urgent Bridge Rehabilitation Program

2nd Selection

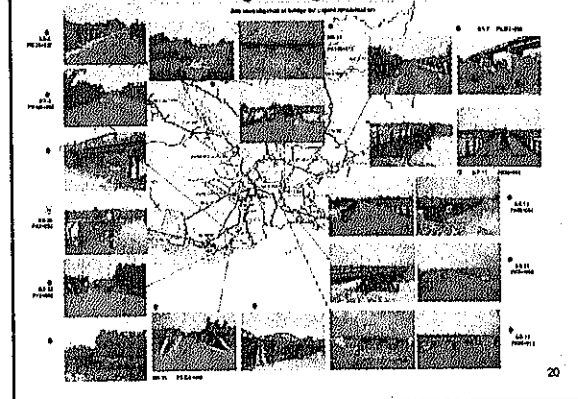
(4) Structural Condition and Bridge Capacity : No. 6, 9, 10, 11, 12, 19

(5) Importance and Traffic Volume : No. 1, 15, 19

No.	A.M. No.	STA.	Type	No. Lanes (ft)	Length (ft)	No. of Piers	No. of Abutments	Structural Condition			AADT (PCU) (24-Hr)	Others	
								Super-structure	Sub-structure	Foundation			
1	100-000	100+00	Span Pier	4.20	48.00	7	4	15	Badly	Good	Good	1,200	Very Old beam, steel deck plate
4	120-000	120+00	Span Pier	4.20	55.00	3	15	15	Good	Good	Good	500	Installation of pedestrian bridge
5	020-020	020+00	Span Pier	4.50	67.00	6	15	15	Badly	Old Cast Pier	Collapsed	2,500	Collapsed on Jan. 27, 1990
6	030-030	030+00	Span Pier	4.20	30.00	1	8	8	Badly (Deck)	Good	Good	1,100	Deck to be replaced
6	110-410	110+00	Play Area	5.40	51.00	3	15	15	Good	Concrete (New)	Good	1,100	Non-Cross. Substructure
9	040-040	040+00	Play Area	6.00	42.00	2	9	9	Badly	Badly	Badly	1,000	Very damaged bridge pier
10	040-040	040+00	Play Area	6.00	64.50	6	9	9	Badly	Badly	Badly	1,000	Very damaged bridge pier
11	040-040	040+00	Play Area	1.80	45.00	12	9	9	Badly	Badly	Badly	1,000	Very damaged bridge pier
12	110-410	110+00	Play Area	6.00	48.00	4	9	9	Badly	Badly	Badly	1,000	Very damaged bridge pier
19	220-220	220+00	Play Area	4.50	18.00	11	9	9	Badly	Badly	Badly	1,100	Collapsed by vehicle strike
19	020-020	020+00	Span Pier	4.50	37.00	1	15	15	Badly	Good	Good	1,200	Old abutment

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Candidate Bridges Along Main Trunk Roads



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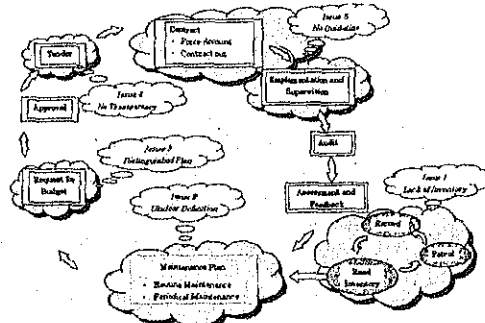
JICA Road Network Development Study (Master Plan)

Road Maintenance System

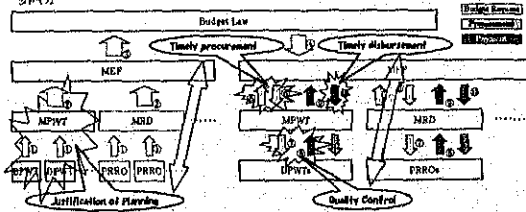
March 13, 2006

Study Team

Project Cycle



Current Typical Procedure and Problems

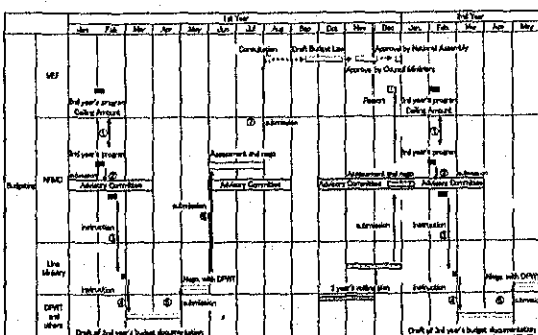


- ① Provincial offices request transfer of next year's budget
- ② Line ministries request MEF of next year's budget which are coordinated by the ministries
- ③ MEF drafts the budget law and get the approval of NA
- ④ Management of the Budget
- ⑤ Request of procurement, making contract (Contract by contract)
- ⑥ Approval for contract
- ⑦ Request of Payment (Paid by payment)
- ⑧ Payment
- ⑨ Making contract and instruction of works
- ⑩ Request of Payment with clearance

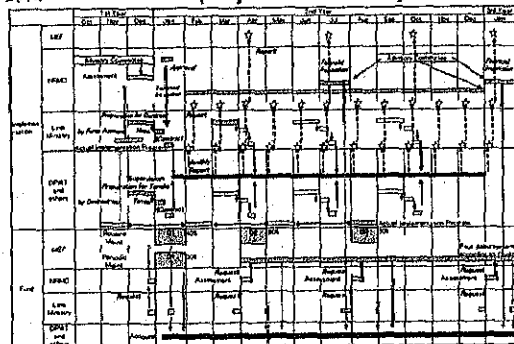
Conclusion & Recommendation

1. Identification of Routine Operation
2. Establishment of NRMC
3. Preparation of Guideline
4. Maint. Management by Project Cycle
5. Provincial Capacity Development

Routine Operation Program (Budgeting)



Routine Operation Program (Implementation)





Role of National Road Maintenance Committee (NRMC)

- Justification of Road Maintenance Budget
Assessment at Planning Stage
- Timely Disbursement of Budget
Assessment at Implementation Stage
- Inspection of Road Maintenance Work
Assessment at Implementation/Completion Stage



Preparation of Guidelines (1)

1. Budget Planning
 - 1) Road Inventory
 - 2) Assessment
 - 3) Treatment Selection
 - 4) Unit Cost
 - 5) Implementation Plan
2. Procurement
 - 1) Selection of Contactor
 - 2) Negotiation/Tender Method
 - 3) Document
 - 4) Form of Contract
3. Request/Disbursement
 - 1) Linkage of NRMC
 - 2) Form of Payment Request/Disbursement

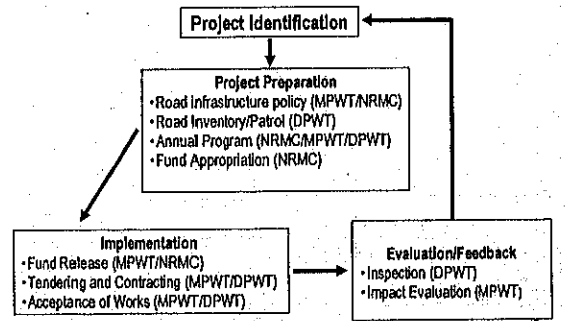


Preparation of Guidelines (2)

4. Accounting
 - 1) Open Special Account
 - 2) Accounting Slip
 - 3) Accounting Book
 - 4) Form of Financial Inspection
5. Preparation of Maint. Works
 - 1) Specification/Drawing
 - 2) Method Statement
6. Quality Control
 - 1) Supervising System
 - 2) Inspection System
 - 3) Form of Technical Inspection



Project Cycle



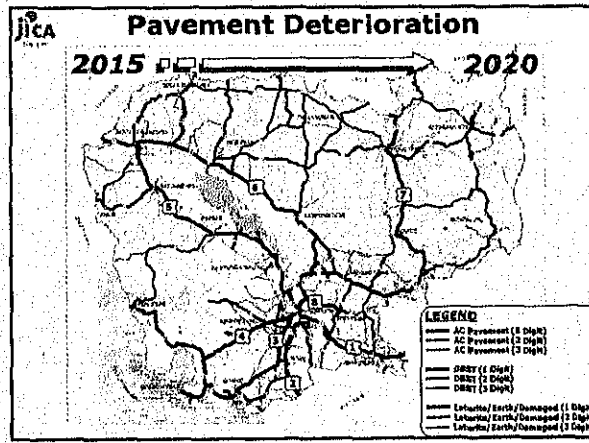
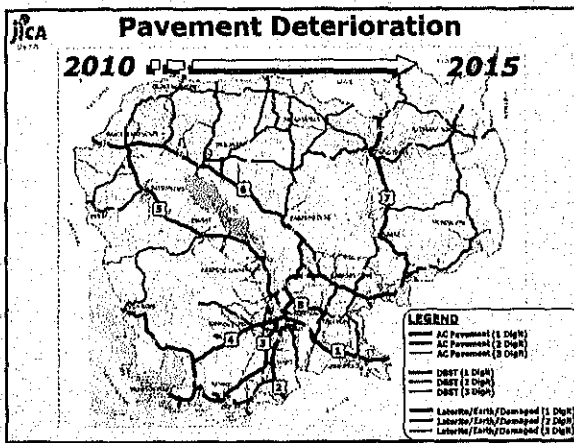
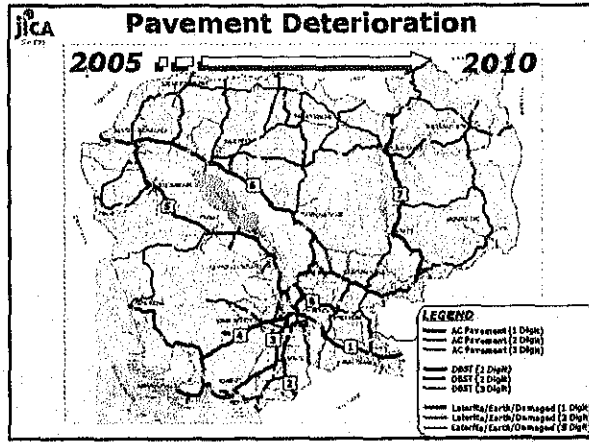
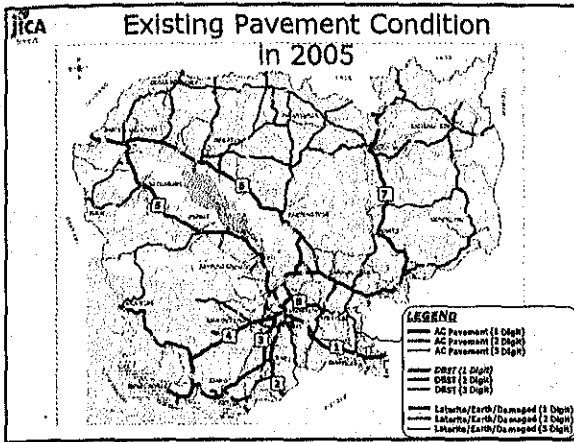
Provincial Capacity Development

1. Data keeping/transmission and allow free access to data-base in MPWT
2. Appointment a qualified director
3. Training Guideline to staffs
4. Transparency on the process of prioritizing the project
5. Settlement on the project implementation capability which differs in each province



Personnel Exchange & Equipment Supply

Group by Region	Group by Representative	Priority	Involved Personnel	Remarks
Central	1	First	Phanom Phan	Group Leader
		Second	Kampong Speu	Follow up
North	1	First	Take	Group Leader
		Second	Siem Reap	Follow up
East	1	First	Samnang Chhn	Group Leader
		Second	Prey Veng	Follow up
South	1	First	Kampong	Group Leader
		Second	Kampong	Follow up
West	1	First	Siem Reap VII	Group Leader
		Second	Kab Leang	Follow up
West-North	1	First	Battambang	Group Leader
		Second	Samnang Chhn	Follow up
West-North	2	First	Prey Veng	Group Leader
		Second	Prey Veng	Follow up
West-North	3	First	Siem Reap	Group Leader
		Second	Prey Veng	Follow up



THE STUDY ON THE ROAD NETWORK DEVELOPMENT
Participant List of 2nd Seminar in Cambodia

13th March, 2006

No.	Name	Position	Organization
1	Mr. Kim Sovann	Deputy Director of DPWT	Banteay Meanchey
2	Mr. Ky Vyrin	Deputy Director of DPWT	Battambang
3	Mr. Sok Srun	Deputy Director of DPWT	Kg. Cham
4	Mr. Kao Kosal	Deputy Director of DPWT	Kg. Chhnang
5	Mr. Som Sothea	Deputy Director of DPWT	Kg. Speu
6	Mr. Mao Lang	Director of DPWT	Kg. Thom
7	Morm Touch	Deputy Director of DPWT	Kampot
8	Mr. Mea Soeun	Director of DPWT	Kandal
9	Mr. Ly Sareth	Director of DPWT	Koh Kong
10	Mr. Oum Tit	Director of DPWT	Kratie
11	Mr. Sreng Sros	Deputy Director DPWT	Kratie
12	Mr. Son Tha	Deputy Director of DPWT	Mondulkiri
13	Mr. Phan Sam Ann	Director of DPWT	Preah Vihear
14	Mr. Noun Cham Rong	Deputy Director of DPWT	Prey Veng
15	Mr. Chim Koung	Deputy Director of DPWT	Pursat
16	Mr. So Samnang	Director of DPWT	Ratanakiri
17	Mr. Kang Chantra	Deputy Director of DPWT	Siemreap
18	Mr. Chrea Tharavuth	Deputy Director of DPWT	Sihanouk ville
19	Mr. Son Nu	Deputy Director of DPWT	Stung Treng
20	Mr. Bun Savan	Director of DPWT	Svay Rieng
21	Mr. Tey Siphon	Deputy Director of DPWT	Svay Rieng
22	Mr. Prum Somnang	Director of DPWT	Takeo
23	Mr. Khoun Sei	Director of DPWT	Oddor Meanchey
24	Mr. Mok Sun	Deputy Director of DPWT	Kep
25	Mr. Din Kim	Director of DPWT	Pailin
26	Mr. Ean Narin	Deputy Director of DPWT	Phnom Penh
27	Mr. Sor Chamrong	Depty Governor	Banteay Meanchey
28	Mr. Sous Sopheat	D. Director of Cabinet	Battambang
29	Mr. Ly Sou	Deputy Governor	Kg. Chhnang
30	Mr. Koul Bot	Deputy Governor	Kg. Speu
31	Mr. Chun Chun	Deputy Governor	Kg. Thom
32	Mr. Choup Sopheak	Deputy Governor	Kampot
33	Mr. Pean Sanau	Deputy Governor	Kratie
34	Mr. Thou Son	Governor	Mondulkiri
35	Mr. Cheng Limkeang	Deputy Governor	Siemreap
36	Mr. Meas Vuthy	Deputy Governor	Sihanouk ville
37	Mr. Van Vuth	Deputy Governor	Stung Treng
38	Mr. Men Phann	Officer of Governor	Svay Rieng
39	Mr. Kim Nea	Deputy Governor	Svay Rieng
40	Mr. Srey Hen	2nd Deputy Governor	Takeo

No.	Name	Position	Organization
41	Mr. Chim Chin	Deputy Governor	Oddor Meanchey
42	Mr. Ich Sarou	Deputy Governor	Pailin
43	Mr. Heng Vatana	Deputy Director of Cabinet	Phom Penh Muticipality
44	Mr. Mour Kim san	Deputy Director General	MRD
45	Mr. Khun Juline	Deputy Director of DIC	MEF
46	Mr. Dari Chetana	Chief of Office DIC	MEF
47	Mr. Phat Kong	Counterpart of Study Team	MEF
48	Mr. Heng Daravuthy		MOP
49	Mr. Pogn Sachak	Deputy Director of Technical	MOWRAM
50	Mr. Ouk Nida	Program officer	ADB
51	Mr. Seak Pengkeang	Program officer	JICA Cambodia
52	Mr. Soun Vanhong	Department transport	MPWT
53	Mr. Mao Vicheka	Department transport	MPWT
54	Mr. Ket Veasna	Airport Constrution Dept.	MPWT
55	Thann Vuthira	Staff of Recerch Center	MPWT
56	Mr. Sok Onn	Officer of Havy Equip. Dept.	MPWT
57	Mr. Nut Chanthou Sokha	Deputy Director	
58	Mr. Sa Sivutha	Offcer	
59	Mr. San Piset	Counterpart of JST	MRD
60	Mr. Yim Chamnan	Couterpart of JST	MOE
61	Mr. Cheam Sovanny	Counterpart of JST	MPWT
62	Mr. Mao Phanarith	Counterpart of JST	MPWT
63	Mr. Yin Borin	Counterpart of JST	MPWT
64	Mr. Nop Kilarith	Counterpart of JST	MPWT
65	Mr. You Dara	Counterpart of JST	MPWT
66	Mr. Akihisa Kojima	Deputy Team Leader	JICA Study Team
67	Mr. ATakashi Shimizu	Deputy Team Leader	JICA Study Team
68	Mr. Kazuo Yumita	Member	JICA Study Team
69	Mr. Katsuyoshi Matsuda	Member	JICA Study Team
70	Mr. Shigeru Takara	Member	JICA Study Team
71	Mr. Jovito C. Santos	Member	JICA Study Team

The Study on the Road Network Development In the Kingdom of Cambodia

3rd Seminar

Date: 25th of July (Tuesday), 2006, 8:30 am - 12:00 am

Venue: MPWT, Big Conference Room at 1st floor

Schedule:

Welcome and Opening Remarks

8:30-8:35am

H.E. Tram Iv Tek

1st Program

8:35- 9:15 am

Findings of Road Network Master Plan
(Road network system, Improvement measures
and Implementation plan)

Mr. Matsuda

Questions and Answers (30 minutes)

2nd Program

9:45- 10:15 am

Findings of Road Network Master Plan
(Guidelines and Capacity Development)

Mr. Fukuma

Questions and Answers (25 minutes)

(A coffee break of 20 minutes)

3rd Program

11:00- 11:30 am

Findings of Pre-Feasibility Study
(NR 57 Improvement Project and
Urgent Bridge Rehabilitation Program)

Mr. Takara

Questions and Answers (25 minutes)

Closing Remarks

12:30-12:35am

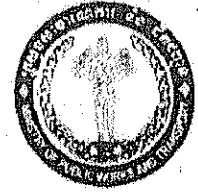
Mr. Shinkai

Thanks for your cooperation.

JICA Study Team Office:

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Tel.: 023-426-099
Fax: 023-426-098



Ministry of Public Works and Transport

**The Study
on
The Road Network Development
in
The Kingdom of Cambodia**

**3rd Seminar
July 25th, 2006**

JICA Study Team

(Nippon Koei Co., Ltd. and Katahira & Engineers International, JV)

1st Program:

**Findings of Master Plan Study
(Road Network System, Improvement Measures and Implementation Program)**

គំរោងសិក្សាប្រចាំប្រទេស

Master Plan Formulation Study

សិក្សាសាលាសេដ្ឋកិច្ច ថ្ងៃទី ២៥ ខែ កក្កដា ឆ្នាំ ២០០៦

3rd Seminar on 25 July, 2006

JICA Study Team
on the Road Network Development
in the Kingdom of Cambodia

Why is M/P needed? ហេតុអ្វីត្រូវតែរៀបចំផែនការសិក្សាប្រចាំប្រទេស?

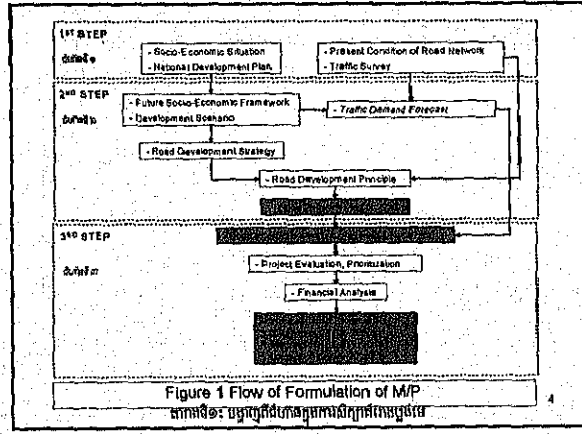
- 1) To formulate most cost-effective road development plan
រៀបចំការវិនិយោគសាងសង់ប្រព័ន្ធលូតាមប្រទេសដែលមានតម្លៃទាបបំផុត
- 2) To support national economic development plan
ធ្វើផែនការសេដ្ឋកិច្ចជាតិដោយយោងលើផែនការសិក្សាប្រចាំប្រទេស
- 3) To prepare long-term budget plan for road development
រៀបចំផែនការថវិកាសម្រាប់ការវិនិយោគសាងសង់ប្រព័ន្ធលូតាមប្រទេស

តើយើងធ្វើការសិក្សាប្រចាំប្រទេសដូចម្តេច?

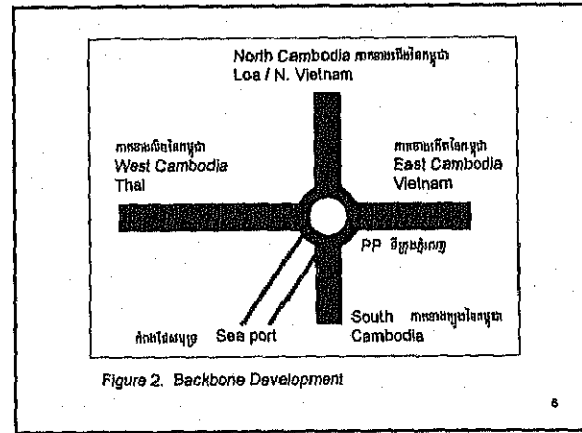
How to make M/P?

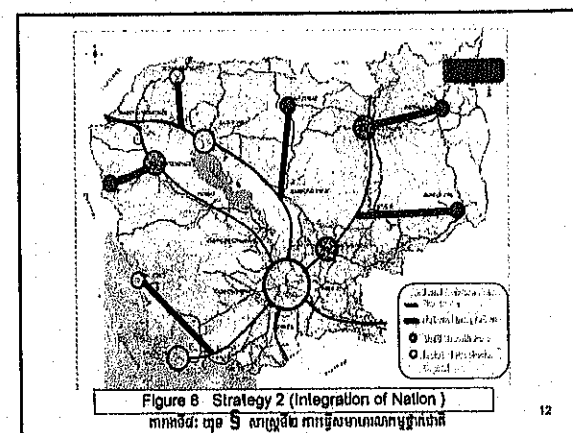
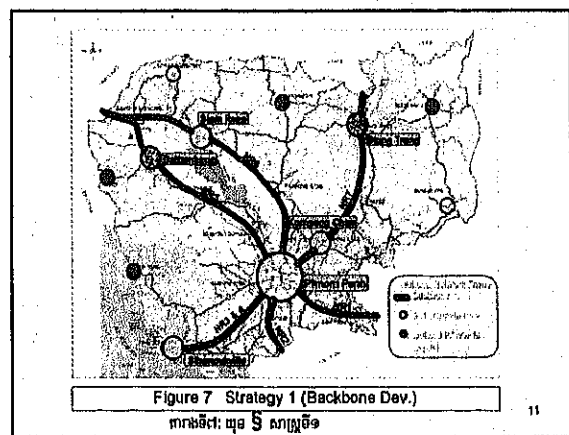
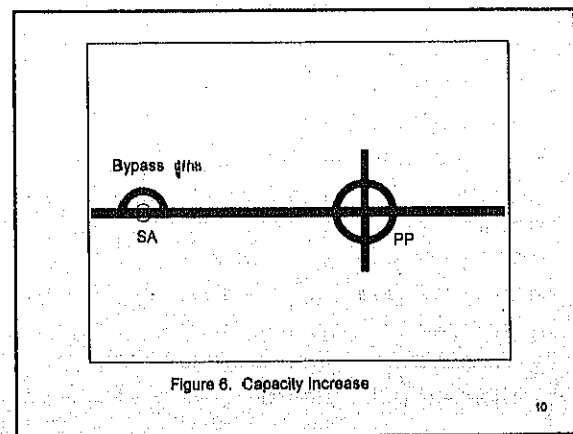
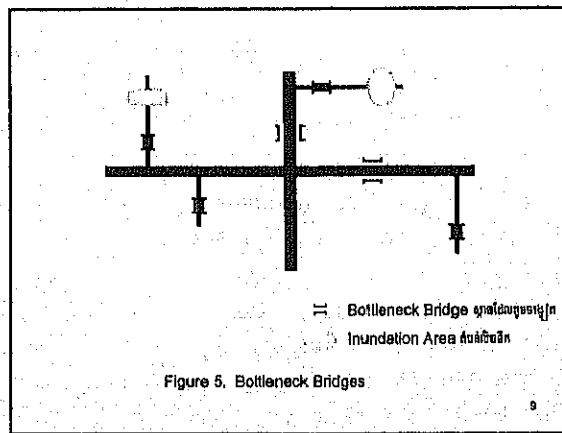
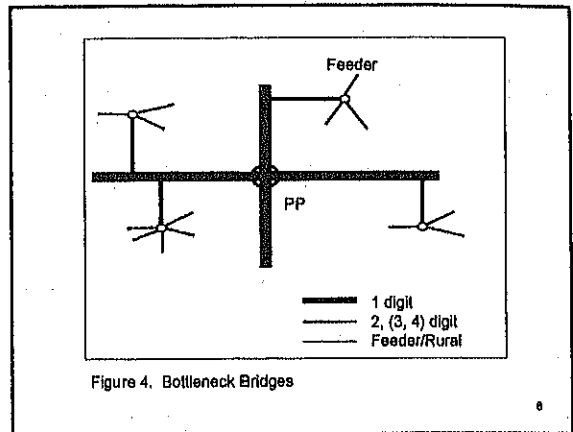
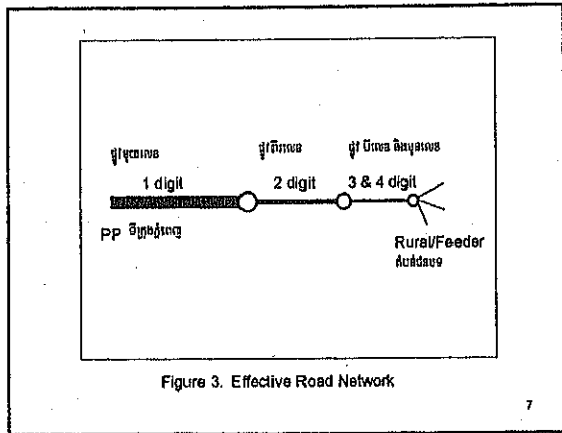
<Process>

- 1) Problem Diagnosis ការវិភាគបញ្ហា
- 2) Formulation of Development Proposal វិនិយោគប្រឡងផែនការ
- 3) Strategy Set-out គម្រោងយុទ្ធសាស្ត្រ
- 4) Alternative Development ការជ្រើសរើសផែនការ
- 5) Projection/Forecast ការប្រកាសទុក្ខដំណើរការ
- 6) Evaluation ការវាយតម្លៃផែនការ
- 7) Master Plan Formulation ការរៀបចំផែនការសិក្សាប្រចាំប្រទេស



Recognition	Development Concept	Proposal	Ref.
1. As the nation located in the center of Indochina Peninsula, strengthening of road Axis centered around Phnom Penh	• Strengthening of North-South, East-West Corridors • Inter-connection of road with high development potential • Improvement of 1-Digit Roads (including bridges)	• Oversee functional roles of each 1-Digit road • Identification of bottleneck bridges on 1-Digit roads	Fig2
2. As a nation got off to late start in road infrastructure development, catching up to international standard provision of road-network in areas of both quality and quantity	• Interdependent road function among 1, 2, 3rd rural roads • Continuous road services connecting Nation's capital, Provincial, Capital-Regional Centers (Market cities) - Villages	• Road network development as a package of roads with different grades • Package 1: 1-Digit (A to B) - 2-Digit (B to C) • 3rd Digit (C to D) - Rural Rd. (D to E) • Package 2: 1-Digit (A to B) - 2-Digit (B to C) • 3rd Digit (C to D) - Rural Rd. (D to E) • Consideration of the above in terms of effect on economy and transport time	Fig3
3. As a nation with a large number of the illiterate people, development of road network which contribute poverty alleviation	• Provision of minimum level of road service • Consideration of income inducing effect	• Rural road improvement by strengthening of road maintenance (Bottom-up Approach) • Induction of income inducement effect (Top-down Approach)	Fig4
4. As a nation where big rivers and lakes are distributed in the domain, providing of all-weather roads including bridges	• Improvement of bridges • Provision of 1-Digit roads	• Identification of bottleneck bridges on road network	Fig5
5. As a nation with potential modernization and high economic growth in near future, advance investment in road development	• Introduction of large infrastructure taking into account future demand • Consideration of alternative routes such as bypasses	• Proposal of infrastructure with large capacity taking into account expected future increase in demand • Proposal of bypasses where large traffic demand is expected	Fig6
6. Lack in comprehensive road development policy and engineering standard due to road development undertaken by foreign donors	• Adjustment of road development policies • Consistency in development policy	• Consensus among donors • Adoption of common design standard etc.	5.





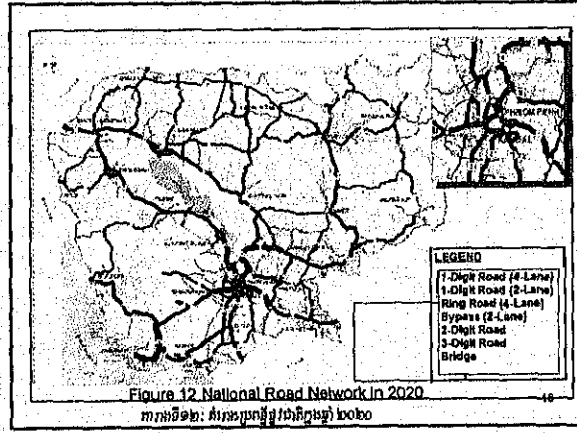
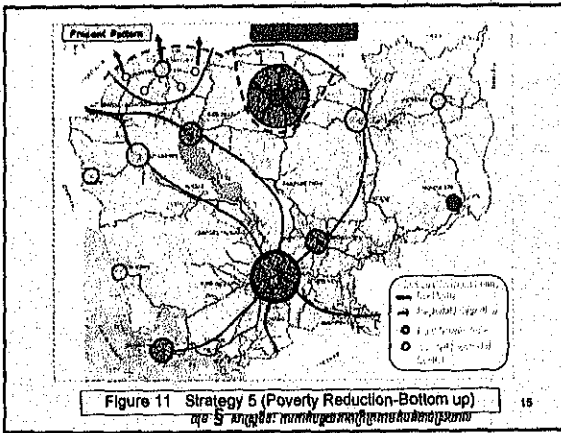
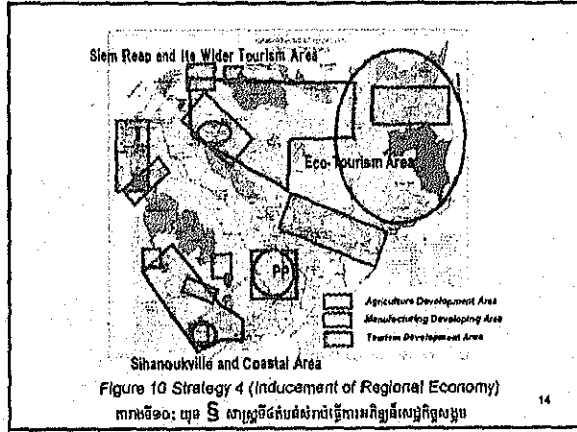
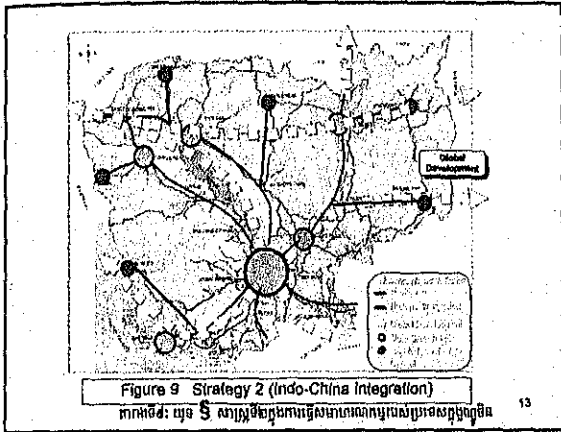


Table 2 Number of Projects Proposed by Master Plan
 ភាពសំខាន់: ចំនួនគម្រោងដែលបានផ្តើមរៀបចំដោយគម្រោងស្តង់ដារ

Road Classification ប្រភេទផ្លូវ	Number of Projects ចំនួនគម្រោង	Remarks កំណត់សម្គាល់
1-Digit	30	Incl. 6 New Construction
2-Digit	38	
3-Digit and under	17	
Total	85	

< Brain Storming > Effect of Road Development
 ការស្រាវជ្រាវផ្តល់នូវផលប៉ះពាល់ដល់ប្រទេសជាតិ

(A) Direct Effect: ផលប៉ះពាល់ផ្ទាល់ដល់សេដ្ឋកិច្ចជាតិ

- Vehicle Operation Cost Saving ផលប៉ះពាល់ថយចុះថ្លៃប្រតិបត្តិការយានយន្ត
- Transport Time Cost Saving ផលប៉ះពាល់ថយចុះថ្លៃពេលវេលាដឹកជញ្ជូន
- Reduction on Damage on Cargoes ការបន្ថយការខូចខាតទំនិញ
- Reduction of Traffic Accident ការបន្ថយគ្រោះថ្នាក់ចរាចរណ៍

(B) Indirect Effect: ផលប៉ះពាល់ខ្លាំងប្រយោជន៍

- Promotion of Industry បង្កើនសេដ្ឋកិច្ចជាតិ
- Exploitation of Natural Resources សំរាប់ប្រើប្រាស់ធនធានធម្មជាតិ
- Expansion of Market Sphere ពង្រីកទីផ្សារ
- Promotion of Efficient Distribution Industry បង្កើនការចែកចាយទំនិញឱ្យមានប្រសិទ្ធភាព

(C) Intangible Effect: ផលប៉ះពាល់មិនមែនជាសម្បត្តិ

- Promotion of Education (Commuting) ផលប៉ះពាល់ដល់ការសិក្សា
- Strengthening of Emergency Service ការបង្កើនសេវាបន្ទាន់ប្រយោជន៍
- Enhancement of Government Service បង្កើនគុណភាពសេវាប្រកបដោយសាមញ្ញភាព
- Contribution to WID ផលប៉ះពាល់ដល់ការងារសម្រាប់ស្ត្រី

Table 3 OD Matrices Versus Economic Activity
 արձույթ: արտադրանքի Բաժնիքներ

OD	Zone 1	Zone 2	Zone 3	Zone i	Zone j	Zone n	Generation	Economic Activity
Zone 1	T ₁₁	T ₁₂	T ₁₃	T _{1i}	T _{1j}	T _{1n}	G ₁	E ₁
Zone 2	T ₂₁	T ₂₂	T ₂₃	T _{2i}	T _{2j}	T _{2n}	G ₂	E ₂
Zone 3	T ₃₁	T ₃₂	T ₃₃	T _{3i}	T _{3j}	T _{3n}	G ₃	E ₃
Zone i	T _{i1}	T _{i2}	T _{i3}	T _{ii}	T _{ij}	T _{in}	G _i	E _i
Zone j	T _{j1}	T _{j2}	T _{j3}	T _{ji}	T _{jj}	T _{jn}	G _j	E _j
Zone n	T _{n1}	T _{n2}	T _{n3}	T _{ni}	T _{nj}	T _{nn}	G _n	E _n
Attraction	A ₁	A ₂	A ₃	A _i	A _j	A _n	Control Total	

Economic Activity	E ₁	E ₂	E ₃	E _i	E _j	E _n
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Table 4 Inter-regional Accessibility
 արձույթ: արտադրանքի մատչելիություն

Access.	Zone 1	Zone 2	Zone 3	Zone i	Zone j	Zone n	Economic Activity
Zone 1	-	ACC ₁₂	ACC ₁₃	ACC _{1i}	ACC _{1j}	ACC _{1n}	E ₁
Zone 2	ACC ₂₁	-	ACC ₂₃	ACC _{2i}	ACC _{2j}	ACC _{2n}	E ₂
Zone 3	ACC ₃₁	ACC ₃₂	-	ACC _{3i}	ACC _{3j}	ACC _{3n}	E ₃
Zone i	ACC _{i1}	ACC _{i2}	ACC _{i3}	-	ACC _{ij}	ACC _{in}	E _i
Zone j	ACC _{j1}	ACC _{j2}	ACC _{j3}	ACC _{ji}	-	ACC _{jn}	E _j
Zone n	ACC _{n1}	ACC _{n2}	ACC _{n3}	ACC _{ni}	ACC _{nj}	-	E _n

Economic Activity	E ₁	E ₂	E ₃	E _i	E _j	E _n
-------------------	----------------	----------------	----------------	----------------	----------------	----------------

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(1) Generation/ Attraction Model:

$G_i = F(\text{Economic Activity } i \text{ zone})$
 $A_i = F(\text{Economic Activity } i \text{ zone})$

(2) Gravity Model:

$T_{ij} = F(G_i, G_j, ACC_{ij})$
 $= G_i^\alpha \times G_j^\beta / ACC_{ij}^\gamma$

(3) Economic Impact Model:

Economic Activity i zone = $F(\sum_j ACC_{ij})$
 * Summing up for j
 () MET Model, SPAMETRI)

21

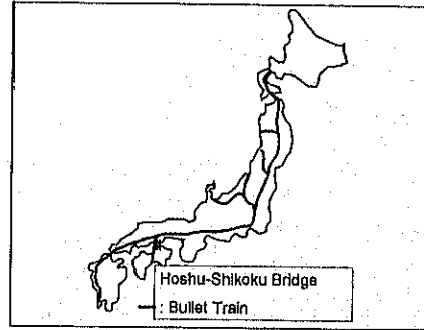


Figure 13

22

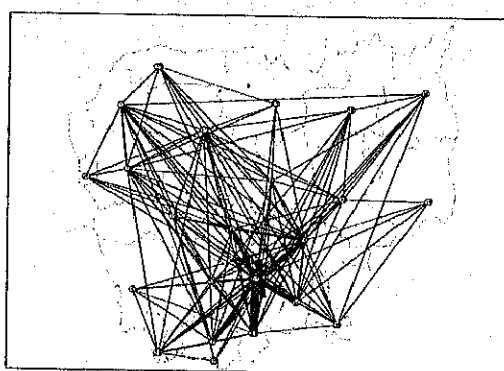


Figure 14 Desired line 2005
 արձույթ: մտարարային ցանց

23

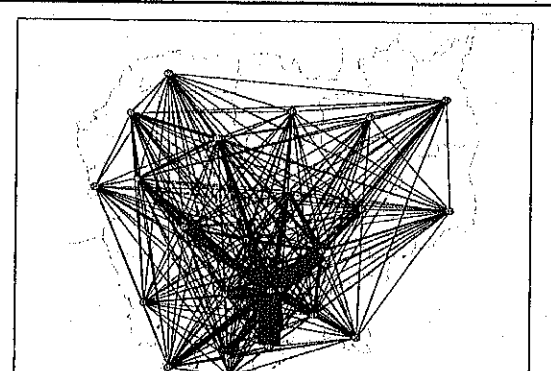


Figure 15 Desired line 2020
 արձույթ: սղարդված արտադրանքի ցանց

24

Evaluation ကိစ္စခံစား

(A) Economic Evaluation for Total Road Network ကုမ္ပဏီတစ်ခုလုံးအတွက်စီးပွားရေးအကဲဖြတ်ခြင်း

<Total Project Cost>
\$2,528million
<Benefit from Total Project>
2010: \$221 million, 2010: \$515 million
2010-20: Accumulated Benefit: \$3,839 million
2010-35: Accumulated Benefit: \$15,952 million

<Evaluation>
B/C Ratio: 1.62

(B) Economic Evaluation for each of the Proposed Roads (85 in total)
ကုမ္ပဏီတစ်ခုလုံးအတွက်စီးပွားရေးအကဲဖြတ်ခြင်း

(C) Financial Consideration

<Public Financing>
Domestic Procurement: \$981 million
International Procurement: \$1,285 million
Total: \$2,266.2 million

<Private Financing>
Direct Road User Charge: \$262 million

Table 5 Investment Budget Comparison

ကုမ္ပဏီတစ်ခုလုံးအတွက်စီးပွားရေးအကဲဖြတ်ခြင်း

\$ million

Investment, Budget	Category	Short Term	Medium Term	Long Term	Total
Investment	Road Development	403	583	1,049	2,035
	Maintenance	113	189	199	481
	Miscellaneous	6	5	1	12
	Total	522	757	1,249	2,528
Available Budget	Public Financing	563	716	987	2,266
	Private Financing			262	262
	Total	563	716	1,249	2,528

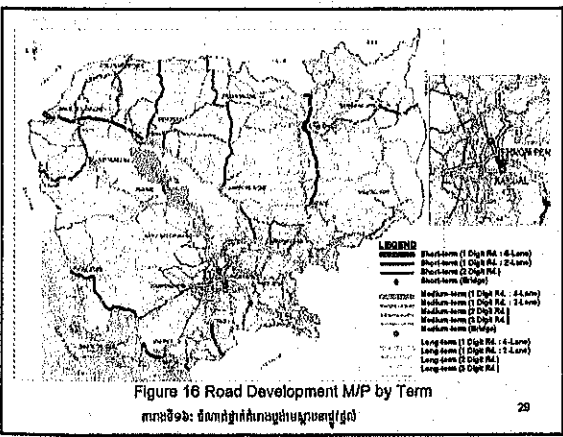
Table 6 Procurement Plan ကုမ္ပဏီတစ်ခုလုံးအတွက်စီးပွားရေးအကဲဖြတ်ခြင်း

\$ million

Year	Domestic Procurement				External Assistance				Total	
	Special Tax (Subsidy)	Leasing from Storage	Vehicle Reg. Fee	Total	Loan International Credit Org.	Loan Bilateral	Grant Aid	Total	Total	Total
2006	22.7	-	0.2	22.9	48.9	11.8	23.2	82.7	105.7	128.6
2007	21.1	-	0.3	21.4	48.9	11.8	23.2	82.7	104.1	125.5
2008	20.6	-	0.3	20.9	48.9	11.8	23.2	82.7	103.6	124.0
2009	20.3	-	0.4	20.7	48.9	11.8	23.2	82.7	103.3	123.7
2010	20.0	-	0.4	20.4	48.9	11.8	23.2	82.7	103.0	123.4
2011	20.1	12.8	0.4	33.3	48.9	11.8	23.2	82.7	130.0	153.3
2012	24.2	15.6	0.4	40.2	48.9	11.8	23.2	82.7	131.6	155.8
2013	36.5	11.5	0.5	48.5	48.9	11.8	23.2	82.7	157.2	205.7
2014	39.0	15.0	0.6	54.6	48.9	11.8	23.2	82.7	163.3	211.7
2015	42.7	24.9	0.6	68.2	48.9	11.8	23.2	82.7	176.8	229.5
2016	47.8	27.0	0.6	75.4	48.9	11.8	23.2	82.7	185.1	242.5
2017	51.1	28.1	0.6	79.8	48.9	11.8	23.2	82.7	189.5	247.2
2018	54.8	28.4	0.7	83.9	48.9	11.8	23.2	82.7	193.6	251.3
2019	58.9	28.4	0.7	88.0	48.9	11.8	23.2	82.7	197.7	255.4
2020	63.4	28.4	0.7	92.5	48.9	11.8	23.2	82.7	201.8	259.5
Total									1,285.2	1,943.8

Implementation Plan ကုမ္ပဏီတစ်ခုလုံးအတွက်စီးပွားရေးအကဲဖြတ်ခြင်း

Step	Required finance for 15 years	Financial procurement plan		
Step 1	Allocation of finance	Short term (2006 ~2010)	Medium term (2011 ~2015)	Long term (2016 ~2020)
Step 2	Distribution of projects based on Project Evaluation	High Priority	Medium Priority	Low Priority
Step 3	Adjustment of priority within the budget	← → ← →		
Step 4	Implementation Program	Projects in Short term	Projects in Medium term	Projects in Long term



2nd Program:

**Findings of Road Maintenance Development
(Guidelines and Capacity Development)**

JICA
JICA Road Network Development Study (Master Plan)
 គំរោងសិក្សាប្រុងមេត្តិបណ្តាញផ្លូវថ្នល់របស់អង្គការ JICA
Road Maintenance Development
 ការអភិវឌ្ឍន៍លើផ្នែកការថែទាំផ្លូវថ្នល់

How to prepare strategic budget plan
 វិធីសាស្ត្រក្នុងការរៀបចំផែនការថវិកា
 July, 2006
 Study Team

JICA
Justification of the Project(1)
 ដំណោះស្រាយក្នុងការរៀបចំគំរោង
For Easy Understanding of Technical Aspect
 ដំណោះស្រាយងាយយល់លើបញ្ហាបច្ចេកទេស ត្រូវមានឯកសារយោងដូចខាងក្រោមនេះ

Attach Drawings គំនូសតាមលំអិតស្តីពីការងារបច្ចេកទេស
Attach Photos រូបថតជាក់ស្តែង
Attach Typical Cross Section ស្ថានភាពជាក់ស្តែងរបស់ផ្លូវ
 ដែលគំរោងបានស្នើឡើង
Clarify the Work Method តួសបញ្ជាក់អោយបានច្បាស់ពីវិធីសាស្ត្រ
 ក្នុងការអនុវត្តគំរោង

JICA
Justification of the Project(2)
 ដំណោះស្រាយក្នុងការរៀបចំគំរោង
For Easy Understanding of Contract Aspect
 ដំណោះស្រាយងាយយល់លើកិច្ចសន្យាការងារ ត្រូវមានឯកសារយោងដូចខាងក្រោមនេះ

- **Attach Time Schedule** តារាងពេលវេលាក្នុងការអនុវត្តគំរោង
- **Attach Payment Schedule** ផែនការចំណាយលើការប្រើប្រាស់ថវិកា
- **Clarify the Period of Defect** តួសបញ្ជាក់ពីបញ្ហាស្នូកស្នាយរបស់គំរោង
- **Way of Change Order** វិធីសាស្ត្រក្នុងការកែតម្រូវការប្រើប្រាស់ថវិកា

JICA
Reasonable Cost Estimation(1)
 ការរៀបចំបញ្ជីតម្លៃដែលអាចទទួលយកបាន
Three Element of the Cost
 បញ្ជីតម្លៃត្រូវមានទម្រង់ដូចខាងក្រោមនេះ

- **Labor Cost** ការចំណាយលើកម្លាំងពលកម្ម
- **Material Cost** ការចំណាយលើសម្ភារៈសំបក
- **Equipment Cost** ការចំណាយលើគ្រឿងយន្ត

Above data shall be prepared by DPWT and adjusted by DOR ទិន្នន័យទាំងនេះត្រូវរៀបចំឡើងដោយ DPWT និងកែតម្រូវដោយ DOR ផ្អែកលើការស្រាវជ្រាវ និងការស្រាវជ្រាវផ្សេងៗ ។

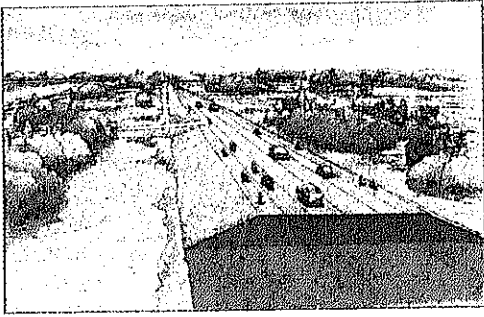
JICA
Reasonable Cost Estimation(2)
 ការរៀបចំបញ្ជីតម្លៃដែលអាចទទួលយកបាន
Annual Routine Work by DOR
 តារាងការងារធម្មតាប្រចាំឆ្នាំរបស់អង្គការថែទាំផ្លូវថ្នល់

- **Set up Unit Cost before start to prepare Budget** រៀបចំតម្លៃឯកតាមមុនដើម្បីរៀបចំថវិកា
- **Agreement on Unit Cost with MEF**
 ធ្វើអោយមានកិច្ចប្រយោជន៍រវាងភាគីពាក់ព័ន្ធនានា
- **Work Method Statement** តួសបញ្ជាក់ពីវិធីសាស្ត្រក្នុងការអនុវត្តការងារថែទាំផ្លូវថ្នល់

JICA
Reasonable Cost Estimation(3)
 ការរៀបចំបញ្ជីតម្លៃដែលអាចទទួលយកបាន
Annual Routine Work by DPWT
 តារាងការងារធម្មតាប្រចាំឆ្នាំរបស់អង្គការថែទាំផ្លូវថ្នល់

- **Prepare typical Cross Section to be applied** រៀបចំស្ថានភាពជាក់ស្តែងរបស់ផ្លូវដែលគំរោងបានស្នើឡើងសំរាប់ការងារថែទាំ
- **Prepare Bill of Quantity** រៀបចំស្នូកបញ្ជីតម្លៃឯកតាមមុន

Reasonable Cost Estimation(4)



3rd Program:

**Findings of Pre-Feasibility Study
(NR.57 Improvement Project & Urgent Bridge Rehabilitation Program)**

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Findings of Pre-Feasibility Study

ការស្វែងរក
នៃការសិក្សាស្រាវជ្រាវ S ភាពដំបូង
Study Team
July 24, 2006

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

PART A: Pre-Feasibility Study for National Road No. 57

ផ្នែក ក
ការសិក្សាស្រាវជ្រាវ S ភាពដំបូងសំរាប់ផ្លូវជាតិលេខ ៥៧

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Background ប្រវត្តិ

ការកែលម្អផ្លូវជាតិលេខ ៥៧ គឺជាគម្រោងមួយនៃគម្រោងកែលម្អផ្លូវជាតិលេខ ៥៧ ដែលជាគម្រោងអាទិភាពខ្ពស់បំផុតក្នុងគម្រោង

Improvement of National Road No.57 is one of the top priority projects identified in the Master Plan

Road Length : 104 kms
Existing Road Bed: Laterite
Existing Bridges : 14 Bailey Bridges
3 Concrete Bridges

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Objective គោលបំណង

- Estimation of the project cost based on the preliminary design and the implementation plan
- Economic and financial analysis
- Estimation of maintenance cost
- Estimation of landline/UXO survey and clearing

Improvement Target គោលដៅកែលម្អ

- To upgrade the road to all weather condition
- To upgrade the road capacity sufficient to meet national demand
- To upgrade the bridges to be permanent
- To upgrade the road with proper safety Facilities against traffic accidents

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

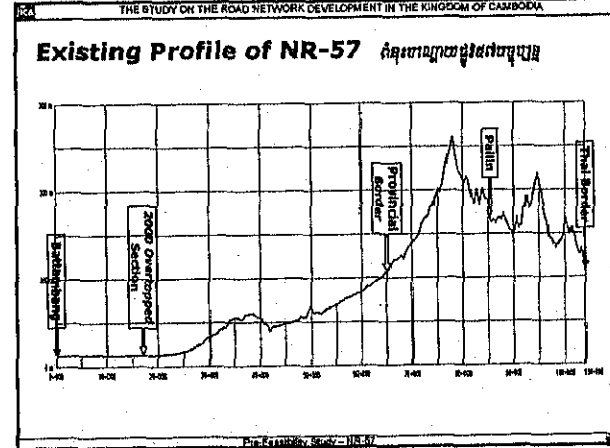
Existing Road Condition ស្ថានភាពផ្លូវបច្ចុប្បន្ន

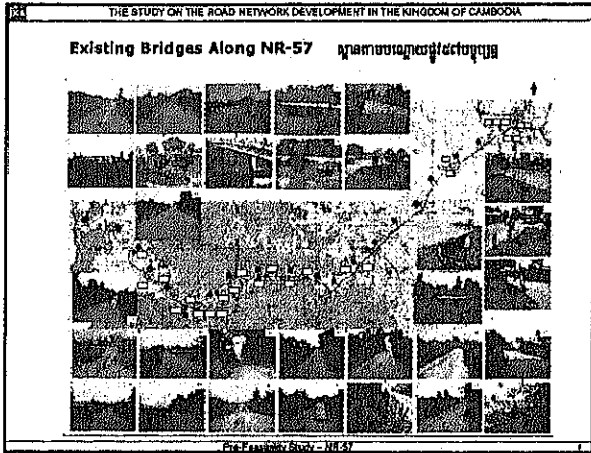
Roadside Use ការប្រើប្រាស់ផ្លូវ

- Beginning to 10km - residential/commercial
- Km 10 to Km 30 - agricultural
- Km 30 to Km 80 - open field
- Km 80 - Pailin City
- Until Border - open/agriculture
- Border - commercial

NR-57:
• Secondary National Road with highway/arterial function
• 104km long connecting Battambang with Pailin and Thailand border
• Passes through several districts and tourist attraction areas

Pre-Feasibility Study - NR-57



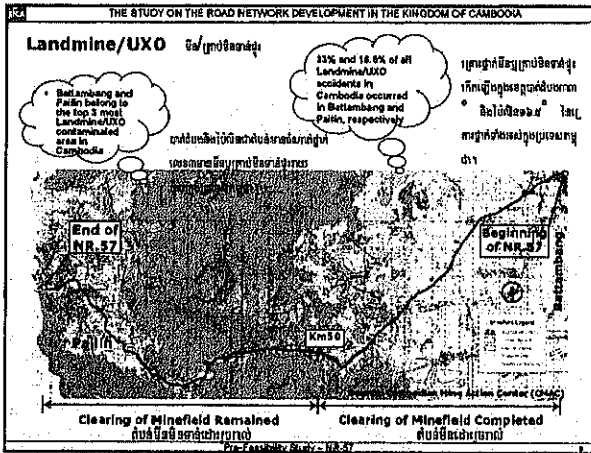


THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Existing Traffic Condition គោលការណ៍ស្ថាប័នប្រយោជន៍

Province/District	Type	2005	2010	2015	2020
Svay Pao	Motor Cycle	1,562	1,953	2,363	2,883
	Car/Tractor	242	317	399	491
	Total	1,804	2,269	2,762	3,373
Banan	Motor Cycle	4,059	5,086	6,154	7,508
	Car/Tractor	1,061	1,390	1,751	2,194
	Total	5,120	6,475	7,905	9,702
Battanak Mondul	Motor Cycle	1,423	1,779	2,152	2,626
	Car/Tractor	396	519	653	804
	Total	1,819	2,297	2,805	3,430
Subtotal	Motor Cycle	7,054	8,817	10,669	13,016
	Car/Tractor	1,698	2,225	2,803	3,448
	Total	8,752	11,042	13,472	16,464
Pailin	Motor Cycle	2,214	2,504	2,409	2,812
	Car/Tractor	258	263	434	530
	Total	2,472	2,767	2,843	3,342
Total	Motor Cycle	9,168	11,121	13,150	15,828
	Car/Tractor	1,954	2,488	3,237	3,978
	Total	24,453	30,857	37,855	46,019

Pr. Feasibility Study - NR-57



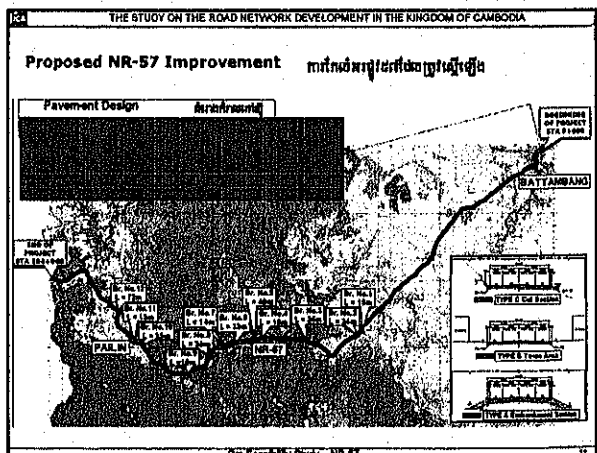
- THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA
- ### Design Concept គោលការណ៍ស្ថាប័នប្រយោជន៍
- Road and Bridge design shall comply with the Cambodian Road and Bridge Design Standard,
 - Existing road alignment shall be maintained, if possible,
 - Road vertical profile shall consider flood level with sufficient freeboard
 - Bridge location and alignment shall consider river requirements and road geometry
- ការស្ថិតនៅ និង ការស្ថិតនៅប្រយោជន៍សម្រាប់ការស្ថិតនៅប្រយោជន៍
 - គ្រប់គ្រងការស្ថិតនៅប្រយោជន៍សម្រាប់ការស្ថិតនៅប្រយោជន៍
 - ការស្ថិតនៅប្រយោជន៍សម្រាប់ការស្ថិតនៅប្រយោជន៍
 - ការស្ថិតនៅប្រយោជន៍សម្រាប់ការស្ថិតនៅប្រយោជន៍
- Pr. Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Design Criteria គោលការណ៍ស្ថាប័នប្រយោជន៍

Design Standard	Cambodian Road and Bridge Design Standard
ស្ថិតនៅប្រយោជន៍	ស្ថិតនៅប្រយោជន៍សម្រាប់ការស្ថិតនៅប្រយោជន៍
Road Classification	RA1/4
Design Speed	90 (60) km/hr
Road Carriageway Width	13.0m (2 @ 3.6 + 2 @ 3.0)
Bridge Width	10.0m (2 @ 3.5 + 2 @ 1.5) 12.0m (Urban area with shoulder)
Bridge Design Flood Freq.	1 in 50 years

Pr. Feasibility Study - NR-57



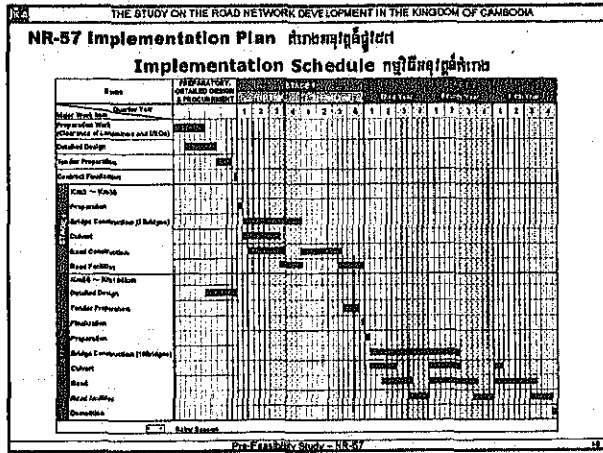
THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

NR-57 Implementation Plan គម្រោងអនុវត្តផ្លូវជាតិលេខ ៥៧

Total Project Cost តំលៃគម្រោងសរុប

Particulars	In Million US\$	
	External Resources	Kingdom of Cambodia
Construction Cost	42.795	
Detailed Design & Construction Supervision	4.280	
Compensation for Resettlement		0.028
Landmine and UXO Clearance		0.300
Relocation of Public Utilities		0.010
Total	47.075	0.338
Grand Total	47.413	

Pre-Feasibility Study - NR-57



THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Project Evaluation ការវាយតម្លៃគម្រោង

NPV (US \$ '000)	9,814.0
Benefit Cost Ratio (B/C Ratio)	1.26
EIRR (%)	14.34

Notes:
 - Project Life - 25 years
 - Discount Rate - 12%

The Benefit-Cost Analysis indicates that the improvement of National Road No. 57 is economically feasible.

ការវាយតម្លៃគម្រោងបង្ហាញថា ការកែលម្អផ្លូវជាតិលេខ ៥៧ គឺមានលទ្ធភាពសេដ្ឋកិច្ចបាន។

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

NR-57 Maintenance Management ការគ្រប់គ្រងថែទាំផ្លូវ

Activity	MPWT	DPWT
Daily and Monthly Patrol	<ul style="list-style-type: none"> Evaluation of monthly inspection - PWRC 	<ul style="list-style-type: none"> Patrol Check Visual Inspection Inspection Record
Routine Maintenance Works	<ul style="list-style-type: none"> DPWT's Budget Assessment, Project Estimate & Bidding - DOR. Supervising & Inspection - DOR. 	<ul style="list-style-type: none"> Prepare Routine Maintenance Budget Implementation & Supervision Routine Progress & Final Report
Periodical Maintenance Works	<ul style="list-style-type: none"> Project Estimate, Bidding & Contract Supervising and Reporting Project Hand-over of Management to DOR. 	<ul style="list-style-type: none"> Inspection Record Transfer of Management from PWRC.
Emergency Works	<ul style="list-style-type: none"> Inspection by PWRC & DPWT Project Estimate, Designs & Specs, Bidding and Contract Supervision and Reporting Hand-over of Management to DOR. 	<ul style="list-style-type: none"> Conduct Inspection by PWRC & DPWT Transfer of Management from PWRC.

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

សេចក្តីសន្និដ្ឋាន និង ការណែនាំ

Conclusion សេចក្តីសន្និដ្ឋាន

- The Pre-Feasibility Study for NR.57 has shown that this project is technically and economically viable with a high economic internal rate of return
- This project should be implemented as early as possible due to its importance in supporting the regional economy

ការសិក្សាស្រាវជ្រាវប្រេន-វិជ្ជាស្រាវជ្រាវសម្រាប់គម្រោងអនុវត្តផ្លូវជាតិលេខ ៥៧ បានបង្ហាញថា គម្រោងនេះមានលទ្ធភាពសេដ្ឋកិច្ចខ្ពស់ និងមានសារៈសំខាន់ក្នុងការគាំទ្រសេដ្ឋកិច្ចតំបន់។

គម្រោងនេះគួរតែអនុវត្តឱ្យបានឆាប់រហ័សបំផុត ដោយសារតែសារៈសំខាន់របស់វាក្នុងការគាំទ្រសេដ្ឋកិច្ចតំបន់។

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

Recommendations ការណែនាំ

- Preparation Aspects
 - Allocation of Budget for Project Preparation
 - Cleaning of Landmines/UXO prior to Field Survey
- Management Aspects
 - Operation and Maintenance
 - Recycling of Existing Temporary Structures
 - Education for Traffic Safety, Rules and User Behavior

ការណែនាំសម្រាប់ការរៀបចំគម្រោង និង ការគ្រប់គ្រងគម្រោង

Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

Recommendations ការផ្តល់អនុសាសន៍

Environmental Aspects

- Full EIA is required since total project length is 104km.
- However, EIA was not conducted due to:
 - Illegal Squatting and Land Speculation
 - Validity of EIA
- Once Project Implementation is decided, EIA should be conducted considering:
 - Samlaut Multiple User Area
 - Resettlement
 - Others – land use, local economy, diseases, landmine/ UXO, pollution, environmental management plan, etc.
 - Information disclosure to all stakeholders should be done

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

ទិដ្ឋភាពប្រែប្រួល

- ការវាយតម្លៃផលប៉ះពាល់បរិស្ថានដោយស្របច្បាប់ត្រូវធ្វើឡើងក្នុងក្របខណ្ឌផែនការស្ថិតិស្រុក ខេត្ត និងជាតិ ឆ្នាំ ២០១៥-២០៣០ ។
- ប្រសិនបើការវាយតម្លៃផលប៉ះពាល់បរិស្ថានមិនអាចធ្វើបានដោយសារ៖
 - អនាមិកប្រកួលប្រជែងប្រយោជន៍អ្នកលក់ដី
 - កុលសម្ព័ន្ធការពារផលប៉ះពាល់បរិស្ថាន
- នៅពេលការអនុវត្តគម្រោងបានចាប់ផ្តើម ការវាយតម្លៃផលប៉ះពាល់បរិស្ថានត្រូវធ្វើក្នុងដោយគិត៖
 - កំណត់ប្រើប្រាស់ ត្រីមាសដំបូងនៃគម្រោង
 - ដោយប្រកបដោយប្រសិទ្ធភាព
 - ការប្រើប្រាស់ រចនាសម្ព័ន្ធផ្និតផ្សំ ដើម្បី ប្រយោជន៍ ភាពកាន់កាប់ ដែលគ្រប់គ្រងដោយស្របច្បាប់
 - ផ្តល់ព័ត៌មានទៅដល់អ្នកពាក់ព័ន្ធ ៩ ទាំងអស់ជាមុន

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

PART B:

Pre-Feasibility Study for Urgent Bridge Rehabilitation Program

ផ្នែក B

ការសិក្សាស្រាវជ្រាវ ៩ ភាគដំបូងសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក

ផ្នែក B

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Background ប្រវត្តិ

Urgent Bridge Rehabilitation Program is one of the top priority projects identified in the Master Plan

កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែកសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក គឺជាគម្រោងមួយក្នុងចំណោមគម្រោងដែលបានកំណត់ក្នុងកម្រិតជាមុន ។

Pr. No.	No. Rts.	EIL	VMS (m)	Length (m)	No. Cyls	Type PCS	Standard Condition		
							Superstructure	Substructure	Abutment
1	3	05-03	130	32.00	15	1.50	Rebar Cast Deck	Concrete	Fair
2	3	05-05	120	40.00	15	2.00	Rebar Cast Deck	Concrete	Fair
3	2	07-03	120	100.00	35	2.00	Rebar Cast Deck	Concrete	Fair
4	15	04-03	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor
5	15	04-04	140	42.00	15	2.00	Steel Truss Deck	Steel	Very poor
6	15	04-05	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor
7	15	04-06	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor
8	15	04-07	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor
9	15	04-08	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor
10	15	04-09	140	42.00	15	1.00	Steel Truss Deck	Steel	Very poor

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Project Justification

- Most of the 3-Digit and some 2-Digit national roads have been rehabilitated but bridges remains unrehabilitated and become bottlenecks in these areas
- The Master Plan identifies the need to prioritize upgrade of such bridges in the primary and secondary national roads to improve traffic capacity and traffic safety

លទ្ធផល

- ការកែលម្អស្ថានភាពឡើងវិញដោយឡែកសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក គឺជាគម្រោងមួយក្នុងចំណោមគម្រោងដែលបានកំណត់ក្នុងកម្រិតជាមុន ។
- ការកែលម្អស្ថានភាពឡើងវិញដោយឡែកសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក គឺជាគម្រោងមួយក្នុងចំណោមគម្រោងដែលបានកំណត់ក្នុងកម្រិតជាមុន ។

Project Objectives

- Estimation of the project cost based on the preliminary design and the implementation plan
- Economic and financial analysis
- Estimation of maintenance cost

កម្រិត

- ការវាយតម្លៃតម្លៃគម្រោង ៩ ភាគដំបូងសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក
- ការវាយតម្លៃសេដ្ឋកិច្ច និងហិរញ្ញវត្ថុ
- ការវាយតម្លៃថ្លៃថែទាំ

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Project Selection ការជ្រើសរើសគម្រោង

Block	Project Name	Project Length (km)	Project Cost (USD)	Socio-Economic Benefits (USD)
Northwest Block	1. Phnom Penh - Pursat	100	1,200,000	1,500,000
	2. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	3. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	4. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	5. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	6. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	7. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	8. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	9. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
	10. Phnom Penh - Kampong Chhnang	100	1,200,000	1,500,000
Southeast Block	11. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	12. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	13. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	14. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	15. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	16. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	17. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	18. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	19. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000
	20. Phnom Penh - Kampong Speu	100	1,200,000	1,500,000

Southeast Block Selection

- Southeast Block is taken as Master Plan priority because of high socio-economic benefits
- គម្រោងជ្រើសរើសគម្រោងសំរាប់កម្មវិធីស្តារស្ថានភាពឡើងវិញដោយឡែក គឺជាគម្រោងមួយក្នុងចំណោមគម្រោងដែលបានកំណត់ក្នុងកម្រិតជាមុន ។

Pre-Feasibility Study – NR-37

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Bridge Screening ការប្រើប្រាស់ប្រាស

1st Screening

- Bridge in national roads (1 & 2-digits) not improved during previous road rehabilitation
- Bridge Length > 30m needing technical assistance from donors
- Improvement of basic human needs can be expected to a large number of people

2nd Screening

- Structural Condition
- Bridge Traffic Capacity and Traffic Demand

Final Selection

- 2 Bridges in Kampot
- 1 Bridge in Kamdal
- 4 Bridges in Prey Veng

MPWT Initial Request (3-E Block)

- Based on Bridge Inventory

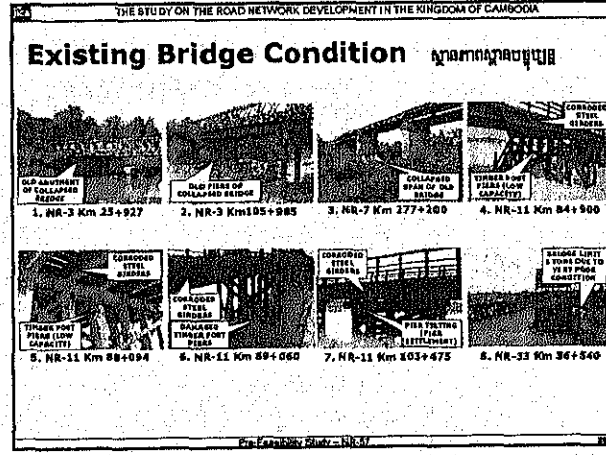
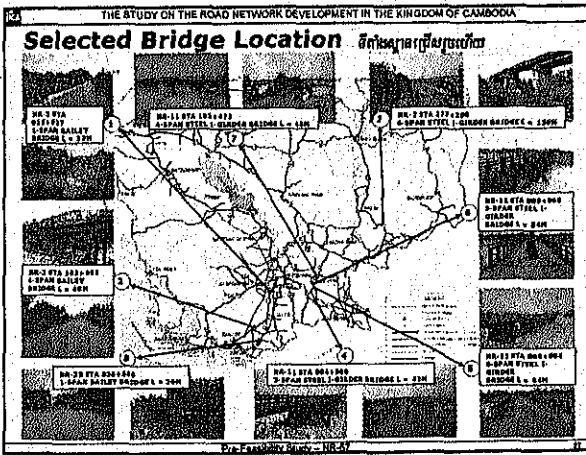
Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Selected Bridges ស្ថានភាពជ្រើសរើស

No.	Road No.	Province	Route	Type	Length (m)	Change-over year (%)	Span structure	Substructure	Load Limit (ton)	Overall Condition	2000 P.M.T. (\$10 ³)	Remarks
1	3	Kandal	28 + 927	Beam	37.8	4.8	1-span beam bridge with steel deck	Old concrete abutments	15	Poor	0.515	Original concrete bridge replaced by steel bridge bridge carrying to old bridge's load
1	3	Kampong	159 + 918	Beam	68.0	4.3	4-span beam bridge with steel deck	Old concrete abutments and pier	18	Poor	3.990	Steel bridge is sitting on top of old reconstructed old reconstructed bridge
3	7	Strelak	277 + 200	Beam	139.0	4.4	4-span beam bridge with steel deck	Old concrete abutment and pier	18	Poor	1.076	All bridges to be replaced with steel bridge and the 2000 P.M.T. can be increased. The existing bridge bridge is placed on top of the old reconstructed bridge
5	11	Prey Veng	94 + 000	Steel girder	12.5	8.8	1-span steel girder bridge with timber deck	Old timber pier	15	Very Poor	0.125	The pier deck and piers for pier loads are in very poor condition
5	15	Prey Veng	96 + 004	Steel girder	64.5	5.4	1-span steel girder bridge with timber deck	Old timber pier	18	Very Poor	0.34	The pier deck and piers for pier loads are in very poor condition
6	18	Prey Veng	96 + 004	Steel girder	64.5	4.8	1-span steel girder bridge with timber deck	Old timber pier	18	Very Poor	0.30	The pier deck and piers for pier loads are in very poor condition
7	11	Prey Veng	102 + 411	Steel girder	68.0	4.0	1-span steel girder bridge with timber deck	Old timber pier	18	Very Poor	0.38	The pier deck and piers for pier loads are in very poor condition. One of the piers is tilted and leaning to the left
8	20	Kampong	76 + 000	Beam	30.0	5.3	1-span beam bridge with steel deck	Old concrete abutment	8	Very Poor	0.17	Bridge is old and pier is bent to the left

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THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Design Concept ក្នុងគំនិតការពង្រឹង

- Bridge shall have the same functional standard as the road.
- Existing bridge alignment/location (where geometry elements comply with the road standard) shall be maintained as much as possible to minimize additional right-of-way.
- Road profile shall be adjusted to meet the minimum bridge design flood freeboard
- Bridge scheme shall consider minimum adverse social impact.
- Environmental preservation shall be a primary concern
- The bridge shall incorporate appropriate traffic safety facilities in design and construction.

- ស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រសើរ
- ទីតាំងជ្រើសរើសទីតាំងស្ថិតនៅក្នុងតំបន់ដែលមានការប្រើប្រាស់ដីប្រកបដោយសុវត្ថិភាព
- ស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រសើរជាងស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រចាំឆ្នាំ
- គែមការពារបរិស្ថានប្រកបដោយសុវត្ថិភាព
- ការដឹកជញ្ជូនស្របច្បាប់ស្របតាមច្បាប់
- ស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រសើរជាងស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រចាំឆ្នាំ

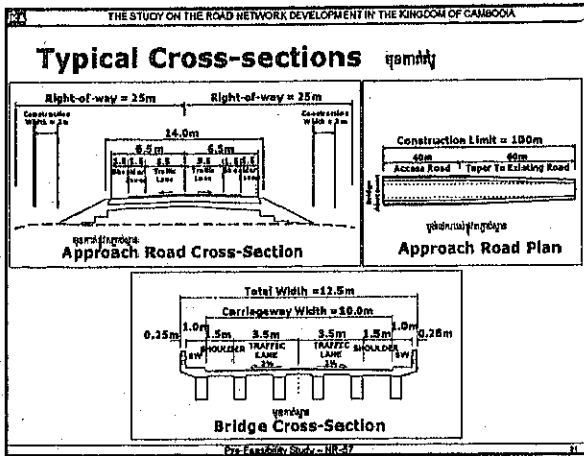
Pre-Feasibility Study - NR-57

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Design Criteria ស្ថានភាពក្នុងគំនិត

Design standard ស្ថានភាពប្រតិបត្តិការ	1	Cambodian Road and Bridge Design Standard ស្ថានភាពប្រតិបត្តិការប្រើប្រាស់ប្រកបដោយសុវត្ថិភាព
Road Classification ស្ថានភាពប្រតិបត្តិការ	2	R6 (reduced to R8 for access road)
Design speed ល្បឿន	3	90 km/h (access road)
Access Road Width ទទឹងផ្លូវ	4	14.0m
Bridge Width ទទឹងទ្វារ	5	12.0m (2x6.0+2x0.15+2x0.15)
Design Flood Free-board លើសពីទឹកជំនន់	6	1 in 60 years
Design Live Load ទំងន់	7	T44, L44, H.P.240

Pre-Feasibility Study - NR-57

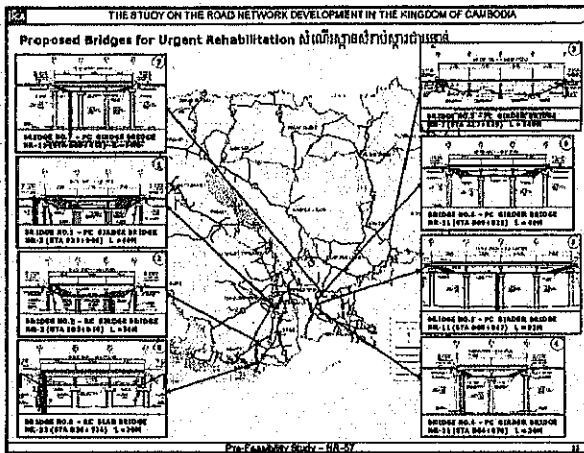


THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Summary of Bridge Design រូបសម្ព័ន្ធនៃប្រព័ន្ធប្រទេស

Dr. No.	Road No.	Station	Deck Elev. (m)	Total Length (m)	Superstructure			Substructure	
					Type	Span (m)	Deck Width (m)	Pier	Abutment
1	NR-3	025+900	16.40	60.6	PCDG (AASHTO Type IV)	3 @ 20	10.0 +2.0 =12.0	Column Pier on RC Driven Pile (0.4x0.40m)	Seat Type Cantilever on RC Driven Pile (0.4x0.40m)
2	NR-3	105+955	30.00	84.6	RCDG (D=100)	3 @ 18	10.0 +2.0 =12.0	Column Pier on RC Driven Pile (0.4x0.40m)	Seat Type Cantilever on RC Driven Pile (0.4x0.40m)
3	NR-7	277+128	82.25	140.8	PCDG (AASHTO Type VI)	4 @ 35	10.0 +2.0 =12.0	Column Pier on Spread Footing	Seat Type Cantilever on RC CIP Pile (11.0m)
4	NR-11	084+978	10.54	42.6	PCDG (AASHTO Type IV)	2 @ 21	10.0 +2.0 =12.0	Column Pier on RC CIP Pile(11.0m)	Seat Type Cantilever on RC CIP Pile (11.0m)
5	NR-11	042+047	11.60	82.8	PCDG (AASHTO Type IV)	4 @ 23	10.0 +2.0 =12.0	Column Pier on RC CIP Pile(11.0m)	Seat Type Cantilever on RC CIP Pile (11.0m)
6	NR-11	088+928	10.80	49.8	PCDG (AASHTO Type IV)	3 @ 23	10.0 +2.0 =12.0	Column Pier on RC CIP Pile(11.0m)	Seat Type Cantilever on RC CIP Pile (11.0m)
7	NR-11	101+448	10.84	81.6	PCDG (AASHTO Type IV)	3 @ 18	10.0 +2.0 =12.0	Column Pier on RC CIP Pile(11.0m)	Seat Type Cantilever on RC CIP Pile (11.0m)
8	NR-33	036+934	3.60	20.6	RC Slab (D=600)	3 @ 10	10.0 +2.0 =12.0	Wet Pier on RC Driven Pile (0.4x0.40m)	Seat Type Cantilever on RC Driven Pile (0.4x0.40m)

Proj. Feasibility Study - NR-07



THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Bridge Preventive Maintenance ការថែទាំប្រទេស

Maintenance Objectives

- To keep the basic function of a roadway to provide a safe and efficient transportation system on a day-to-day basis,
- To keep the bridge in its current as-built condition and protect it from further deterioration, and
- To preserve the intended structural carrying capacity of the bridge.

គោលបំណង

- រក្សាទុកនូវប្រព័ន្ធប្រទេសសំខាន់ៗ ដើម្បីផ្តល់នូវសេវាដឹកជញ្ជូនសុវត្ថិភាព និងមានប្រសិទ្ធភាពប្រចាំថ្ងៃ
- រក្សាទុកប្រទេសសំខាន់ៗ ក្នុងស្ថានភាពដើម និងការពារប្រទេសសំខាន់ៗ ឱ្យមិនរលាយបាត់បង់បន្ថែមទៀត
- រក្សាទុកនូវសមត្ថភាពទ្រទ្រង់រចនាសម្ព័ន្ធប្រទេសសំខាន់ៗ

Proj. Feasibility Study - NR-07

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Bridge Preventive Maintenance ការថែទាំប្រទេស

Annual Routine and Periodic Maintenance Cost តម្លៃថែទាំប្រទេស

Bridge No.	Road No.	Bridge Type	Bridge Length	Deck Width (m)	Maintenance Cost (x1,000 US\$)
1	NR-3	PCDG	60.6	12.5	3,773
2	NR-3	RCDG	84.6	12.5	3,771
3	NR-7	PCDG	140.8	12.5	3,804
4	NR-11	PCDG	42.6	12.5	3,766
5	NR-11	PCDG	92.6	12.5	3,786
6	NR-11	PCDG	69.6	12.5	3,777
7	NR-11	PCDG	54.6	12.5	3,771
8	NR-33	RC Slab	30.6	12.5	3,762
Total					30,210

Proj. Feasibility Study - NR-07

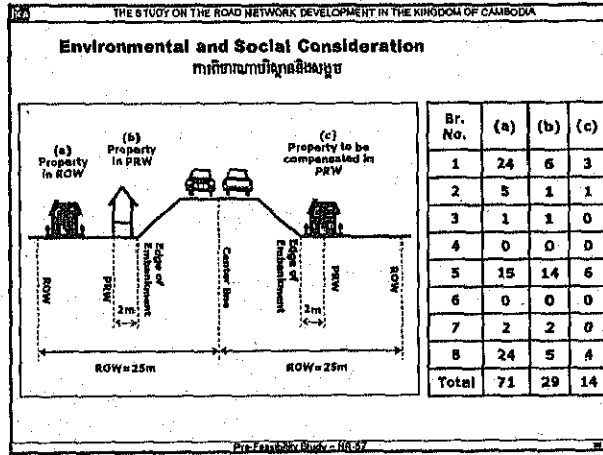
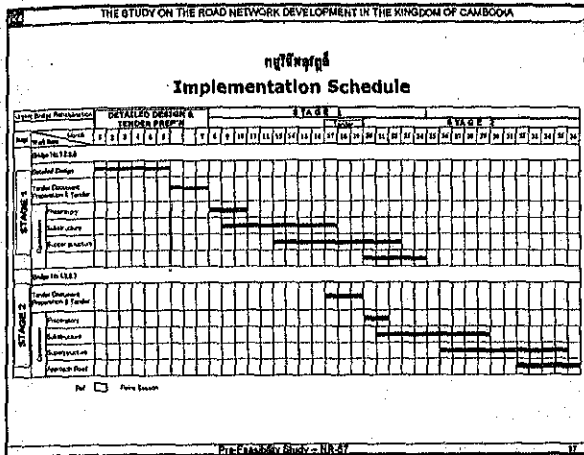
THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Implementation Plan ផែនការប្រទេស

Civil Works Costs		Total Project Cost*	
Bridge No	Cost (Million US\$)	Particulars	External Sources Kingdom of Cambodia
No.1	1.195	Construction Cost	10.710
No.2	1.031		
No.3	2.693		
No.4	0.898		
No.5	1.836		
No.6	1.385	DD & CS	1.071
No.7	1.112		
No.8	0.587		
Total Civil Works	10,710	Compensation/Resettlement	0.015
		Relocation of Public Utilities	0.017
		Total	11,781
		Grand Total	11,813

*in Million US\$

Proj. Feasibility Study - NR-07



THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Project Evaluation

Bridge No.	Road No.	NPV (US\$ '000)	Cost-Benefit Ratio	EIRR (%)
Bridge 1	NR.3	2,505.9	3.40	22.54
Bridge 2	NR.3	313.9	1.34	14.19
Bridge 3	NR.7	-1,008.9	0.57	7.60
Bridge 4	NR.11	2,769.2	4.50	24.34
Bridge 5	NR.11	2,576.9	2.62	24.34
Bridge 6	NR.11	2,386.1	3.02	20.46
Bridge 7	NR.11	2,641.7	3.72	22.07
Bridge 8	NR.33	-156.8	0.70	9.35

Notes:
 □ Project Life - 25 years
 □ Discount Rate - 12%

◆ Bridge Nos. 1, 2, 4, 5, 8 & 7 - Economically Feasible
 ◆ Bridge Nos. 3, 8 - Scarcely Economically Feasible

Pre-Feasibility Study - NR-87

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

សេចក្តីសន្និដ្ឋាន និង ការណែនាំ

Conclusion

- The Pre-Feasibility Study indicated that the Urgent Bridge Rehabilitation is technically feasible but Bridge Nos. 3 & 8 have low financial viability.
- However, improvement of these bridges are necessary from safety and road importance viewpoint.

ការវិនិយោគ ៩ អាចជួយបង្កើនការសុវត្ថិភាពសម្រាប់ប្រជាជន និង ការកាត់បន្ថយការបាត់បង់សម្រាប់ប្រជាជន និង ភ្នាក់ងារ

ប្រសិនបើ ការកែលម្អទ្រទ្រង់ទាំងនេះ គឺជាចាំបាច់ ពី ភាពសុវត្ថិភាព និង ភាពសំខាន់សំខាន់

Pre-Feasibility Study - NR-87

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

Recommendations

- Preparation Aspects
 - Allocation of Budget for Project Preparation
 - Clearing of Landmines/UXO (when necessary)
- Management Aspects
 - Operation and Maintenance
 - Recycling of Existing Temporary Structures
 - Education for Traffic Safety, Rules and User Behavior

Pre-Feasibility Study - NR-87

THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

Conclusion and Recommendation

Recommendations

- Environmental Aspects
 - Perform Public Consultation and Public Awareness Survey
 - Set cut-off date to protect against ROW squatters
 - Formulation of Resettlement Action Plan (RAP) for project affected families, and
 - Finalize IELA

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THE STUDY ON THE ROAD NETWORK DEVELOPMENT IN THE KINGDOM OF CAMBODIA

End of Session
Thank You

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