CHAPTER 6

CONSTRUCTION, OPERATION AND MAINTENACE OF THE PROJECT

6. CONSTRUCTION, OPERATION AND MAINTENANCE OF THE PROJECT

6.1 Project Cost Estimation

6.1.1 Condition of the Cost Estimation

(1) Base Years for Cost Estimation

Cost Estimation is carried out based on the material, labor and equipment at the price level in September 2005. The foreign currency exchange rate is US$1.0 = ¥108.03 which is 6-month average exchange rate descending from August 2005.

(2) Domestic Portion and Foreign Portion

Materials, equipment and labor which are procured in Cambodia classified as a domestic portion and other are classified as a foreign portion in this cost estimation process. Further, the foreign portion is divided into two categories, i.e. one is procure from Japan and the other is procured either Thailand or Vietnam. The classification by source of country for materials, equipment and labor are shown in Table 6.1.1.

6.1.2 Process of the Cost Estimation

(1) Direct Cost

Direct cost of each item consists of material, equipment and labor cost without tax. Transportation cost to the site for materials and equipment are included in the direct cost considering the transportation distance for each item. Equipment costs were estimated based on the depreciation rate considering the workable days per year at the site.

(2) Indirect Cost

Indirect cost consists of common temporary work, cost for site management and overhead of the contractor. Cost of packages for the transportation of construction equipment, cost for safety measures, and costs for maintenance are the main portion of the common temporary work. Expenditure of contractor for the provision of site office and facilities for staff of contractor and engineers and their transportation cost are included in the cost for site expense. Overhead consists of cost of general overhead and insurance and profit of headquarters.

(3) Tax

Rates of tax are different between the material procured in Cambodia and import material. In addition, the rate on materials and labor are also different in Cambodia. The taxation system applied to resources required for the project in Cambodia is complex and changing in a short-term., Therefore, 10% of tax rate which is applied to common materials procured in Cambodia is applied as Tax portion in this study.

(4) Contingency

Contingency commonly includes physical contingency and price escalation. 10% of the Direct cost, Indirect cost and Tax is considered as contingency of the project in this study.

(5) Engineering Service Cost

Engineering service cost covers detailed design including documentation for the tender, and construction supervision

Process of the cost estimation is summarized in Figure 6.1.1.

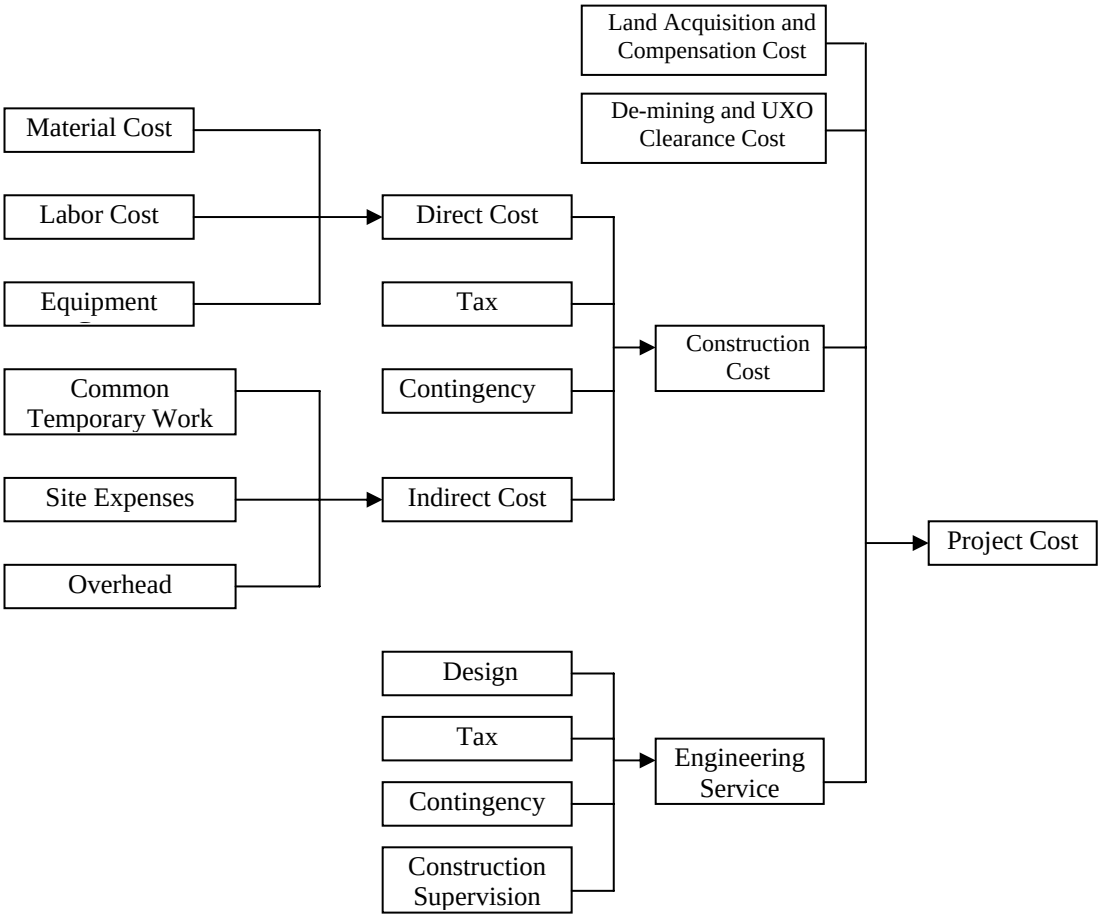


Figure 6.1.1 Procedure of Project Cost Estimation

Table 6.1.1 Unit Price and Source of Country for Project Resources

Item		Unit Cost			Source of Country		
		Unit	US$	JP Yen	Cambodia	Thailand/ Vietnam	Japan
Labor	Foreman	day	23.0		○		
	Skilled Labor	day	10.0		○		
	Common Labor	day	7.2		○		
	Mechanic	day	10.0		○		
	Electrician	day	11.0		○		
	Welder	day	9.5		○		
	Rigger	day	10.5		○		
	Operator	day	19.0		○		
	Sailor	day	11.0		○		
	Bridge Foreman	day		26,818			○
	Bridge Specialist	day		23,532			○
Equipment	Bulldozer	day	150		○		
	Backhoe	day	90		○		
	Dump Truck (10t)	day	50		○		
	Truck Crane (25t)	day	150		○		
	Crawler Crane (50t)	day	200		○		
	Road Roller	day	50		○		
	Tire Roller	day	100		○		
	Asphalt Finisher	day	170		○		
	Truck Crane (200t)	day	1444			○	
	Concrete Plant	day	170			○	
	Asphalt Plant	day	225			○	
	Concrete Pump Car	day	125			○	
	Reverse Circulation Drill	day	195			○	
	Vibro Hummer	day	150			○	
Material	Fine Sand	m^3	9.0		○		
	Coarse Aggregate	m^3	17.0		○		
	Laterite	m^3	2.7		○		
	Wood	m^3	290.0		○		
	Portland Cement	ton	77.6			○	
	Asphalt Bitumen	ton	340.0			○	
	Reinforcement Bar	ton	575.0			○	
	H Shaped Steel	ton	845.0			○	
	PC Cable	ton	1090.0			○	
	Stay Cable	ton		515,000			○
	Bearing	set		7,975,574			○
	Expansion Joint	m		1,062,000			○

6.1.3 Construction Cost

Construction cost was estimated by the method mentioned in the previous section. Total construction cost is estimated at US$ 73,170,000 which is summarized in Table 6.1.2.

Table 6.1.2 Summery of the Overall Construction Cost

Unit US$ Million

Cost Item	Local	Foreign	Total
Direct Cost			
Temporary Work	0.31	1.61	1.92
Road Construction	6.66	1.65	8.31
Bridge Construction	7.67	29.09	36.76
River Protection	0.19	0.02	0.21
Miscellaneous work	0.00	2.08	2.08
(1)Direct Cost	**14.82**	**34.45**	**49.27**
Indirect Cost			
Common temporary Work	0.45	0.37	0.82
Site Expenses	0.27	2.69	2.96
Overhead	0.00	3.37	3.37
(2)Indirect Cost Total	**0.72**	**6.43**	**7.15**
(3)Tax (10%) = ((1)+(2))x 0.1	1.55	4.09	5.64
(4)Contingency (10%)=((1)+(2)+(3))x0.1	1.71	4.50	6.21
(5)Construction Cost =(1)+(2)+(3)+(4)	**18.81**	**49.46**	**68.27**
Engineering Service			
Detailed Design	0.01	1.54	1.55
Construction Super Vision	0.35	2.15	2.50
(6)Engineering Service Total	**0.36**	**3.69**	**4.05**
(7)Tax (10%) =(6)x0.1	0.04	0.37	0.40
(8)Contingency (10%) =((6)+(7))x0.1	0.04	0.41	0.45
(9)Engineering Cost=(6)+(7)+(8)	**0.43**	**4.47**	**4.90**
(10)Overall Construction Cost =(5)+(9)	**19.24**	**53.93**	**73.17**

6.1.4 Land Acquisition and Compensation Costs

Land acquisition and compensation costs are estimated based on the compensation table that IRC currently adopts for the Project of Improvement of National Road No.1.

Table 6.1.3 Land Acquisition and Compensation Costs

Unit US$ Million

Item	Cost	Remarks
Land Acquisition	0.448	Total area that needs for acquisition is 528,000m^2 excluding the river, and roads, and including the construction yard. Administration cost (15% of the total land price) and contingency (10% of the total land cost plus administration costs) are inclusive.
Compensation Cost	0.226	Compensation includes that for houses, wells, fences and trees. It also includes such allowances as resettlement allowance, widow allowance, disabled allowance, poor-household (less than 10 US$) allowance. Administration cost (15%) and contingency (10% of the sub-total) are also inclusive.
Total	0.673	

6.1.5 De-mining and UXO Clearance Costs

De-mining and UXO clearance costs are estimated and summarized in Table 6.1.4.

Table 6.1.4 De-mining and UXO Clearance Costs

Location	Usage	Area (m^2)	Unit Cost (US$/ m^2)	Cost (US$ Million)
Phnom Penh Side	Road	100,000	0.25	0.025
	Construction yard	43,000	0.25	0.011
Neak Loeung Side	Road	280,000	0.35	0.098
	Construction yard	120,000	0.35	0.042
Total		543,000		0.176

6.1.6 Total Project Costs

Total project costs are estimated at US$ 74.0 million at the price level in September 2005.

Table 6.1.5 Summary of the Total Project Cost

Unit US$ Million

Item	Cost	Remarks
Construction Cost	**73.17**	Construction cost includes engineering service and contingency.
Land Acquisition and Compensation	0.673	
Demining and UXO Clearance Costs	0.176	
Total	74.02	

6.2 Construction Plan and Implementation Schedule

6.2.1 General

The annual difference between the high water level and the low water level of the Mekong River near Neak Loeung is about 7.0 m. Structures which are constructed in the Mekong River will be designed taking such hydraulic condition into consideration. Substructures in the Mekong River are designed, based on the low water level in general. Therefore, it is essential that the pile foundation and pile cap of the piers in the river shall be constructed at the time of low water level and the overall construction schedule shall be adjusted to suite the construction schedule of substructures in the river.

The selected optimal main bridge type is the Concrete Cable Stay Bridge with the center span length of 320 m. The overall construction schedule of the project is dominated by the construction term of the main bridge. Considering the required construction term of such a large-scale bridge, the construction schedule of the main bridge should be harmonious with the hydraulic condition of the river.

6.2.2 Construction Schedule

The construction schedule of the selected bridge shall be developed considering the following conditions:

1. Commencement of the foundation work in the river should be November or December when the water level of the Mekong River starts to fall.

2. Embankment of the approach road is utilized as the construction road and dike against the flood. Therefore, earthwork for the embankment shall start in the early stage of the schedule.

3. Foundation work of the approach bridge should commence after the completing the embankment of the approach road.

4. The super-structure of the main bridge is to be constructed by balanced cantilever erection method and constructed through the year after completion of Pylons.

5. PCT girders for the approach bridge should start the fabrication at the construction yard in parallel with the construction of substructure of the approach road, and girders should be erected stage by stage after completion of substructures.

The total construction period is estimated at 45 months and Figure 6.2.1 shows the construction schedule of the Second Mekong Bridge in Cambodia under ideal hydraulic conditions to commence the construction of foundation for the main bridge pylons.

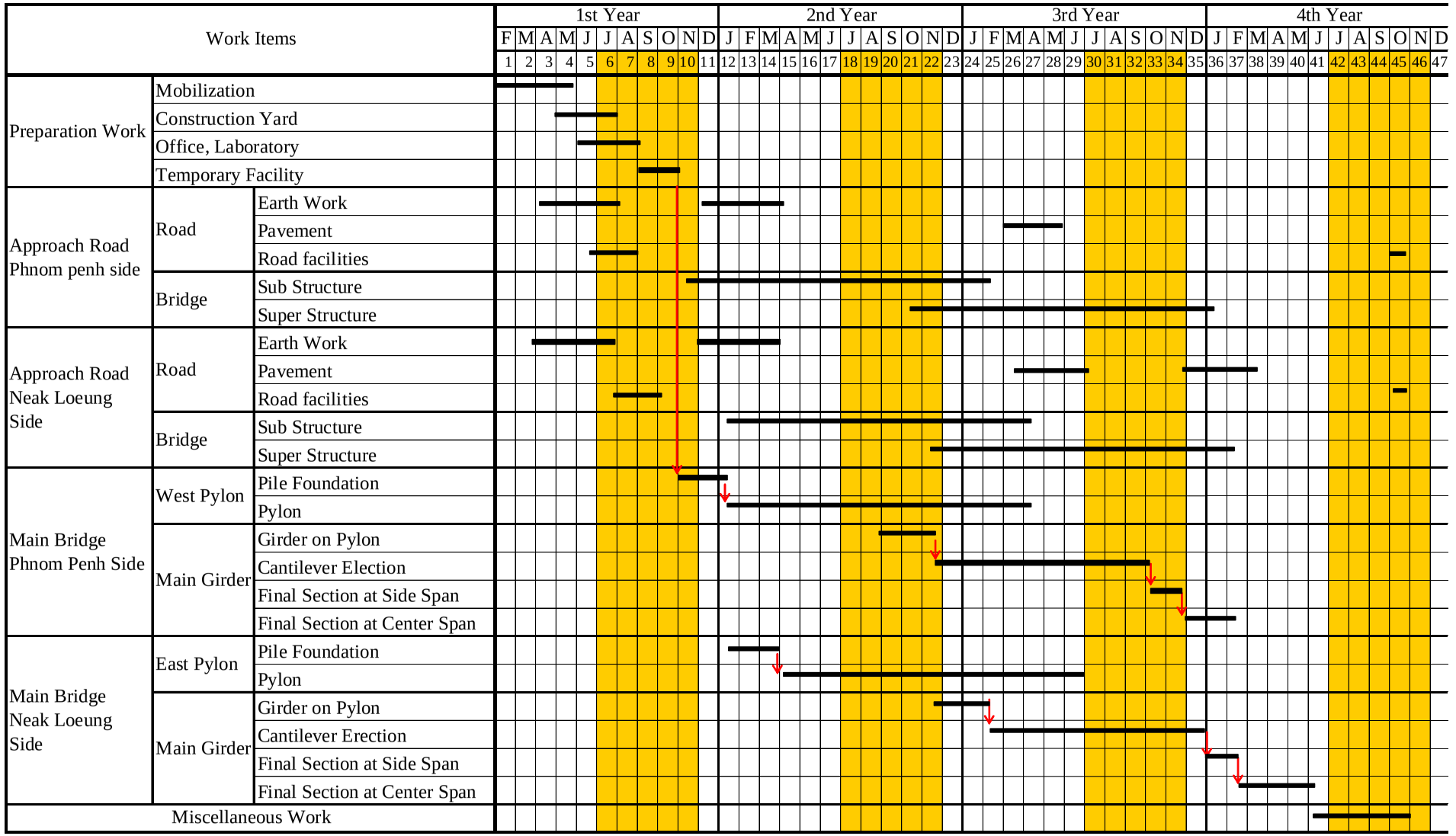


Figure 6.2.1 Construction Schedule of the Second Mekong Bridge

6.2.3 Implementation Schedule

(1) Formation of the Project

A major objective of the project is to provide the transport infrastructure crossing the Mekong River for the economic and social development of Cambodia, with especially easy and smooth connection between Ho Chi Minh and Phnom Penh through National Highway No.1. Considering the size and complexity of the project and that it lies in a very remote location from an industrial area, a detailed planning and management strategy must be prepared for a successful project implementation.

Various alternatives corresponding to each of the project routes were examined and their impacts and implications were compared to select optimum solutions to issues raised by each project elements in this study. As a result of comparative analysis, the optimal route, method and type of the bridge are recommended in this study.The subsequent implementation needs to cover the engineering studies and actions below:

1) Basic Engineering Study/ Review of Feasibility Study

Specific study for engineering is necessary to define the scope of the Project including further detailed survey of geological conditions and topographic survey on the final reviewed alignment and more detailed cost estimation of the project.

2) Procurement of Funding for the Project

Based on the results of the Basic Engineering Study, the Government of Cambodia shall make drive to gather budget for the project and study the burden sharing of relevant funding sources.

3) Detailed Design for Construction and Selection of the Construction Contractor.

Detailed design and documentation, including technical specification for the construction work, shall be prepared before the tender for selection of a construction contractor. The specification, including structure, material and method of construction and rule for prequalification of the contractor, shall be defined in this stage. The time required for detailed design including producing design documents, additional geotechnical investigations and wind tunnel test is estimated as about six months. After finishing the detailed design, it is necessary to obtain approval and agreement from the relevant authorities to implement the tender for the Project. Construction contractor shall be selected based on the rules and regulations of the tender. Land acquisition for the Project shall be completed before the contract is awarded.

4) Construction of the Structure for the Project

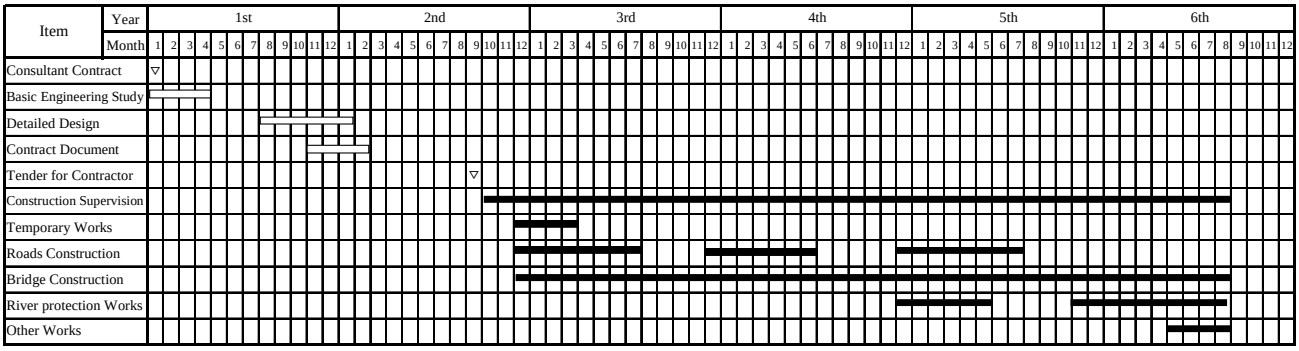
A 45-month construction period including the mobilization period is expected for the project bridge construction. The construction schedule for the main bridge is dominant to the overall construction schedule of the project.

Critical path of the construction of the main bridge will be as follows:

1. Preparation work that includes site clearance, construction of construction road and yard
2. Construction of the site office, construction of facilities that include concrete batching plants and casting yard for the approach bridge.
3. Construction of temporary facilities including temporary piers.

4. Construction of the foundation of pylons, timing of the construction shall be examined in detail considering the hydraulic condition of the river.
5. Construction of Pylon
6. Erection of the main girder.
7. Completion of road furnishing and miscellaneous works.
8. Completion of default liability period.

The target timetable for the Project is proposed in Figure 6.2.2. The time schedule related to the resettlement is elaborated in section 3), (5) 7.5.4 of the Main Report.



Note: Time schedule is subject to change depending on the fund source or the process of approvals by the government.

Figure 6.2.2 Time Schedule of the Project

6.3 Operation and Maintenance System of the Project

6.3.1 Current Situation of Road/Bridge Operation and Maintenance System

(1) Responsibility of Maintenance

Main trunk roads, which allow high mobility of traffic between and within regions in Cambodia, are categorized into three classes: primary national roads (single digit number), secondary national roads (double digit number), and provincial roads. These trunk roads are operated and maintained by MPWT and DPWT (Department of Public Works and Transport) and the total length of these roads reached 7,500 km as shown in Table 6.3.1.

Table 6.3.1 Trunk Road Length by Class

Class	Length (km)
Primary National Roads	1,988
Secondary National Roads	2,178
Provincial Roads	3,559
Total	7,511

Source: MPWT, survey year not specified

(2) Organization for Road Maintenance

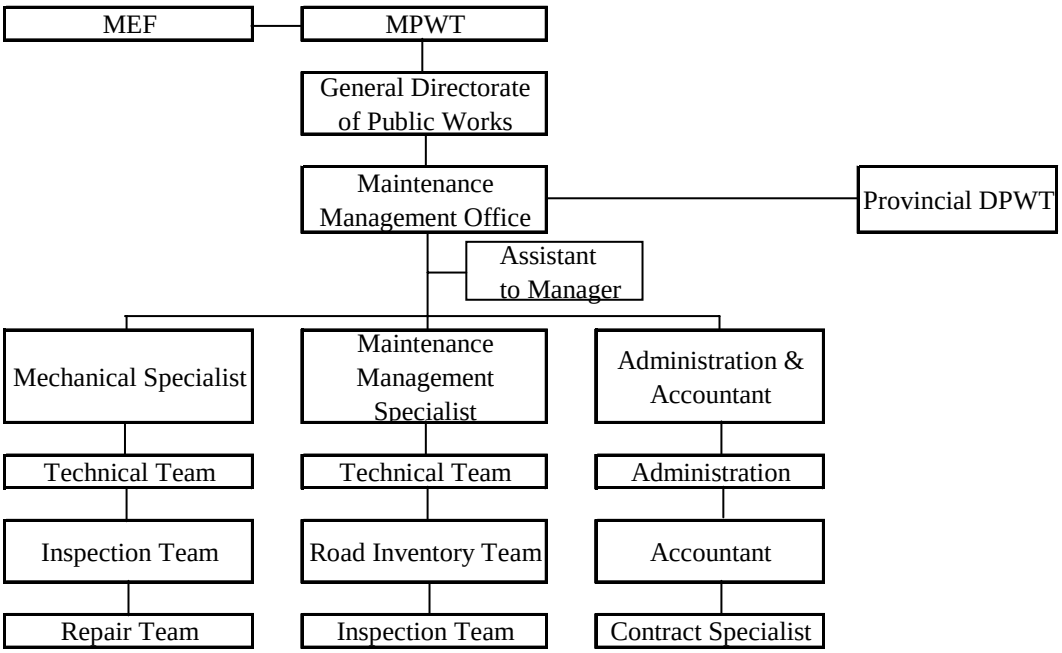
Road maintenance works in Cambodia are planned and implemented by three organizations: MPWT, Road Construction Center (RCC) and DPWT. Each organization is

responsible for a specific type of road, for instance, MPWT maintains the primary and secondary national roads whereas DPWT maintains provincial roads. The detailed responsibility of each organization is summarized in Table 6.3.2 and the organizational structure of MPWT is shown in Figure 6.3.1.

Table 6.3.2 Organizational Responsibility for Road Maintenance

Organization	Responsibility
MPWT	The Department of Road and Bridge in MPWT is in charge of road maintenance. The Road Management Office was established in 2003 as a special task force in the General Directorate of Public Works to implement routine road maintenance.
Road Construction Center	The Road Construction Center (RCC) was established in 1996 under technical assistance of JICA. It belongs to the Department of Heavy Equipment Center of MPWT. The equipment of RCC is used for road maintenance works by MPWT, by DPWT and by private companies on lease basis upon the requests.
DPWT	Each province has the Department of Public Works and Transport (DPWT). DPWT is in charge of provincial road maintenance and that inside the cities. In addition, some of the routine maintenance works of primary and secondary national roads are implemented by DPWT when agreed between MPWT and DPWT.

Source: JICA Study Team



Source: MPWT

Figure 6.3.1 Organization of Road Management Office

(3) Staff

MPWT employs about 180 staff for road maintenance as shown in Table 6.3.3. DPWT of each province employs approximately 100 – 200 staff, including part-time employees.

Table 6.3.3 Number of Staff by Organization

Organization		Staff	Remarks
MPWT	Road Management Office	29	
	Road Construction Center (RCC)	147	Staff includes part time employees

Source: MPWT, survey year not specified

(4) Budget

1) National Budget

The budget of MPWT for the road maintenance is mainly used for recurrent works. All the major development and improvement works have been implemented under foreign assistance. The road maintenance works have been insufficiently implemented due to the budgetary constraints.

2) Fund for Road Maintenance and Repair (FRMR)

'Fund for Road Maintenance and Repair (FRMR)' is one of the main sources of funds for road maintenance and emergency works. This fund collects two cents/liter on regular gasoline sales and four cents/liter on diesel sales. Half of the total revenue is in principle allocated to road maintenance as an earmarked tax. One-third of the earmarked tax is utilized for routine maintenance works and the remaining two-thirds is for emergency and rehabilitation works. In 2003, the total amount, which was allocated to road maintenance, was around $7.5 million.

3) Foreign Assistance

Road maintenance works have been supported by various donors, including the World Bank, ADB and JICA. Regarding the JICA project, MPWT has established the Road Management Office in 2003 under technical and financial support by JICA to realize the first comprehensive road maintenance work in Cambodia. The total length covered by this program reached 1,230 km. The budget required for the program is $1.7 million and granted by JICA.

6.3.2 Existing Operation and Maintenance System

(1) Past Maintenance Activities

MPWT is responsible for road maintenance on primary and secondary national roads in principle, while DPWT is for provincial roads. In some cases, actual routine maintenance works on national roads, which are relatively small-scale works, are implemented by DPWT through negotiation with MPWT.

1) Road Management Office

The first comprehensive road maintenance was carried out under the Road Management Office. The roads, which were maintained by the program, are shown in Table 6.3.4.

Table 6.3.4 Past Maintenance Works

Road No.	Length (Km)	Road No.	Length (Km)	Road No.	Length (Km)
1	20.0	121	8.4	13	39.0
21A	21.0	33A	19.3	64	97.0
138	25.0	318	24.0	6	17.5
146	30.0	343	28.0	68	42.0
175	20.0	44	83.6	68	76.0
57	63.0	136	73.0	7	114.0
57	38.2	48+161	13.0	78	64.3
22	9.6	7	48.0	78	41.3
108	22.0	56	18.3	6	29.0
110	11.0	160	20.0	6A	44.0
32	34.0	64	36.0	Total	1,229.5

Source: MPWT

2) NR 4

NR 4 was improved by USA grant-aid assistance and was introduced as the first toll arterial road in Cambodia. MPWT and the Ministry of Economy and Finance contract out to a private company (AZ Investment Co. Ltd.) to manage the road maintenance under a concession, including toll collection and road maintenance works.

(2) Equipment

DPWT is equipped for the road maintenance works. According to the stock inventory by MPWT, most equipment at DPWT was made in the mid 1980s and is relatively outdated. The details of the equipment of Prey Veaeng, Kandal and Svay Rieng provinces is tabulated in Appendix 6.3. The details of equipment of RCC are tabulated in Appendix 6.3.

(3) Road Maintenance Perspective

The primary national roads have been paved and improved mostly under the foreign assistance, whereas the secondary national roads and provincial roads still remain unpaved As shown in Table 6.3.5, 33% of the primary roads remain in poor or bad condition while 75% of the secondary national roads and 67% of the provincial roads are in poor or bad condition. A considerable amount of funding is still required to improve the national and provincial roads to an acceptable level.

Table 6.3.5 Surface Condition by Road Class

Condition	Excellent	Good	Fair	Poor	Bad	Under Construction
Primary National Roads	2%	8%	26%	22%	11%	31%
Secondary National Roads	0%	4%	18%	39%	36%	3%
Provincial Roads	0%	2%	27%	37%	30%	5%

Source: ADB (2002)[1]

[1] ADB (2002) Cambodia: Strengthening the Maintenance Planning and Management Capabilities at the Ministry of Public Works and Transport: TA No. 3257 -CAM

(4) Maintenance Plan in 2005

MPWT formulated a maintenance plan for the routine maintenance works in 2005. This is the second comprehensive road maintenance plan prepared by MPWT; the total budget is estimated at around 24 billion Riel to maintain a road length of 2,800 km. Together with the previous program, most of the primary and secondary national roads will be covered by the plan. Although the budget is still not yet approved by the Ministry of Economy and Finance, this is one of the challenges to achieve preventive road maintenance in Cambodia.

6.3.3 Operation and Maintenance Plan for the Project

(1) Estimated Maintenance Costs in the Country

1) Road Length

Around 7,000 km is the total length of main roads that require maintenance works, excluding NR 4, where the expenditure of maintenance works is covered by the toll revenue.

2) Requirement for Maintenance Expenditure

a. Assumption of Future Road Condition
The construction of the bridge at Neak Loeung is presumed to be complete in 2012. Conditions of the national road network in 2012 are assumed as follows:

- All the national roads will be improved as asphalt surface. These will be financed by foreign assistance.
- Maintenance works of NR 4 will be covered by toll revenue.
- For secondary national roads, it is assumed that one-third will be paved and two-thirds will remain as earth and gravel roads.
- The provincial roads will remain as earth and gravel roads except some parts which are already paved.

b. Estimated Maintenance Works
The following maintenance works are considered necessary:

- Routine and periodic maintenance works will be required for all the national roads except for NR 4. Major periodic maintenance work is overlay of asphalt pavement, which will be implemented every 7 years on average.
- Routine and periodic maintenance works will be required for the paved secondary national road. Overlay for paved roads will be implemented every 7 years on average and re-grading of earth and gravel roads will be implemented every 3 years on average.
- Since most of provincial roads comprise earth or gravel surfaces, routine maintenance works and light periodic works such as re-grading will be required every 3 years.

c. Estimated Expenditure for Maintenance
Based on the abovementioned analysis, the road maintenance expenditure is estimated as presented in Table 6.3.6.

Table 6.3.6 Annual Cost Required for Maintenance Expenditure

Class	Surface Condition	Length (km)	Routine		Periodic			Annual Total Cost ($1000)
			Unit Cost ($/km)	Annual Cost ($1000)	Unit Cost ($/km)	Periodic Cost ($1000)	Annual Cost ($1000)	
Primary National Roads	Asphalt	1,774	1,360	2,413	100,000	177,400	25,343	27,755
Secondary National Roads	Asphalt	726	1,360	987	100,000	72,600	10,371	11,359
	Earth/gravel	1,452	1,150	1,670	4,000	5,808	1,936	3,606
	Sub-total	2,178		2,657			12,307	14,965
Provincial Roads	Earth/gravel	3,559	1,150	4,093	4,000	14,236	4,745	8,838
Total		7,511		9,163			42,396	51,558

Source: JICA Study Team
Note: Timing of the periodic maintenance is every 7-year for paved roads and every 3-year for unpaved roads.

3) FRMR Perspective

a. Required Cost and FRMR
Current available sources from FRMR and future required amount for road maintenance works in Cambodia in 2012, which is the opening year of the project bridge, is estimated as shown in Table 6.3.7.

Table 6.3.7 Current Budget and Required Amount

Unit: $ million

Item	Kind	Amount	Remarks
Current FRMR in 2003	Earmarked Budget	7.5	Approximately half of the FRMR, total of $13.0 million is allocated to the maintenance in 2003
Required Amount in 2012	Routine	9.16	All primary national roads & 1/3 of secondary national roads will be paved by the year 2012. Provincial roads will remain unpaved even after the year 2012.
	Periodic	42.40	
	Total	51.56	

Source: Prepared by JICA Study Team based on the interview at MPWT and estimation by JICA Study Team

b. Future Growth of FRMR
Fuel consumption is expected to grow as the number of registered number of vehicles increases. Estimated future annual growth rate of registered vehicles is 5%-7% as shown in Table 6.3.8. Under the assumption that the annual growth rate of the fuel consumption is 6%, earmarked annual budget for road maintenance will reach around $13 million in 2012. This indicates that the earmarked budget can only cover the expenditure on the routine maintenance or only accounts for 25% of the total requirement. FRMR in 2012 will still have a shortfall for the required amount of road maintenance expenditure.

Table 6.3.8 Annual Growth Rate of Vehicles

Unit: % p.a

Type	2015/2000	
	High	Low
Motorcycle	5.9	5.4
Light Vehicle	7.4	6.8
Heavy Vehicle	6.8	4.5
Total	6.3	5.7

Source: JICA (2003) [2]

(2) Maintenance Cost for the Project

The future maintenance costs for the bridge and approach road are estimated under the following conditions:

1) Bridge Maintenance Work

a. Condition of Bridge Maintenance

The period of 30 years is assumed for the maintenance cycle after the completion of the bridge.

b. Major routine maintenance works

- Daily patrol
- Cleaning once a week
- Inspection once a year.

c. Major Periodic maintenance works

- Pavement will be overlaid every 10 years and re-paved after 30 years
- Lighting and its affiliated facilities will be repaired after 15 years and replaced after 30 years
- Expansion joints will be repaired every 10 years
- Metal fence will be re-painted every 10 years
- Drainage pipes will be replaced every 10 years
- Metal parts of the bridge, such as stay pipe, will be re-painted every 10 years.

2) Road Maintenance Work

The maintenance works consist of routine maintenance and periodic maintenance works.

a. Routine Works
The following routine maintenance works will be required for the approach road:

- Patrol and inspection
- Cleaning work for related facilities
- Repair works for light damages on pavement and others
- Other light works

[2] JICA (2003) The Feasibility Study on the Improvement of National Road No. 1 (Phnom Penh – Neak Loeung Section) in the Kingdom of Cambodia

b. Periodic Works and Heavy Repair
The following periodic maintenance works will be required:

- Overlay of asphalt pavement
- Heavy rehabilitation and restoration works on slopes, embankments and other related facilities from damage in a rainy season.
- Other heavy repair works including emergency works.

3) Annual Total Maintenance Cost

The periodic maintenance costs are converted into annual cost based on the time span of the required works. Necessary funds for periodic maintenance works are reserved for the future expenditure. As the consequence, the annual maintenance costs for the bridge and approach road are estimated as shown in Table 6.3.9.

Table 6.3.9 Annual Maintenance Costs

Unit: $1000/year

Type	Routine	Periodic	Total
Approach Road	7.1	55.7	62.8
Bridge	26.0	102.0	128.0
Total	33.1	157.7	190.8

Source: JICA Study Team

6.3.4 Issues and Recommendations for Operation and Maintenance System

(1) Responsibility and Operation

A basic principle of demarcation and responsibility for the road maintenance has been established for the main trunk road. There is, however, some unclear execution of actual maintenance works. The maintenance works comprise inspection of existing conditions through patrol, categorization of damages, judgment of required maintenance work items, implementation of works and record of all steps through the maintenance works. For instance, road maintenance needs to be inspected by the province and actual periodic maintenance works need to be implemented by MPWT. This demarcation for the road maintenance works needs to be established in order to realize prompt response to the local needs and effective implementation of the maintenance work. As shown in Table 6.3.10, the Study recommends the demarcation of the maintenance responsibility for the project.

Table 6.3.10 Demarcation between MPWT and DPWT

Work Item	MPWT	DPWT	Remarks
Compilation of detailed inventory data	Coordination		
Inspection and patrol	Secondary Responsibility	Primary Responsibility*	*Report to MPWT
Routine maintenance works	Secondary Responsibility**	Primary Responsibility	*Serious maintenance works only
Periodic maintenance works	Primary Responsibility	Secondary Responsibility	
Record of works	Coordination		

(2) Ensuring Budget

Constant and consistent budgetary preparation is one of solutions to road maintenance problems. Although the Fund for Road Maintenance and Repair was established, the available funding is not sufficient to cover all the necessary maintenance works and allocation of these funds to the relevant ministries is in vague. As discussed above, the total amount accruing from the earmarked tax does not seem to meet the necessary road maintenance expenditure. This leads to a discussion on the necessity of toll collection from the project bridge users. This subject is discussed in Section 6.4.

(3) Private Sector Participation and Foreign Assistance

The maintenance works are not always necessary throughout the year. Most of maintenance works on the project road will be required mainly after the rainy season. In addition, one of main maintenance works is for the subsidence of the road embankment. As the work items do not require the sophisticated skill, such works will be implemented by private domestic contractors, when necessary.

The maintenance of the project bridge is another subject. Major maintenance works are not necessary in the first 10 years after its construction. Exchange of expansion joints and other major works are regularly needed after 10 years. Furthermore, it is important to improve know-how of engineering technology of the bridge maintenance in MPWT. Since MPWT has no know-how to maintain a large bridge, the major maintenance technology needs to be acquired by MPWT staff at an initial stage of the project operation with the foreign technical assistance. Making the best use of RCC for staff training is one of the objectives of the project.

(4) Establishment of Maintenance Manual

The technical level of the site engineers varies according to their academic backgrounds and experiences. Furthermore, new method and technology will be required for the maintenance of the project bridge, since Cambodia has never maintained a cable-stayed bridge in the past. Accordingly, the Study recommends preparing a well-explained road/bridge maintenance manual to realize equal quality of maintenance works and new work skills among the site engineers.

(5) Staff and Quality of Maintenance

1) Routine Work

Since 2003, MPWT has established the comprehensive road maintenance program and implemented the road maintenance works by encouraging the local province participation. The actual maintenance works under the program contributed to acquiring experience in maintenance works and to training DPWT staff. In terms of routine maintenance works including repair of potholes, cleaning pipe culverts and others, DPWT can practice the actual works through periodic training.

2) Periodic Work

One of the main periodic maintenance works is the overlay of pavement. All the works for overlay and upgrade of roads to the asphalted pavement have been undertaken by foreign assistance. The concept of life-cycle road improvement mechanism becomes important to minimize the total costs of the road maintenance. It is because adequate periodic maintenance works can save the total maintenance costs. Research and laboratory function, and staff training need to be strengthened and integrated in MPWT.

(6) Equipment

MPWT and the DPWT are well equipped for the road maintenance in terms of its inventory. However, most equipment are, as discussed previously, outdated, which contributes to the ineffective implementation of road maintenance. It is, thus, necessary to make good use of the equipment in Road Construction Center (RCC).

(7) Actions against Overloading of Cargo

The pavement of the project road will be damaged by over-loaded trucks and trailers. Large trucks fully loaded with logs can be often observed on the main trunk roads in Cambodia. Such over-loaded trucks should be strictly restricted from the general arterial roads to avoid pavement deterioration. Establishment and enforcement of legal procedures need to be executed and the installation of weighing bridge needs to be considered as one of measures to control the overloading.

(8) Technical Transfer

The Second Mekong Bridge is one of the most sophisticated bridges in Cambodia and needs high-tech for its design and construction. Technical transfer of this high technology to the local engineer needs to be carefully considered, since this may contribute to the proper maintenance of the project road and bridge. Basic technologies adopted to the bridge, such as concreting, reinforcement bar arrangement, embankment on soft soil, are of great use for local construction engineering since maintenance works of most roads and bridges in Cambodia require these basic technologies. Technical transfer for such basic engineering shall be implemented through on-the-job training during the construction and/or at the relevant institution, i.e. RCC.

6.4 Application of Toll System for the Project

6.4.1 Basic Policy on Toll System for the Project

(1) Rationale of Toll Imposition

There should be a philosophy to justify collecting toll from the public. Funds required for the road projects are generally gathered from sources such as the general government budget, earmarked funds for special purposes and toll revenue. When the toll is collected from the public such a principle as “cost-pay”, “beneficiaries-pay” or “damaging-pay” is applied as a basis for the legislation of collecting toll.

The first two principles (i.e. “cost-pay”, “beneficiaries-pay”) are generally for a toll road that has an alternative route, and the toll road user has options whether to use the toll road or another ordinary road. Therefore, it is rational that the toll road user should be fully or partly liable for the costs of initial investment as well as operation and maintenance. The toll rate can be determined to cover all the costs (“cost-pay” principle) or within the limit of users’ benefit derived from savings, compared to the use of alternative road, in vehicle operation and time costs in general (“beneficiaries-pay” principle).

As to the Second Mekong Bridge project, there exists no alternative route unless the existing ferry continues operation even after the bridge is open to traffic. The road user has no choice but the project bridge. Therefore, it is hard to purely apply “beneficiaries-pay” principle to the toll system of the project.

Meanwhile, the project bridge together with the approach road is part of the National Road No. 1, and this construction is mainly the responsibility of the central government. If the project is implemented by external grant-aid, there will be no rationale to insist on the

"cost-pay" principle for collecting toll from the user. If the project is implemented by the loan it can be justified to apply the toll for repayment ("cost-pay " principle within a limited range of the cost, since the central government is liable for the operation and maintenance of NR 1).

"Damaging-pay" principle will be applied to the maintenance costs required to ensure the road condition is passable or as required by regulations. If the government funding is not sufficient to cover all the maintenance costs of roads, tolls can be collected directly from the users to reinforce the capacity of government budget.

Another option of collecting toll from the bridge users is to set the toll at the same or lower level than the present ferry tariff, assuming that the level of current ferry service to cross the river is either maintained or improved by the bridge.

If the ferry is totally abandoned and replaced by the bridge, short distance travelers such as pedestrians and pedal-cyclists will hardly cross the river. Therefore, small boat operation should be allowed for those travelers to cross the river.

(2) Required Project Costs and Justification of Toll Application

1) Maintenance Costs

Part of earmarked tax on fuel (FRMR) has been appropriated for road rehabilitation and repair works according to the current regulation. However, the FRMR fund is not enough to meet the requirement for all the future road maintenance in the country. As discussed in the previous section, only the cost for routine works will be covered by FRMR, but the large amount of expenditure required for periodic maintenance works will be beyond the reach of the existing FRMR capacity.

The approach road of the bridge will be constructed on the soft ground, and what is worse it will be placed in the flood prone area. These conditions make it more importance to ensure sufficient budget necessary to make timely repairs and restore damages on the road. It is also necessary to establish funds for heavy repair and replacement works of the bridge, which will be necessary every 10 or 30 years, although a large expenditure will not be required for bridge maintenance works during the first 10 years.

Since the project cost is significantly large (about 16% of the 2002 government revenue), the project sustainability should be assured by proper maintenance so that the project investment is economically viable. In this context, it can be justified to collect the toll at the minimum level for the maintenance expenditure based on "damaging-pay" principle, if the government budget is not affordable.

2) Costs for the Mitigation of Negative Impacts

The Second Mekong Bridge project will bring about many PAPs within the ROW of the project. PAPs will be compensated according to the prevailing rules in Cambodia. Additionally, ferry related businesses such as restaurants and vendors could also receive negative impacts due to the reduced number of customers comprising ferry users and employees. No direct compensations are eligible for them, although some may find new jobs or business opportunities created by the development of the Neak Loeung area as a whole.

Mitigation measures will have to be taken to address these issues of indirect negative impacts as well. Re-use of construction yard after the project is one of the possibilities as a countermeasure for negative impact mitigation.

The cost of mitigation measures in principle should be incorporated into the project cost. However, the liability to the mitigation cost should not be borne only by the bridge users but also by the beneficiaries of the project at large.

3) Development Costs for Flood-free Land

Flood-free land is formed by the construction of the approach road in the eastern side of the River. It is envisaged that flood-free land development will contribute not only to the urban development of Neak Loeung, but also be a mitigation measure for negative impacts as being proposed a schematic land use plan in Chapter 3.

Residents or developers will carry out landfill for low lands and construction of buildings for the development of flood-free land. As the entire development area is large, basic infrastructure arrangement such as local roads, drainage facility, electricity facilities, telecommunication sub-network and water supply become inevitable for effective and efficient development. However, individual solutions for such infrastructure development will surely face financial and institutional issues.

Basic infrastructure development is a key to the success for the effective and efficient area development. Although MPWT and/or Prey Veaeng Province may not have sufficient budget, experience or human resources to manage such land development, costs should be recovered from beneficiaries of the land development, not from the bridge users.

The government should legislate regulations and a system to effectively pursue an area development plan and to recover the initial investment costs for the infrastructure, including preparation of the land development plan, taxation on land ownership/incomes, and so forth.

4) Costs for Investment (Loan Repayment)

If the project is financed by loan, funds for repayment will be collected from the government and/or users of the project road/bridge, based on the “cost-pay” principle, and within the limit of user benefits, based on the “beneficiaries-pay” principle.

(3) Coverage of Toll System

1) Levels of Toll

a. To Cover Operation and Maintenance Costs
Considering the scarce budget for the road maintenance in MPWT, it is inevitable to establish future resources for maintenance expenditures after the completion of the bridge. Without this resource, the bridge may face serious problems that will fail to secure stability and traffic safety in the future. If the toll system is adopted to the project, additional costs, other than the maintenance costs, are required for system operation and management. These additional costs will have to be borne by the toll bridge users.

c. To Cover Investment Costs
If the project is implemented following the “cost-pay” principle either fully or partially by road users, suitable toll rates will have to be determined that enable the government to repay the loan, and generally within the range of the user benefits to follow the “beneficiaries-pay” principle. The financial analysis will disclose the financial feasibility of alternative toll rates, which will be discussed in Chapter 9.

2) Vehicles Subject to Toll

a. Free Toll for Pedestrians and Pedal-cycles
The total length of the bridge and approach road is 5.4 km. In addition, the longitudinal grade of the slope of the approach road is 4%. These conditions obviously restrict pedestrians and pedal-cycles to pass over the bridge. These users will transfer to buses or other public transport after completion of the bridge. Or some small private ferry boats may still service these users on demand after the completion of the bridge. Pedestrians and pedal-cycles should be free of charge due to low rates of the toll, and such traffic does not affect any serious deterioration of the pavement due to light wheel loads on the bridge and road.

b. Toll for International Transit
Following the GMS agreement for the least developed member countries, an application of special toll rate to the international transit may be proposed apart from domestic users. It is, however, not recommendable to impose a special toll at the toll gate for international transit due to the following reasons:

- Simplification of the toll categories is preferable.
- International transit vehicles can pay the special toll by rule in parallel with the custom clearance procedure, when passing the border facility.
- Integrated procedure is one of important issues to pass the border among countries in Indochina and imposing such a special toll on the international transit at the toll gate separately will be against the principle of integrated procedures.

3) Extension of Toll System to NR-1

It is conceivable that the toll system is extended to the whole stretch of NR-1, like NR-4, to recover the total maintenance cost of NR-1. However, it is hard in practice to achieve fairness among NR 1 users, unless NR 1 is re-developed as a full access-control road. A partial access-control system like NR 4 is likely to be acceptable, but it requires a separate study to find suitable locations of tollgates with the consent of the majority of users.

6.4.2 Traffic Demand and Toll Revenue

Elasticity between the toll and the traffic volume was analyzed, based on the results of "willingness to pay survey", which was conducted by the Study Team in May 2004. In every case, it was assumed that the traffic demand in "Base Case[3]" could increase by as little as 5%, when the toll is set free. This is because most of the ferry users at Neak Loeung are medium and long distance travelers and the traffic demand at Neak Loeung could accordingly hardly be restricted by a change in the current tariff level.

The survey reveals the relationship between the toll rate and the traffic demand of each category of the vehicle. Study results of the demand elasticity to the toll rate are described in detail in Appendix 6.4.

This section estimates the sustainable toll levels to cover both 1) project operation and maintenance costs and 2) the surplus of ferry operation plus project operation and maintenance costs. A detailed analysis of the project finance to fully cover the project cost, including that of the verification of the toll level, is discussed in Chapter 9.

[3] "Base Case" is defined that the existing ferry keeps operating in future

(1) Operation and Maintenance Cost

1) National View

As discussed in the previous section, MPWT can not afford to provide a budget to meet all the road maintenance costs. From an optimistic viewpoint, the earmarked budget from FRMR may be able to cover the routine maintenance expenditure. The Study, however, shows that FRMR does not have the necessary amount of expenditure, which will be required for the future periodic road maintenance in the country.

2) Estimated Bridge and Road Maintenance Cost

The annual maintenance costs required for the project bridge and approach road are estimated in the previous Section 6.3.3 as re-presented in Table 6.4.1.

Table 6.4.1 Annual Maintenance Costs

Unit: $1000/year

Type	Routine	Periodic	Total
Approach Road	7.1	55.7	62.8
Bridge	26.0	102.0	128.0
Total	33.1	157.7	190.8

Source: JICA Study Team

3) Estimated Operation Costs

Only collecting toll is the prerequisite condition to estimating operation costs. The total cost of whole management business, including the toll collection and the maintenance works, is estimated at $ 78,000/year as shown in Table 6.4.2.

Table 6.4.2 Cost of Toll Collection and Management

Unit: $/year

Item	Quantity	Unit cost	Annual Total	Remarks
Staff*	30	800	24,000	Including real up
Office	1	6,500	325	For 20 years
Vehicle	10	20,000	20,000	For 10 years
Other Expenses		0	33,244	75% of above
Total			77,569	$/year

Source: JICA Study Team
Note: Toll collection is assumed for 24 hours.

(2) Toll to Cover Operation and Maintenance Costs of the Project

As shown in Table 6.4.3, the following toll levels are found appropriate to cover the total (US$ 269,000/year) of maintenance costs ($ 191,000/year) and operation costs ($ 78,000/year). The annual revenue accruing from the tolls is presented in Table 6.4.4.

Table 6.4.3 Estimated Toll to Entrust Project Maintenance by Private Operator

Type	Toll (Riel)
Motorbike	100
Sedan/Pickup	400
Short Body Bus	600
Long Body Bus/ Short & Long Body Truck	1,700
Semi/Full Trailer	3,400

Source: JICA Study Team

Table 6.4.4 Annual Revenue to Cover Private Management Fees for Maintenance

Year	2012	2013	2014	2015	2016	2017
$ Million	0.069	0.223	0.240	0.258	0.281	0.304

Source: JICA Study Team
Note: Toll collecting ratio is reasonably assumed at 80%, 2012 revenue is estimated under the assumption that the bridge is open to traffic in September 2012.

(3) Toll to Cover Equivalent Surplus from Ferry Operation

Another option of collecting toll from the bridge users is to determine the toll level that meets the equivalent surplus achieved by the current ferry operation. The ferry operation recently gained a surplus of around $ 500,000/year, according to the interview survey at the ferry terminal by the Study Team. This option becomes rational when the surplus of the ferry operation is allocated to the road sector and the loss of the surplus after the abolition of ferry operation is covered by toll collection.

Under the condition that the tolls are set up to comprise the surplus ($ 500,000/year) additionally to the project maintenance and operation costs ($ 269,000/year), the following toll levels are found appropriate to cover the subject surplus.

Table 6.4.5 Estimated Toll to Cover Surplus of Ferry Operation

Type	Toll (Riel)
Motorbike	200
Sedan/Pickup	1,400
Short Body Bus	2,100
Long Body Bus/ Short & Long Body Truck	6,000
Semi/Full Trailer	11,800

Source: JICA Study Team

Table 6.4.6 Annual Revenue to Cover Surplus of Ferry Operation

Year	2012	2013	2014	2015	2016	2017
$ Million	0.231	0.749	0.805	0. 866	0.941	1,018

Source: JICA Study Team
Note: Toll collecting ratio is reasonably assumed at 80%, 2012 revenue is estimated under the assumption that the bridge is open to traffic in September 2012.

6.4.3 Results of Toll System Study

(1) Overview of Examinations

Table 6.4.7 shows an overview of the examinations undertaken in the previous Section 6.4.2. Around 9% of the current ferry toll is enough to cover the project operation and maintenance costs for the bridge and approach road.

Table 6.4.7 Overview of Examinations for Toll Rate and Revenue

Category of Toll	Unit	Toll Case		
		1	2	3
		Equivalent Toll to Current Ferry	Toll to Cover Operation and Maintenance Costs of the Project	Toll to Cover Surplus of Ferry Operation
Motorbike	Riel	500	100	200
Sedan/Pickup		5,800	400	1,400
Short Body Bus		8,500	600	2,100
Long Body Bus/ Short & Long Body Truck		25,000	1,700	6,000
Semi/Full Trailer		49,000	3,400	11,800
Annual Revenue in 2013	$ Million	3.03	0.223	0.749
Required Annual Maintenance/Operation Costs/Surplus of Ferry Operation	$ Million	0.269	0.269	0.769

Source: JICA Study Team
Note: Case 2 covers maintenance costs ($191,000) and operation costs ($78,000). Case 3 covers the surplus of ferry operation ($500,000) and operation and maintenance costs ($269,000)

(2) Recommendations

1) Recommended Toll Rate

Based on the preceding analysis, the toll system should be confined area-wise only to the project bridge and road at the toll rate to cover in minimum the operation and maintenance expenditures for the project, if the project is operated by the toll system.

2) Management System and Private Sector Participation

It is recommendable for MPWT to undertake the maintenance works due to its being the first and large-scale bridge in Cambodia. Following this view, it is also preferable for MPWT to undertake the toll collection with a view to lowering the toll rate. It is, however, necessary to keep transparency of management to the public. In addition, exchange of the agreement between MPWT and the Ministry of Economy and Finance is required to cope with annually fluctuating maintenance costs that exceed the currently applied single fiscal year budget.

As disclosed in Chapter 9, the project is not financially attractive for private sector. However, if the government implements the project at its cost and contracts out a portion of the project maintenance and operation, the private sector will be able to participate in the toll bridge management, similar to the existing toll road of NR-4, where toll rate and the agreed contract between the government and the operating company are often controversial to the general public. In order to pursue such private sector participation, legal and institutional framework should be prepared through discussion with concerned stakeholders.

Determination of the toll rate is one of the important factors that affects the attractiveness of the project, which is always sensitive socially and politically. Therefore, justification of the toll level is a matter of importance.

One of advantages of entrusting the operation and maintenance work to the private sector is to manage the toll road away from strict legal framework of the Government. This is expected to enable the management to be effective and efficient under the private business mentality. However, the method to entrust the project maintenance to a private company will have to be discussed from the viewpoint of the accumulation of technical experience by MPWT. This is because the technical experience obtained through the execution of the actual maintenance works will be valuable to accumulate in the Ministry for future similar projects.

3) Special Body to Pursue the Flood-free Land Development

It is proposed that a management body should be legally established to pursue the flood-free land development. In addition, a system to recover the cost for the basic infrastructure development will have to be formed beginning with the preparation of the development plan in collaboration with central and local governments as well as private sector.

4) Periodic Review of Toll Rate

It is obvious that the traffic will grow year by year, although some fluctuation will take place over a long period. The revenue will also increase accompanying the traffic growth. This indicates that the total revenue from the road users may exceed the necessary maintenance expenditure. The toll rate needs to be periodically reviewed to meet the original purpose through the monitoring of the balance between revenue and expenditure.

5) Establishment of Self-reliance System

One of the most important issues for implementation of the project and road/bridge maintenance in Cambodia is an insufficient budget. Establishment of self-reliance in MPWT is a key to the success in every activity. Introduction of the toll road system is one of the solutions as a threshold of self-reliance.

CHAPTER 7

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

7. ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Cambodia's Legal Framework for EIA

Article 6 of the Law on Environmental Protection and Natural Resources Management (LEPNRM), enacted on 24 December 1996, stipulates that an EIA should be managed by the Department of Environmental Impact Assessment and Review of the Ministry of Environment (MOE). The Sub-decree on EIA Process, No. 72 ANKR.BK dated 11th August 1999 and Prakas on Guidelines for Preparing EIA Report and Environmental Impact Assessment Process specify the institutional responsibility, the EIA requirements, the EIA examination procedures for new projects and existing projects, and conditions for project approval. According to the Guideline, the project owner should prepare the EIA Report including the following components, and the EIA should be revised within 30 days, when changes make it necessary. The detailed information on Cambodia's legal framework for EIA can be obtained in Section 6.3 of Interim Report of this Study.

- Project Summary
- Introduction
- Purpose of the Project
- Project Description
- Description of Environmental Resources
- Public Participation
- Environmental Impact Analysis
- Environmental Impact Mitigation Measures
- Economical Analysis and the Environmental Value
- Environmental Management Plan
- Institutional Capacity
- Conclusion and Suggestion

The Cambodian Government is responsible for both IEE and EIA, as stipulated in the said environmental law, and the Study Team provided MPWT with technical support to resolve environmental and social consideration issues.

7.2 Scoping and TOR for EIA Study

7.2.1 Scoping for EIA Study

The Environmental Impact Assessment (hereinafter referred to as EIA) is concerned with potential *natural environmental impacts"*, including impacts on human health and safety, and *"social environmental impacts"* to be caused by the construction of both new bridge and approach roads. EIA study is carried out in accordance with the Cambodian EIA Law, the JICA New Guideline for Environmental and Social Consideration and relevant international EIA standards/guidelines. The major objectives of EIA study is to qualitatively and quantitatively estimate potential major natural and social environmental impacts to be caused by the proposed project. While, in the first phase of the Study, all the alternatives including *"Zero Option"* were preliminarily evaluated by the IEE-level environmental and social environmental studies, the proposed project, namely, *"Ferry+Bridge Option (Route A)"*, is evaluated under full-scale EIA study. Based on the estimated potential impacts, mitigation measures as well as monitoring plan are also proposed to solve significant and major potential impacts.

Tables 7.2.1 and 7.2.2 summarize the evaluation results of the natural and social environment-related IEE study, carried out within Phase 1 study of this proposed project. Based on these results, more detailed studies were carried out for the "Category-A" and "Category-B" environmental factors, whereas simple analysis was performed for "Category-C" and "Category-D" within this

EIA study. More specific descriptions (or TOR) for each "Category-A" and "Category-B" factors are to be delineated, based on the significance of possible impacts of each environmental and social factor, to be described in the following section.

Table 7.2.1 Summary of IEE Evaluation (Natural Environment*)

No.	Environmental Factors	IEE Evaluation (Construction Phase)	IEE Evaluation (Operation Phase)	Level of EIA Study
1	Air Quality	C	C	Simple analysis
2	Water Quality	A	D	More detailed study
3	Soil and Sedimentation	A	A	Same as above
4	Waste Disposal	A	D	Same as above
5	Noise/Vibration	B	C	Same as above
6	Subsidence	A	A	Same as above
7	Bad Smell	D	D	No additional analysis
8	Topography and Geology	A	A	More detailed analysis
9	River Bed (e.g., benthos)	A	D	Same as above
10	Flora/Fauna	A	B	Same as above
11	Water Resources	B	D	Same as above
12	Accidents	C	B	More detailed analysis
13	Global Warming	C	C	Simple analysis

Note: *: Natural environment includes such elements as item No. 1, 2, 5, 12 and 13 that affect human health and safety.

Table 7.2.2 Summary of IEE Evaluation (Social Environment)

No.	Environmental Factors	IEE Evaluation (Construction Phase)	IEE Evaluation (Operation Phase)	Level of EIA Study
1	Migration of Populations and Involuntary Resettlement	A	D	More detailed analysis
2	Impact on Local Economy (Employment, Livelihood, etc.)	D	A	Same as above
3	Utilization of Land and Local Resources	B	C	Same as above
4	Social Institutions (Social Capital and Local Decision-making institution)	D	D	No additional analysis
5	Existing Social Infrastructure and Services	D	D	No additional analysis
6	Vulnerable Social Groups	B	D	More detailed analysis
7	Equality of Benefits and Losses and Equality in Development process	B	B	Same as above
8	Local Conflicts	B	B	Same as above
9	Gender	B	B	Same as above
10	Children's Rights	B	B	Same as above
11	Cultural Heritage	B	D	Same as above
12	Infectious Diseases (HIV/AIDS)	B	B	Same as above

7.2.2 TOR for EIA Study

TORs for EIA studies on the natural and social environment were developed, based on the Cambodian EIA Law and the JICA New Guidelines of Environmental And Social Considerations as well as relevant international environmental guidelines for the large-scale infrastructure development projects. Also, several remarks, suggestions/or comments obtained through a series of discussion/or consultation processes with MOE, MAFF, MOWRM and other relevant agencies/or organizations are incorporated within this TOR development. The terms of reference for EIA study was determined in accordance with the JICA guidelines and in consultation with stakeholders through a series of stakeholder meetings. Based collection of the up-to-date environmental and socio-economic information around the affected area by the proposed Project, the existing socio-economic baseline data was comprehensively reviewed and quantitatively identified. More in-depth field survey covering a wide range of environmental and socio-economic information were implemented. The detailed impacts of each environmental factor are described in Appendix 7.2.

The countermeasures to mitigate the negative impacts as well as the practical monitoring plan which include implementing agencies, indicators and frequency of verifications for the purpose of mitigating the negative impacts during the planning/construction and operation phases were formulated.

7.2.3 Manpower Input to IEE and EIA Study

IEE and EIA study of the project have been conducted in collaboration with the JICA Study Team and Cambodian Consultants. The manpower input to IEE and EIA study are summarized separately for the natural environmental survey and social environmental survey as shown in Tables 7.2.3 and 7.2.4.

Table 7.2.3 Manpower Input to IEE and EIA Study for Natural Environment

Contents of Services	Survey or Study Crews	Working Period (months)
IEIA-related baseline data collection	Chief Consultant	4.0
Local Fishery Survey	Chief Consultant	1.0
Local Flood Damage Survey	Chief Consultant	1.0
Roadside Noise Survey	Roadside Noise Surveyor 1 Roadside Noise Surveyor 2	0.5
Traffic Counting for Roadside Noise Survey	Traffic Counting Surveyor 1 Traffic Counting Surveyor 2 Traffic Counting Surveyor 3 Traffic Counting Surveyor 4 Traffic Counting Surveyor 5	0.5
Roadside Air Quality Survey	Air Quality Surveyor 1 Air Quality Surveyor 2 Air Quality Surveyor 3	0.5
Water Quality Survey	Water Quality Surveyor 1	1.0
Soil Survey	Soil Surveyor 1	0.5
Biological Environment Survey	Lead Surveyor GIS Specialist Ornithologist Aquatic Specialist Habitats Specialist Mammal Specialist	2.0
Flow Velocity Survey	Flow Velocity Surveyor 1	0.5
Logistics and On-Site Coordination	Chief Consultant Assistant Consultant	8.0

Note: "Working Period" listed within this table includes working periods of relevant preparatory (e.g., site briefing) and post activities (e.g., reporting and revising).

Table 7.2.4 Manpower Input to IEE and EIA Study for Social Environment

(M/M required for IEE-level local consulting services)

Contents of Services	Survey or Study Crews	Working Period (months)
Supervision and Data Analysis on IEE-related Baseline Data	Chief Consultant	2.0
Assistance to Public Consultation	Chief Consultant	1.0
IEE-related Baseline Data Collection (Local Economy)	Consultant 2	1.0
IEE-related Baseline Data Collection (Other Social Environmental Issues)	Consultant 3	1.0
Total		5.0 M/M

(M/M required for EIA-level local consulting services)

Contents of Services	Survey or Study Crews	Working Period (months)
Supervision and Data Analysis on PAPs' Economic Profile Survey and Other Studies	Chief Consultant	3.0
Assistance to Public Consultation	Chief Consultant	1.0
Field Survey on PAPs' Economic Profile Survey	Surveyor 1	1.5
Field Survey on Markets, Restaurants, shops, Vendors, Drivers and Passengers	Surveyor 2	1.5
Field Survey on Other Social Environmental Issues	Surveyor 3	1.5
Total		8.5 M/M

Source: JICA Study Team

7.3 Impact Assessment of Natural Environment

7.3.1 Preliminary Impact Assessment

(1) Descriptions of Preliminary Impact Assessment

Here, based on the selected best plan of route and bridge/approach road structures, possible environmental impacts regarding natural environmental factors listed in Table 7.3.1 are summarized separately. Table 7.3.1 summarizes the possible environmental impacts to be caused by the proposed project.

Table 7.3.1 Summary of Possible Impacts (Natural Environment)

	Environmental Factors	Remarks of Possible Impacts
1	Air Quality	1. Dust during the construction period 2. Future roadside air quality condition after the construction
2	Water Quality	1. Risk of water pollution to the Mekong River during the construction. 2. Potential of water quality degradation due to the erosion during/and after the construction

	Environmental Factors	Remarks of Possible Impacts
3	Soil and Sedimentation	1. Potential for soil erosion during/and after the construction. 2. Potential of sedimentation due to the erosion during/and after the construction. 3. Potential of cross-sectional seepage of the approach roads after the construction.
4	Waste Disposal	1. Preparation of excavated soil dump site. 2. Household wastes discharged from construction yard during the construction period.
5	Noise/Vibration	1. Noise and vibration during the construction period. 2. Future roadside noise and vibration after the construction.
6	Subsidence	1. Potential of Subsidence during/and after the construction.
7	Bad Smell	1. Bad smell due to the compost smell originated from the decayed plants under inundated water.
8	Topography and Geology	1. Worsened local flood/or inundation after the construction. 2. Risk of malaria, dengue and waterborne disease outbreak from newly created long-term inundated area. 3. Potential of the regional seepage/or recharge from the Mekong River to the regional drainage system of the flood-free land during/and after the construction. 4. Potential of the erosion of the riverbank of the Mekong River.
9	River Bed (e.g., benthos)	1. Disturbance to the river bed condition (e.g., benthos)
10	Flora/Fauna	1. Destruction of natural floodplain vegetation. 2. Disturbance to birds and wildlife during the construction period. 3. Illegal fishing/or hunting activities by bridge construction workers. 4. Habitat change due to the physical change/or damage on the Mekong River. 5. Risk of pollution to aquatic species during the construction period. 6. Disturbance to animal path after the construction.
11	Water Resources	1. Demolition of shallow wells. 2. Risk of pollution to the aquifer during the construction period.
12	Accidents	1. Potential of increased traffic accidents during the construction period. 2. Potential increase in traffic accidents after bridge operation starts. 3. Undiscovered UXOs or landmines during the construction period. 4. Increased risk of vessel collisions.
13	Global Warming	1. Possible CO_2 emission reduction after bridge operation starts.

(2) TOR of EIA-related field Survey (Natural Environment)

Based on the potential impacts that might be induced during both construction and operation phases of the proposed project, described above, it was found that more detailed/or further environmental studies/or surveys need to be carried out within this EIA study. Table 7.3.2 summarizes the TOR of several natural environment-related field surveys to be conducted within this EIA study. The detailed TOR of each field survey are described in Appendix 7.3.

Table 7.3.2 Field Environmental Survey (Natural Environment)

1. Roadside Air Quality
Carry out 24-hours continuous survey at two (2) points across the study area. Parameter: TSP, CO, NO_2, SO_2, Traffic volume by vehicle type Survey Campaign: Once
2. Roadside Noise

Carry out 24-hours continuous survey at two (2) points across the study area. Parameter: Leq, Traffic volume by vehicle type Survey Campaign: Once
3. Water Quality Survey
Carry out water quality survey of surface and subsurface waters. Parameters: 1) pH, 2) turbidity, 3) DO, 4) BOD, 5) COD, 6) Conductivity, 7) Temperature, 8) SS, 9) E-Coli-form, and 10) Total Coli-form Sampling Points: 6 points at surface water & 4 for subsurface water Survey depth (surface water): D1 = 30 cm below the surface. Sampling Campaign: Twice (once in summer and once in winter, respectively)
4. Soil Survey
Carry out soil survey of surface layer. Parameter: Heavy Metal and other contaminants Sampling Points: 2 points (one point at the each sides of the Mekong River, respectively). Sampling Campaign: Once
5. Biological Survey (floodplain and Mekong River)
Carry out baseline field survey of the flora and faunal components as well as other natural resources and habitats around the direct influence area of the selected route option. Delineate potential impacts to be caused by the proposed project qualitatively.
6. Hydrological Study (Mekong River Cross Sectional Flow Measurement)
Carry out a cross sectional flow measurement of Mekong River along the selected bridge route option, using ADCP. Survey Lines: One line (selected route option). Survey Periods: Once in Rainy season.

7.3.2 Results and Discussions of Field Survey

(1) Roadside Noise Survey

Figures 7.3.1 and 7.3.3 show the time variation of the hourly-averaged Leq values measured at both sides. From these figures, it can be seen that hourly-averaged measured Leq values are varied between 50 and 70 dBA. Several peaks seem to exist around the morning (6:00 - 8:00 a.m.) and the evening time (4:00 - 6:00 p.m.). During the nighttime period between 9:00 p.m. and 3:00 a.m., orders of magnitude of the roadside noise level measured at two points are subdued to 50 dBA. Similar tendency of the time variation of the roadside noise is observed within the survey results of the preliminary noise study, carried out within the basic design study of the improvement project of National Road No. 1 [JICA, 2005].

In Cambodia, the daytime noise standards (6:00 – 18:00) for the commercial/residential and commercial/service zones are 60 and 70 dBA, respectively, and most of Leq measured at both sides do not exceed those standards. So it can be said that the current daytime roadside environment is not so bad. By the same token, nocturnal noise standards (22:00 – 6:00) for the commercial/residential and commercial/service zones are 45 and 60 dBA, respectively. Most of nocturnal Leq measured at both sides exceed the standard applied for the commercial/residential zone but are below the standard applied for the commercial/service zone. So, it can be said that the current nocturnal roadside noise environment is not so bad, either.

Figures 7.3.2 and 7.3.4 show the time variation of the hourly traffic volume counted within this noise survey. From these figures, it can be seen that there is close correlation between the roadside noise and the traffic volume.

Table 7.3.3 summarizes the Day-Night Average Sound Level, Ldn, computed at all points. From this table, it can be seen that most Ldn values are higher than 60 dBA but below 70 dBA. Using the noise zone classification criteria (see Table AP6.18, attached in Appendix

of Interim Report of this study), the current roadside noise condition of Neak Loeung can be classified as follows:

East Side of Neak Loeung - “Significant exposure: Normally acceptable” - level.
West Side of Neak Loeung - "Moderate exposure" - level

These classification results also supports the previous discussions. Thus, it can be said that the current roadside environment in Neak Loeung is not so bad nor causes any negative impacts on the human health. Figure 7.3.5 visually shows the major survey results summarized in Table 7.3.3.

Table 7.3.3 Roadside Noise Survey Results

	Location	Date	Ld (dBA)	Ln (dBA)	Ldn (dBA)
1	East	June/02/05	63.97	58.71	66.38
2	West	June/03/05	61.62	55.87	63.72

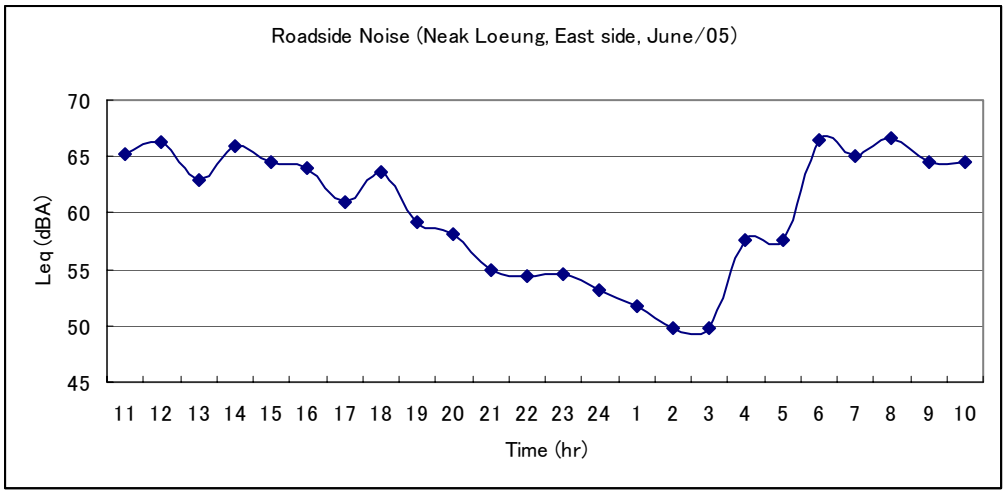


Figure 7.3.1 Noise Measurement Results (East Side of Neak Loeung, June/03/05)

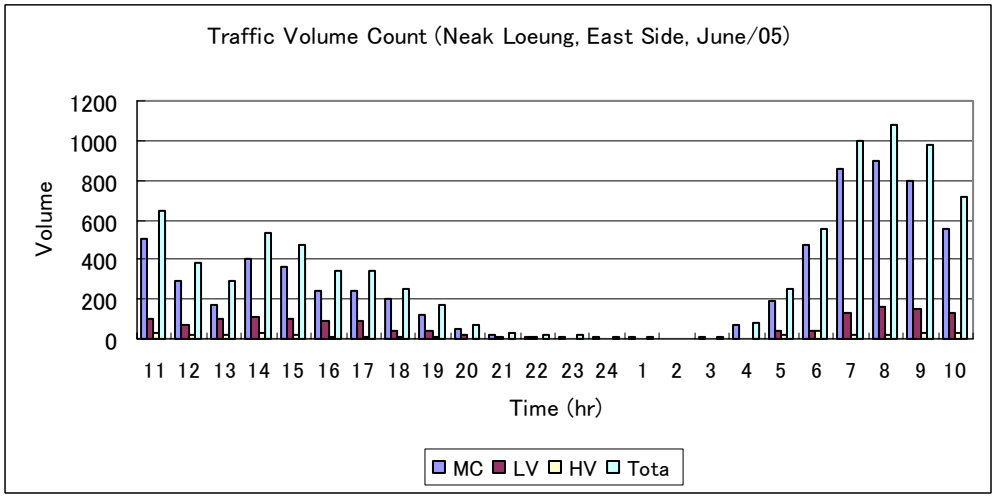


Figure 7.3.2 Traffic Volume Count (East Side of Neak Loeung, East Side, June/03/05)

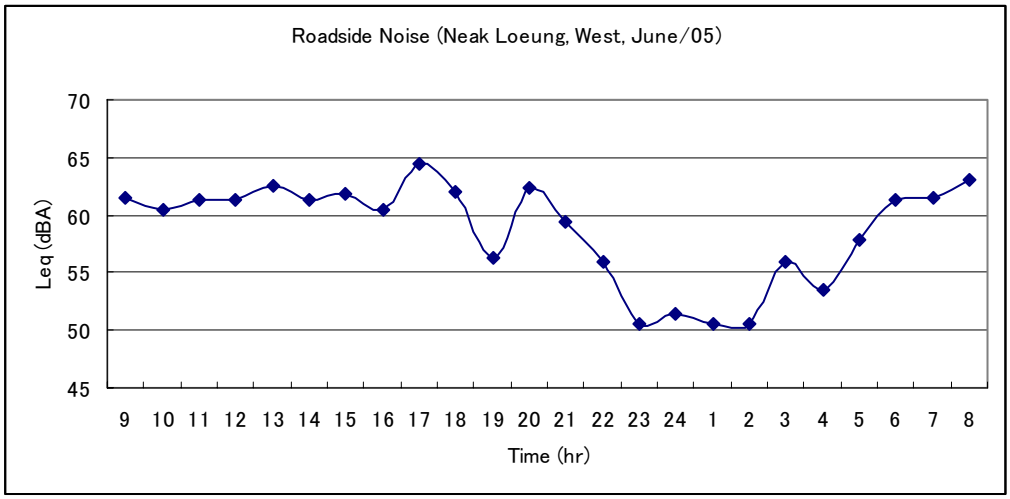


Figure 7.3.3 Noise Measurement Results (West Side of Neak Loeung, June/02/05)

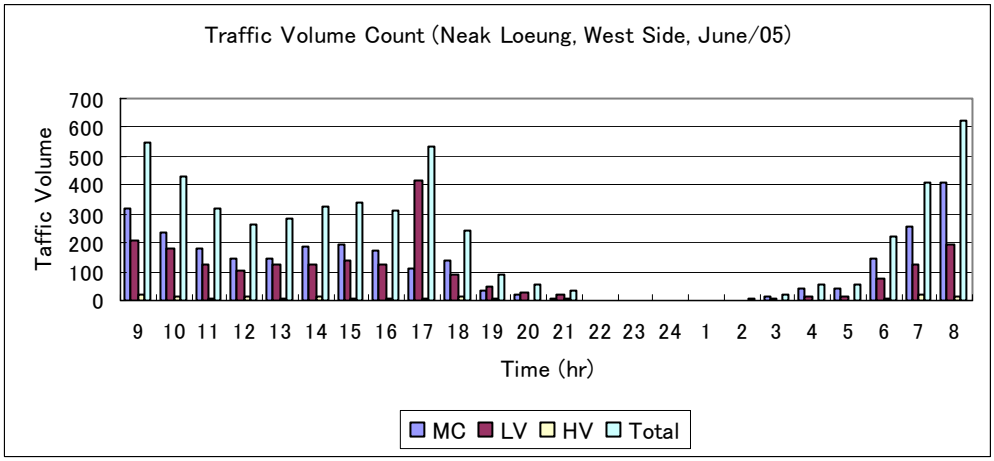


Figure 7.3.4 Traffic Volume Count (West Side of Neak Loeung, East Side, June/02/05)

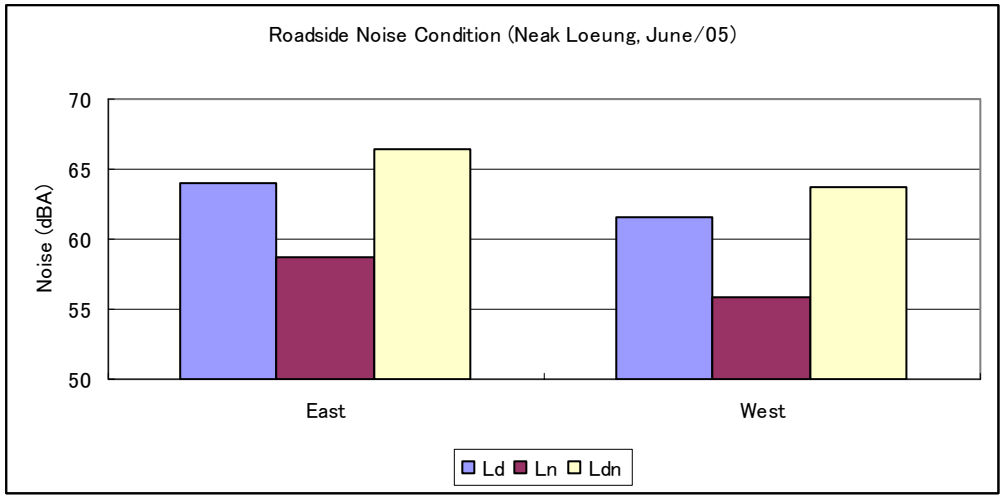


Figure 7.3.5 Roadside Noise Level (dBA) - Ld, Ln and Ldn, Neak Loeung 2005

(2) Roadside Air Quality Survey

Table 7.3.4 summarizes the roadside air quality survey results. From this table, it can be found that all air quality survey results are below the environmental standards, so it can be said that the current roadside air quality environment at both sides are in good condition.

The orders of magnitude of the CO parameter is relatively higher than others. This may be due to the fact that most of households in Neak Loeung use fuelwood for the cooking whereas the burning of firewood would cause significant amounts of CO emission, that are greater than that of vehicle emission.

Table 7.3.4 Roadside Air Quality Survey Results (mg/ m^3)

	East	West	Environmental Standard (mg/m^3)
TSP	0.03	0.06	0.33 (Daily)
CO	5	10	20 (8-hour)
NO_2	083	081	0.1 (Daily)
SO_2	ND(<08)	ND(<08)	0.3 (Daily)

(3) Soil Quality Survey

Table 7.3.5 summarizes analytical results of the soil quality survey. Analytical results of both soil samples show similar tendency in soil components, so it can be guessed that the spatial variation of the surface soil is uniform around the study area.

Also, it can be seen that soil quality parameters such as cadmium, lead and copper are below the environmental standards implemented in Japan. So, it can be said that the likelihood of the soil contamination at both sites by heavy metals would be very small.

Table 7.3.5 Soil Quality Survey Results (mg/kg dry soil)

	East	West	Environmental Standard
Fe	2,550.0	2,490.0	N/A
Mn	401.0	427.0	N/A
Cd	ND < 4	ND < 4	9 mg/kg dry soil[*1]
Pb	94.2	66.6	600 mg/kg dry soil[*1]
Cu	70.0	64.7	125 mg/kg dry soil [*2]
Cr	40.1	32.7	N/A

Source: *1: Soil Contamination by Heavy Metal, Japan Association of Soil and Fertilizer, 1998,
*2: JIS Handbook #53, Environmental Measurement II – Water Quality, 2005)

(4) Water Quality Survey

a) Surface Water (Dry Season)

Laboratory results of the surface water quality obtained from the first measurement (dry season) are attached in Appendix 7.3. From these figures, it is found that most of measured water quality parameters are below the water quality standards for the river water, implemented in Cambodia (see Appendix 2.4 for more detailed descriptions about the river water quality standards). So, it can be said that the river water quality, measured within this campaign at all sampling points is in good condition.

Also, it can be seen that several parameters have spatial variations in the longitudinal direction of the river. This variation may be caused by the local river morphology, local

river flow circulation pattern and/or effluents discharge/or the non-point mass loading from surrounding communities. Compared with this longitudinal variation of the water quality parameter, it is found that relatively weaker spatial variations in the cross-sectional direction exist although several parameters have significant values. This may indicate that the local water body in the cross-sectional direction is well-mixed.

b) Subsurface water (Dry Season)

Laboratory results of sub-surface water quality of first measurement (dry season) are attached in Appendix 7.3. Compared with the water quality condition of the surface water, pH values of entire samples are somewhat lower than those of surface water. In addition, all BOD, COD and Coliform values are considerably low.

Among of them, the water quality of GW3 (both Coliform and COD values are relatively high) is worse than others, and this water quality deterioration might be caused by mixing of the untreated discharge of the household effluents.

c) Surface Water (Rainy Season)

Laboratory results of the surface water quality obtained from the second measurement (rainy season) are attached in Appendix 7.3. Compared with dry-season results, there are several changes in entire water quality condition. Temperatures at all points are somewhat lower than those of dry season while both turbidity and TSS values measured at all points were increased. This may be caused by the enhanced flow circulation pattern around Neak Loeung. Similar water quality fluctuation tendencies are recognized within results of the continuous water quality monitoring program, carried by DoHR, MoWRM.

d) Subsurface water (Rainy Season)

Laboratory results of sub-surface water quality of the second measurement (rainy season) are attached in Appendix 7.3. Compared with dry-season results, there are several changes in entire water quality condition. Temperatures at all points are somewhat lower than those of dry season while both turbidity and TSS values measured at 2 points such as GW3 and GW4 were increased. It was reported that household effluents discharged from surrounding communities were accidentally spilled into those two wells. This may cause those significant changes in measured turbidity and TSS values.

(5) Mekong River Velocity Profile Survey

Figures 7.3.6 and 7.3.7 show the cross-sectional depth-averaged velocity profiles of shallow and deep-pool areas, respectively. As shown in these figures, the order of magnitude of the velocity increase as the distance from the riverfront increase and maximum velocities for each areas are found around the middle of each river. Also, it can be seen that the order of magnitude of the nodal depth-averaged velocity reaches about 3.0 m/sec. Hence, it is likely that strong current that would exceed more than 3.0 m/sec somewhere across the Neak Loeung deep-pool area (note: it is assumed general parabolic velocity profile in the z-direction).

Entire flow condition of the shallow area is slower than that of deep-pool area. So, it is possible to say that this shallow area may play an important role as a temporal evacuation place for local aquatic species during the rainy season. The likelihood that this shallow area is used as the spawning place for the migratory fishes during the rainy season is discussed in the section of the biological environment (flora/fauna) study. Table 7.3.6 summarizes major survey results of velocity.

Table 7.3.6 Mekong River Velocity Profile Survey Results

	Shallow	Deep-pool
Q (m^3/sec)	711.68	29,751.13
River Width (m)	220.77	645.12
Depth - max (m)	5.84	27.57
Depth - min (m)	2.37	2.40
Averaged V (m/sec)	0.618	1.970
V max (m/sec)	1.030	2.913
V min (m/sec)	0.080	0.140

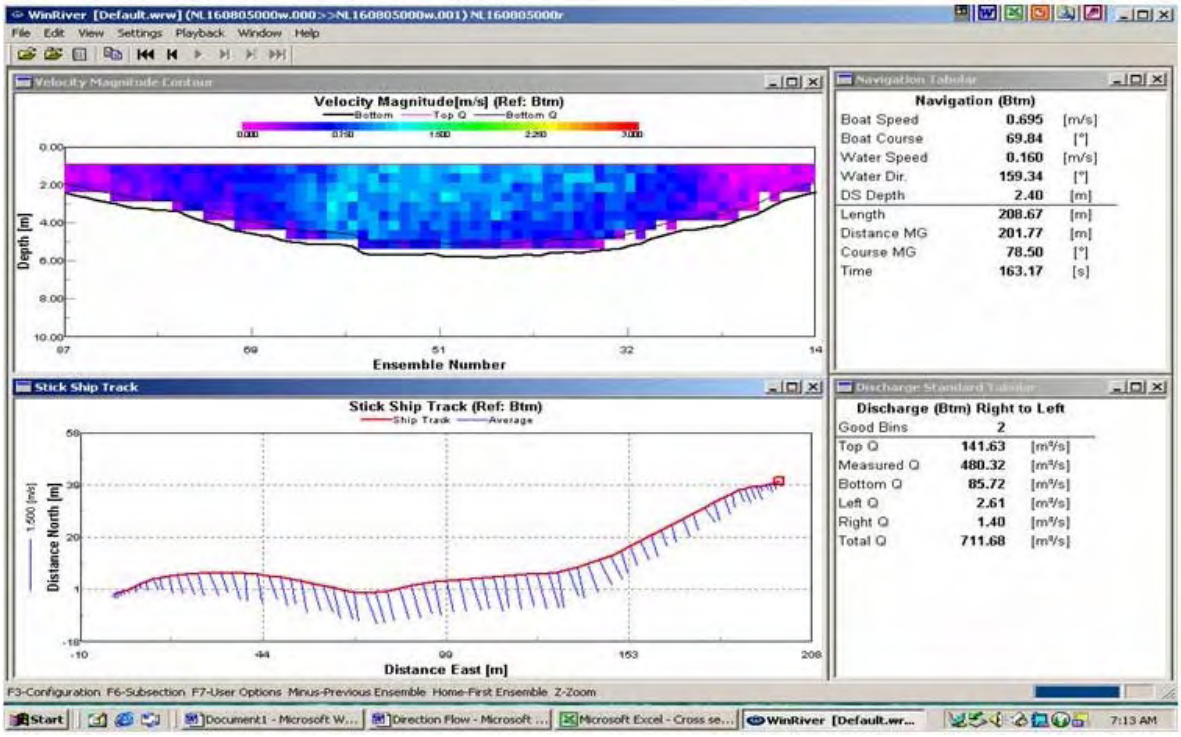


Figure 7.3.6 Cross-Sectional Depth-Averaged Velocity Profile (Shallow Area of the Mekong River)

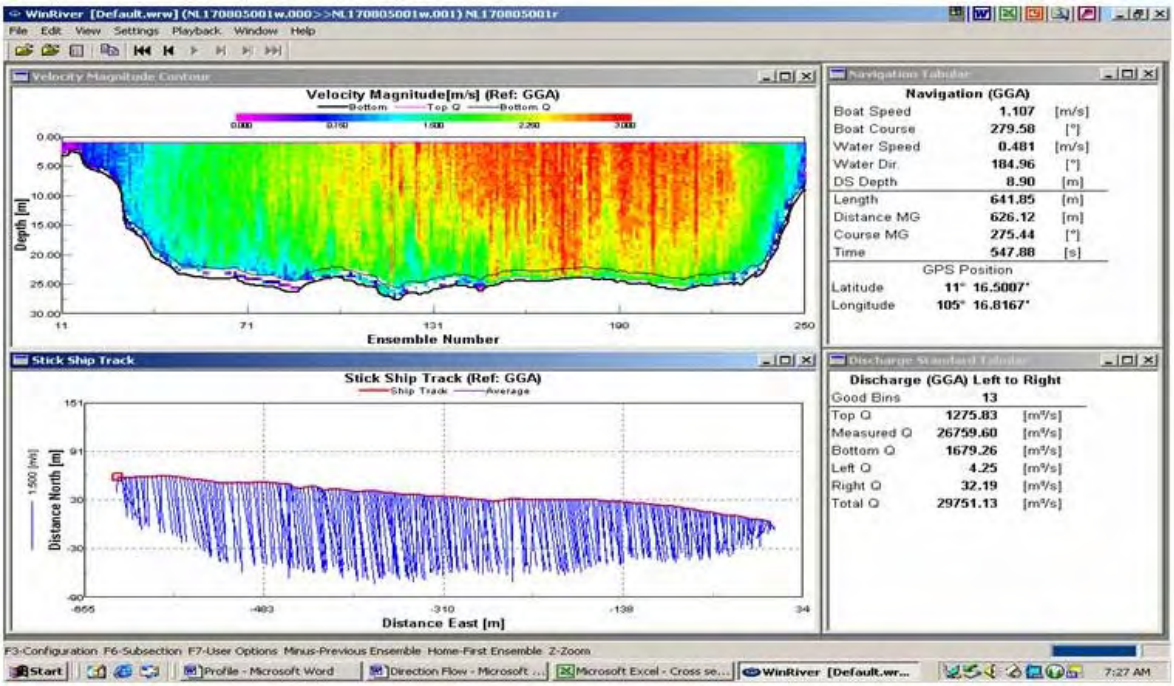


Figure 7.3.7 Cross-Sectional Depth-Averaged Velocity Profile (Deep-Pool Area of the Mekong River)

(6) Biological Environment (fauna/flora) Study

1) Results

This section combines information derived from the literature and unpublished data review with data collected during field surveys and observations. An overview of the past and current status of each faunal group and habitat/vegetation type is given.

a) Fish

At least, 225 fish species have been recorded in the Mekong from both Kandal and Prey Veng Provinces and the Tonle Touch/Prek Veal Robang areas (Sinath, 1994, unpublished data of Department of Fisheries, Prey Veng and Kandal Provinces). In 1989 - 1990, several million fingerling Pangasids were caught at Neak Loeung (Khling, 2005). These figures amply demonstrate the importance of the Mekong River around Neak Loeung for fishing although the current status of Neak Loeung is unclear, and the species distribution and ecology are too poorly known to infer whether the bridge construction would have negative impacts on fish population.

b) Reptiles

The few reptiles observed during the field study comprised unidentified skinks and Agamid lizards. Two species of box turtle were observed for sale at food stalls in Neak Loeung.

c) Birds

Surveys at the site during June 2005 combined with all species known to occur in the nearby Bassac Marshes IBA (Important Bird Area) yielded records of 115 bird species. Only one, the River Lapwing (*Vanellus duvaucelli*), is of regional conservation concern. The only site of any importance to globally threatened and near-threatened

bird species in the area is the Bassac Marshes IBA, which borders the bridge site to the west.

d) Mammals
Only 7 species were reported to persist in the area, none of which are of any conservation concern. All mammal species of the conservation significance have become locally extinct from the area within 5 km of the proposed bridge route.

e) Habitats and Vegetation Types
All habitats and vegetation types along, and in the vicinity of the bridge route have been heavily modified by human activities. From the interview with local peoples, it was found that the natural vegetation types in the area of Neak Loeung had been either lost or heavily degraded since the mid-1980s. (Note: this is confirmed through this study.) The Bassac Marshes IBA and the areas flanking the Tonle Touch/Prek Veal Robabng Rivers are the most substantial remaining traces of natural vegetation in the area. There are no substantial areas of natural or semi-natural vegetation within 500 m from the proposed bridge and approach routes.

Tables 7.3.7 - 7.3.9 summarize the major faunal components such as aquatic species, terrestrial species, and birds, that would occur around Neak Loeung bridge site, respectively. As mentioned above, some of those species listed in those tables used to occur around Neak Loeung in the past, but became extinct due to the over exploitation or growing human pressures, recently. Table 7.3.10 summarizes the overview of habitats and vegetation types along the project route components. Figure 7.3.8 shows the habitat types within a 250 m buffer along the project route.

Table 7.3.7 Overview of Past and Current Status of Each Faunal Group (Aquatic Species)

	IUCN* Status
Fish	
Mekong Giant Catfish (*Pangasianodon giga*)	Critically Endangered
Giant Freshwater Stingray (*Himantura chaophraya*)	Vulnerable
Jullien's Golden Carp (*Probarbus jullieni*)	Endangered
Giant Barb (*Catlocarpio siamensis*)	Not currently afforded an IUCN threat status
Giant Pangasius (*Pangasius sanitwongsei*)	Data Deficient
Laotian Shad (*Tenualosa thibaudeaui*)	Endangered.
Molluscs	
Small snail (*hoi jeub*) Large snail (*hoi pang* and *hoi kong*) Bivalve (leah in Khmer)	Few aquatic macro-invertebrate groups across LMB have been assigned conservation status due to lack of sufficient information (Smith, 2001).

Source: This Study, 2005

Note: *IUCN: International Union for the Conservation and Nature Resources (now changed to the World Conservation Union)

Table 7.3.8 Overview of Past and Current Status of Each Faunal Group (Terrestrial)

	English Name (Scientific Name)	Present at/or within concerned area.5 km of project site	IUCN Status
Mammal			
1	Irrawaddy Dolphin (*Orcacella brevirostris*)		Data Deficient
2	Asian small-clawed Otter (*Aonyx cinereus*)		Near-threatened
3	Smooth-coated Otter (*Lutrogale perspicillata*)		Vulnerable
4	Hairy-nosed Otter (*Lutra sumatrana*)		Data Deficient.
5	Fishing Cat (*Prionailurus viverrinus*)		Vulnerable
6	Long-tailed Macaque (*Macaca fascicularis*)		Near threatened
7	Small Asian Mongoose (*Herpestes javanicus*)	X	

8	Civet (*Paradoxurus/Viverra spp.*)		
9	Siamese Hare (*Lepus peguemsis*)		
10	Flying Fox Bat (*Pteropus sp.*)	X	
11	Bat sp. 1	X	
12	Bat sp. 2	X	
13	House Rat (*Rattus rattus*)	X	
14	Large Bandicoot Rat (*Bandicota indica*)	X	
15	Rice Rat (*Kandol srauv*)	X	
Reptiles			
1	Siamese Crocodile (*Crocodylus siamensis*)		Critically endangered
2	Asian Box Turtle (*Cuora amboinensis*)	X	Vulnerable
3	Black Marsh Turtle (*Siebenrockiella crassicollis*)		Vulnerable
4	Malayan Snail-eating Turtle (*Malayemys subtrijuga*)	X	Vulnerable
5	Asiatic Softshell Turtle (*Amyda cartilaginea*)		Vulnerable
6	Asian Giant Softshell Turtle (Pelochelys cantorii)		Endangered
7	Burmese Pythons (*Python molunus*)	X	Vulnerable
8	Monitors (*Varanus sp./spp.*)	X	
9	Water Snakes (*Enhydris/Homalopsis spp.*)	X	
10	Monocled Cobra (*Naja kaouthis*)	X	
11	Indochinese Spitting Cobra (*Naja siamensis*)	X	
12	Indochinese Water Dragon (*Physignathus cocinus*)	X	
13	Boucourt's Water Snake (*Enthydrisbocourti*)	X	
14	Puff-faced Water Snake (*Homalopsis buccata*)	X	
15	Chequered Keelback (*Xenochrophis piscator*)	X	
16	Paradise Tree Snake (*Chrysopelea paradisi*)	X	
17	Golden Tree Snake (*Chrysopelea ornata*)	X	
18	Tentacled Snake (*Erpeton tentaculatum*)	X	
19	Yunna Stripe-tailed Rat Snake (*Elaphe taeniura yunnanensis*)	X	
20	Indochinese Ratsnake (*Ptyas korros*)	X	
21	Monocled Cobra (*Naja kaouthia*)	X	
22	Indochinese Spitting Cobra (*Naja siamensis*)	X	
23	King Cobra (*Ophiophagus hannah*)	X	
24	unidentified Skink (*Scincidae*)	X	
25	unidentified Agamid lizard (*Agamidae*)	X	

Source: This Study, 2005

Table 7.3.9 Overview of Current Status of Faunal Group (Birds) Found at Neak Loeung

	English Name (Scientific Name)		English Name (Scientific Name)
1	Spot-billed Duck (*Anas poecilorhyncha*)	21	Oriental Magpie Robin (*Copsychus saularis*)
2	Indian Roller (*Coracias benghalensis*)	22	Pied Bushchat (*Saxicola caprata*)
3	White-throated Kingfisher (*Halcyon smyrnesis*)	23	Vinous-breasted Starling (*Sturnus burmannicus*)
4	Collared Kingfisher (*Todiramphus chloris*)	24	Common Myna (*Acridotheres tristis*)
5	Pied Kingfisher (*Ceryle rudis*)	25	White-vented Myna (*Acridotheres grandis*)
6	Blue-tailed Bee-eater (*Merops philippinus*)	26	Yellow-vented Bulbul (*Pycnonotus goiavier*)
7	Plaintive Cuckoo (C*acomantis merulinus*)	27	Streak-eared Bulbul (*Pycnonotus blanfordi*)
8	Lesser Coucal (*Centropus bengalensis*)	28	Zitting Cisticola (*Cisticola juncidis*)
9	Asian Palm Swift (*Cypsiurus balasiensis*)	29	Yellow-bellied Prinia (*Prinia flaviventris*)
10	Spotted Dove (*Streptopelia chinensis*)	30	Plain Prinia (*Prinia inornata*)
11	Red Collared Dove (*Streptopelia tranquebarica*)	31	Common Tailorbird (*Orthotomus sutorius*)
12	Black-shouldered Kite (*Elanus caeruleus*)	32	Olive-backed Sunbird (*Nectarinia jugularis*)
13	Little Cormorant (*Phalacrocorax niger*)	33	Plain-backed Sparrow (*Passer flaveolus*)
14	Great Cormorant (*Phalacrocorax carbo*)	34	Streaked Weaver (*Ploceus manyar*)
15	Purple Heron (*Ardea purpurea*)	35	Baya Weaver (*Ploceus philippinus*)
16	Cinnamon Bittern (*Ixobrychus cinaamomeus*)	36	White-rumped Munia (*Lonchura striata*)
17	Black Bittern (*Dupetor flavicollis*)	37	Scaly-breasted Munia (*Lonchura punctulata)*
18	Golden-bellied Gerygone (*Gerygone sulphurea*)		
19	Pied Fantail (*Rhipidura javanica*)		
20	Common Iora (*Aegithina tiphia*)		

Note: All birds identified in this table are found at Bassac Marshes IBA.
Source: This Study, 2005

Table 7.3.10 Major Habitat Types around the Study Area

Western Approach Road
There is almost no natural vegetation remaining along the route. The land in this area is almost exclusively cultivation or village gardens, but for a narrow strip of wetland dominated by Water Hyacinth (*Eichornia crassipes*), a non-native, invasive species. Maize, sugar cane and 'lohgor' (the Khmer word for what is apparently sesame (*Sesamum indicum*)) are the most frequently grown crops. Many fruit trees (e.g., mango, papaya) are grown in the village gardens, where there are also tall stands of unidentified bamboo species. Just south of the proposed western approach road, a clump of hundreds of stems of the rattan (*Calamus godefroyi*) was found by NR-1, in a roadside ditch amongst cultivation and scrub.
Bridge Route
The section of the western Mekong channel was dry during June of 2005. The riverbed was sandy, and the vegetation was dominated by a tall tussock grass closely resembling *Chrysopogon fetucoides*, a widespread and locally dominant species in the Tonle Sap floodplain. Cultivation along the shallow-sloping west bank of Phnon Knong Island mainly comprised maize and 'lohgor'(in Khmer). There is narrow (200 - 300 m wide) belt of fruit and shade trees mixed with tall bamboo running on a north-south axis, associated with village on the west side of Phnon Knong Island. Extensive areas of maize, sugar cane and 'longor' are cultivated on the east side of this island. The only apparently natural vegetation on this island was some patchy *Chrysopogon festucoides* - like tall grass along the island's eastern banks.
Eastern Approach Road
The eastern approach road has more remnant semi-natural habitat, especially shrub, sedge beds and wetlands, than any other part of the route. Evidence that the area formerly supported flooded shrub-forest was provided by the presence of occasional *Barringtonia sp.* trees, none of which were more than 5 meters high, and woody *Morinda sp./spp.* shrubs. Other shrub species include representatives of the families Malvaceae, attracting various Papilionidae, and tall species closely resembling *Aeschynomene indica*. *Mimosa pigra* was dominant in several areas, in particular, the grassy fallow fields near the east bank of the Mekong, along the channel bisecting the *Eucaplyptus* plantation and in the wetlands to the south.

Source: This Study, 2005

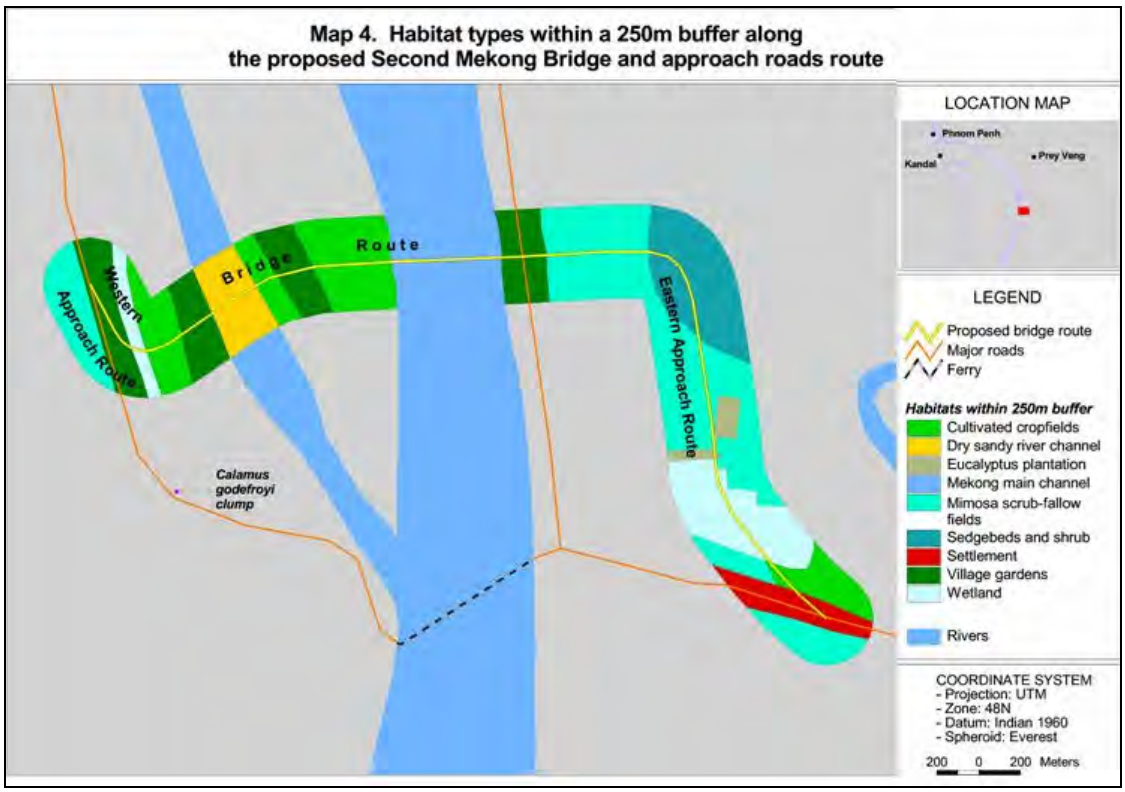


Figure 7.3.8 Habitat Types within a 250 m Buffer along the Proposed Second Mekong Bridge and the Approach Road

2) Discussions

a) Bridge Development Issues relating to Fish Conservation

At Neak Loeung, the key role of the Mekong River for fish is twofold: the main channel is an important migration corridor, and deep pool adjacent to Phnon Knong Island and 2 km south of the bridge site potentially provide important dry season refuge habitat for fish (MRC, 2002). Several globally threatened fish species have been recorded in the Mekong at or near Neak Loeung.

Several bridge piers are to be constructed across the Neak Loeung deep pool area, and local water quality degradation may occur around/or downstream side of those bridge pier construction sites. However, those impacts would be temporary and the significance of those negative impacts would be small as long as appropriate construction methods that would minimize the water quality degradation (e.g., the reverse circulation method) is implemented. In case of occurrence of accidental spillage, it is essential to establish a contingency program in order to minimize the damage to be caused by that accident.

There is little information on the ecology and distribution of most of these species, especially their local status around Neak Loeung. In view of this, it would be desirable to further investigate fish use of the deepwater pools at Neak Loeung, using fisheries catch data and local ecological surveys.

As we discussed earlier, it is likely that the Mekong shallow area (i.e., small channel between the Phnon Knong Island and the west river bank of the Mekong River) is used as an evacuation place for local aquatic species during the rainy season since the entire flow condition of this shallow area is slower than that of deep pools. It is found that current floral condition around this shallow area is poor, so it can be said that likelihood to be one of important spawning areas for the local aquatic species is small (Davidson, 2005). A further understanding of local fish status and ecology would improve understanding of any potential negative impacts of the bridge construction on the fish fauna.

b) Bridge Development Issues relating to Reptile Conservation

At least, two globally threatened turtle species are reported to still occur in very small numbers along the eastern approach road to the bridge. Road construction in this area will certainly destroy a small amount of suitable turtle habitat. Two globally-threatened turtle species such as Asian Box Turtle (Cuora amboinensis) and Malayan Snail-eating Turtle (Malayemys subtrijuga) were observed on sale there during this survey.

Mitigation measures could be considered to create suitable wetland habitat adjacent to the approach roads, and placing some interpretive facilities (e.g., signboards) in strategic locations to raise awareness of turtle conservation issues. Here, a creation of the conservation pond for those box turtles, to be located within the proposed Roadside Station, is presented and several key concepts and management policy of this conservation pond are summarized later. Creation of the conservation pond in conjunction with appropriate management programs would provide a potential opportunity to promote the conservation status of these turtles, which have become very rare across much of South-East Asia as a result of harvesting for food and medical purpose (Van Dijik et. al., 2000).

The reported occurrence of young pythons, probably Burmese Python (*Python molurs*: IUCN[1] Vulnerable) in this area during the wet season, indicates the species breeds nearby (perhaps in the flooded shrub along the Tonle Touch and Prek Veal Robang Rivers). However, the construction of the bridge is very unlikely to impact negatively on the population source of these animals, which require more extensive shrub habitat to breed in.

c) Bridge Development Issues relating to Bird Conservation
The area supports a bird fauna typical of many degraded Mekong floodplain habitats. The most important feature is the large waterbird community, which use the Bassac Marsh IBA area primarily in the wet season (e.g., Seng et. al., 2003). These birds (e.g., Spot-billed Pelican and Lesser Adjutant) occur in relatively small numbers, and live several kilometers away from the bridge route. If bridge construction activities do not encroach more than 300 - 500 m west from NR-1, the bridge development will pose no direct threat to the Bassac Marshes and its bird fauna. No bird species of elevated conservation concern use the proposed project route and adjacent area either in significant enough numbers or with sufficient regularity for the bridge construction to have more than a negligible impact on their populations.

d) Bridge Development Issues relating to Mammal Conservation
The only mammals of conservation importance known from the area have either become locally extinct (e.g., Irrawaddy Dolphin) or occur several kilometers away from the project site. The bridge development will have no direct impact on any mammals of conservation importance, because there are no longer any populations using the area to be impacted by the construction activities.

e) Bridge Development Issues relating to Flora Conservation
The flora of the project site was not intensively investigated, so conclusion about the presence and the degree of the impact on key species can not be delineated. One rarely recorded rattan was detected, but the bridge construction is not expected to have any significant impact on this species, whose fruits are harvested by local people. The lack of unusual or little-modified (i.e., intact) habitat strongly suggests that few if any rare or sensitive species occur at the site. If rare species do occur, they must already be tolerant of various other impacts already felt, including habitat conversion to cultivation, livestock grazing, burning and competition with invasive species such as *Mimosa pigra* and *Eichornia crassipes*.

7.3.3 Impact Prediction Study

(1) Noise Impact Prediction Study

1) Objectives

The purpose of this analysis is to predict the sound pressure level to be generated by the future traffic and transport conditions along main roads such as the National Road No.1, and evaluate the severity of the roadside noise impact during and/or after the construction period of this proposed project. A comparative analysis between With and Without scenario[2] is applied to the noise impact prediction study.

[1] International Union for the Conservation and Nature Recourses

[2] Savings in both the traffic volume along the project road and travel km in the study area are derived from the comparison between costs (**With scenario**) of road users who would pass over the project bridge and costs (**Without scenario**) of either those who have crossed the river by the Neak Loeung Ferry or those who would take the alternative route via Kampong Cham and Kizuna Bridge because of the lack of the ferry

2) Numerical Parameters

Within this study, the noise impact prediction study is carried out for the peak-time transport condition. Table 7.3.11 summarizes the outline of this noise impact prediction. Due to the lack of published traveling speeds of vehicles, two assumed traveling speed parameters (i.e., 40 km/hr and 50 km/hr) are used in order to observe the sensitivity of the predicted roadside noise level to the vehicle traveling speed.

Table 7.3.11 Numerical Conditions

	Descriptions
Prediction Method	B-method specified by Acoustics Society of Japan
Target Years	2004, 2013 and 2020
Simulation Case	Carry out simulation for the peak time traffic condition. Simulation is carried out for following three cases: 1. Verification (2004) 2. **Without** scenario at 2020. 3. **With** scenario at 2020
Power Level*1)	Heavy vehicle : $L_w = 90.0 + 10.0 \log_{10} V$ Light vehicle : $L_w = 82.0 + 10.0 \log_{10} V$ where V is the vehicle moving speed [km/hr]
Prediction Point	Boundary between public and private property (i.e., 30 m away from the road centerline, height of the noise receptor = 1.2 m) located at two noise survey points of National Road No. 1.

*1) ASJ Roadside Noise Study Group [ASJ, 1998]

3) Results and Discussions

Tables 7.3.12 and 7.3.13 summarize the predicted sound level at the National Road No. 1 east and west sides, respectively.

L_{eq} values at both east and west sides in 2004 for **Without-**scenario (note: the vehicle traveling speed = 40 km/hr) are computed as 53.17 and 53.35 dBA, respectively while 56.73 and 57.25 in 2020 for same **Without-**scenario, respectively. From this result, it can be seen that the roadside noise level in 2020 are increased by 3 – 4 dBA at both points. Peak time traffic volumes in 2004 at both sites are of 884 and 914 vehicles/hour, respectively, while 1,487 and 1,557 vehicle/hour in 2020 for **Without-**scenario, respectively.

L_{eq} values at both east and west sides in 2020 for **With-**scenario (note: the vehicle traveling speed = 40 km/hr) are computed as 56.96 and 57.02 dBA, respectively. Peak time traffic volumes in 2020 for **With-**scenario at both sites are of 1,541 and 1,610 vehicles/hour, respectively.

Sensitivity analysis is carried out for both **Without-**and **With-**scenarios, changing the vehicle traveling speed from 40 km/hr to 50 km/hr. It is found that the roadside noise levels at all points of concern are increased slightly, although those noise levels are below the noise environmental standard, 60 dBA (the noise environmental standard to be used for the commercial/residential mixed area in Cambodia).

From these results, it can be seen that most of the predicted roadside noise values are less than 60 dBA. So, it can be said the roadside noise environment at both sides of the

capacity after the traffic demand reaches the ferry waiting time (3 hours) equivalent to the travel time additionally required to detour the route.

National Road No.1 will not be severely deteriorated after the proposed bridge will start its operation. This is mainly due to relatively small amount of computed regional traffic volume of National Road No. 1 (see the future traffic demand forecast study section of this main report for more detailed information).

Table 7.3.12 Roadside Noise Level Simulation Results (Peak Time, National Road No.1, East Side)

		2004	2020
Without scenario	40 km/h	53.17	56.73
	50 km/h	53.83	57.24
With-scenario	40 km/h	**	56.96
	50 km/h	**	57.46

Table 7.3.13 Roadside Noise Level Simulation Result (Peak Time, National Road No. 1, West Side)

		2004	2020
Without scenario	40 km/h	53.35	57.25
	50 km/h	53.99	57.53
With-scenario	40 km/h	**	57.02
	50 km/h	**	57.74

(2) Vehicular Emission Study

1) Introduction

The purpose of this study is to evaluate the amount of vehicular emission to be generated by the regional future traffic and transport condition around Neak Loeung Area, and carry out a comparative study for following two scenarios; i.e., **With-** and W**ithout-**proposed new bridge project in 2020. Though there are several types of vehicular emission, including TSP, CO, NO_2, SO_2, the emission of the carbon dioxides (CO_2) is of concern in this Study. It is because the less impacts caused by other types of emission are expected, since no specific obstacles, like a high story building, is identified in the study area, which form stagnant air. A comparative analysis between With and Without scenario[3] is applied to the vehicular emission study.

2) Computation of Vehicular Emissions

The daily amount of the total emission loading of pollutants, $\mathbf{W_s}$, is computed by,

$$W_s = \Sigma E_s \cdot CK \quad (1)$$

where $\mathbf{E_s}$ is the vehicle-type air pollution emission factor of targeted pollutants, and **CK** is the computational results (i.e., vehicle times kilometers) of the future traffic and transport demand forecast, that are carried out for several different development scenarios (see the future traffic demand forecast study section of the main report for more detailed information). Three different vehicle types are used in the future traffic demand forecast study.

The following assumptions are introduced for the simplification of this study. Due to the lack of the precise information of the motorcycle's emission factor, it is assumed that the order of magnitude of motorcycle's emission factor would be same to that of a light vehicle.

[3] Savings in both the traffic volume along the project road and travel km in the study area are derived from the comparison between costs (**With scenario**) of road users who would pass over the project bridge and costs (**Without scenario**) of either those who have crossed the river by the Neak Loeung Ferry or those who would take the alternative route via Kampong Cham and Kizuna Bridge because of the lack of the ferry capacity after the traffic demand reaches the ferry waiting time (3 hours) equivalent to the travel time additionally required to detour the route. It is assumed that motor cycles would not take detours due to its short travel distance.

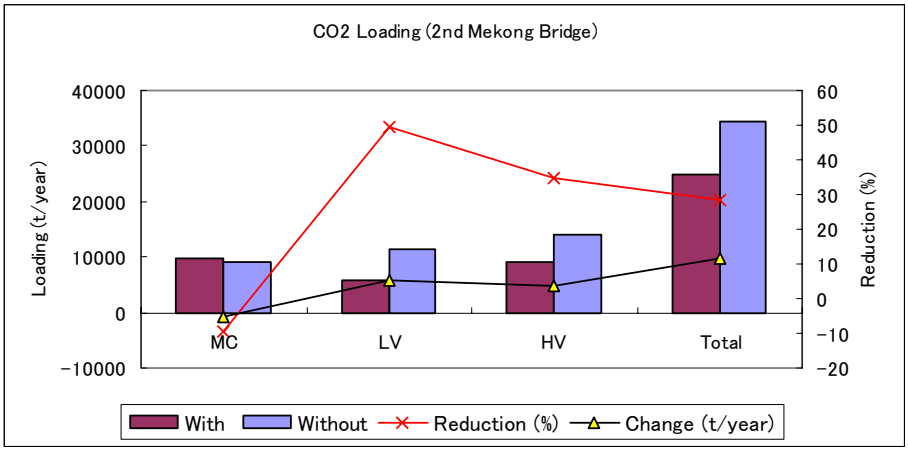
In general, the order of magnitude of CO_2 emission factor of old vehicles tend to be larger than those of new ones. However, due to the lack of precise information of the vehicle age by vehicle type in Cambodia, only one type emission factor is used for each vehicle type within this estimation. No long-term vehicle maintenance/inspection programs that will specify the future vehicle type and the vehicular emission condition exist yet in Cambodia, so it is assumed that no significant change in the vehicular conditions will occur till 2020.

The estimation of the environmental benefit to be caused by the operation of the proposed bridge construction project is carried out by evaluating the amount of the reduction of the emitted CO_2 loading, caused by the change of the regional amount of the vehicle-kilometer of the entire transport situation.

3) Results and Discussions

Based on the evaluation procedures mentioned above, the calculation of the regional amount of CO_2 - vehicular emission loading in 2020 is carried out. Figure 7.3.9 shows the computational result of CO_2 vehicular emission loading and the environmental benefits (i.e., the reduction of the emitted CO_2 loading) to be caused for both **With-** and **Without-**scenarios. From this figure, it can be seen that the total amount of the vehicular CO_2 loading in both **With-** and **Without-**scenarios is of 25,000 and 35,000 ton/year, respectively. So, certain amounts of CO_2 loading (i.e., approximately 10,000 ton/year reduction) would be reduced by this proposed bridge construction project. In addition, further 4,000 ton/year reduction due to the termination of the ferry operation after the bridge operation will start can be expected. Hence, 14,000 ton/year of a regional CO_2 emission loading can be reduced by this proposed bridge construction project during the operation period.

Significant reduction can be achieved within the emission loadings of both the light vehicle (i.e., **LV**) and heavy vehicle (i.e., **HV**). This can be explained by following reasoning. Entire vehicle-kilometer values around Neak Loeung Area for **With-**scenario will be greatly reduced from that of **Without-**scenario, since over-saturated traffic, which exceeds the loading capacity of the three ferries and takes a detour via Kampong Cham and Kizuna Bridge in case of **Without-**scenario, will be significantly reduced to be zero in case of **With-**scenario.



Note: Reduction (%) = 100 x (Emission $_{without}$ - Emission $_{with}$)/(Emission $_{without}$)

Figure 7.3.9 Environmental Benefit (Reduction of CO_2 Vehicular Emission Loading)

(3) Traffic Accident Evaluation Study

1) Introduction

The purpose of this study is to evaluate the traffic safety around Neak Loeung Area qualitatively, and carry out a comparative study under following two scenarios: **With-** and **Without-**proposed new bridge project in 2020. Outline of this safety evaluation procedure implemented within this study is described in following section.

2) Evaluation of Traffic Safety

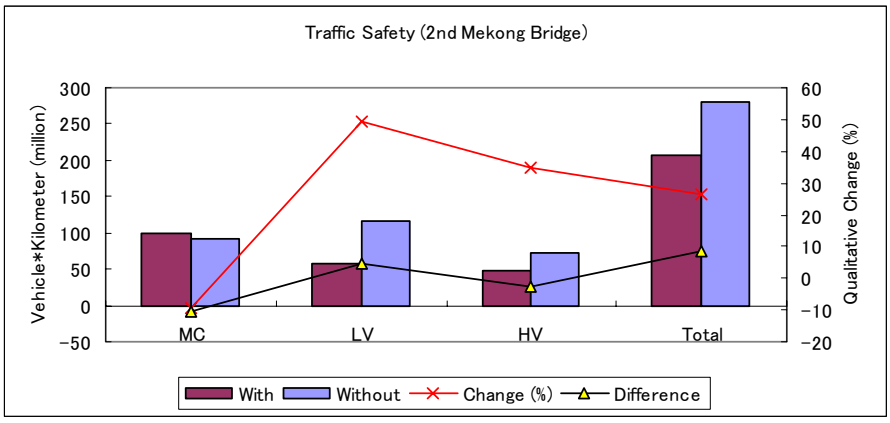
It is well-known that a strong correlation exists between the risk of the traffic accidents and the vehicle-kilometer value. Based on this analogy, it can be said that the risk would increase as the vehicle-kilometer value is increased. This relationship, sometimes, can be expressed, using the linear regression formula [e.g., Ministry of Land and Transportation, Government of Japan, 2002].

Within the IEE study of this project, a regression analysis was carried out, using recent statistical information of nation-wide traffic accidents. From this analysis, it was found that a strong correlation exists between the total number of the traffic accidents and the number of the registered vehicles ($R^2 = 0.86$).

Within this preliminary study, it is assumed that the risk of regional traffic accidents occurring around the Neak Loeung Area has a strong correlation with the value of the regional vehicle-kilometer, and can be expressed by a first-order linear equation although the exact form of the regression formula obtained from an appropriate risk evaluation analysis is not established yet. In other words, if the total value of the regional vehicle-kilometers **With**-scenario is relatively smaller than that **Without**-scenario, it can be said the risk of regional traffic accidents would be lower when the bridge starts its operation. Three different vehicle types are used in the future traffic demand forecast study (i.e., **MC**, **LV** and **HV**).

3) Results and Discussions

Based on the evaluation procedures mentioned above, the qualitative traffic safety assessment of the regional traffic safety in 2020 is carried out. Figure 7.3.10 shows the computational result of qualitative changes of the vehicle-kilometer (i.e., the risk of the regional traffic accident) by the vehicle type for both **With-** and **Without** scenarios. From this figure, it can be seen that the total risk of the regional traffic accidents can be reduced by about 26 %.



Note: Qualitative Change (%) = 100 x (Vehicle*kilometer $_{without}$ – Vehicle*kilometer $_{with}$) /(Vehicle*kilometer $_{without}$)

Figure 7.3.10 Traffic Safety Evaluation

7.3.4 Impacts Mitigation

(1) Introduction

The comprehensive, effective measures of the mitigation (i.e., avoidance, reduction, and elimination) of negative impacts for the pre-construction, construction and operation phases of the project are described in this section. The objectives of the mitigation plan are to review impacts identified through the environmental impact assessment (EIA), and incorporate probable working practices into the mitigation plan during the pre-construction and construction phases of the project in order to anticipate those issues which are likely to require close environmental management.

The mitigation plan addresses the negative impacts caused by the construction works and its operation. The impacts to be caused during the construction period are mostly of a temporary nature lasting only for the construction period, about several years. Detailed descriptions of each mitigation measure are summarized in Table 7.3.14, and cost effective mitigation measures have been recommended. Principal purposes of this mitigation measures are as follows:

a. Maintenance of comfortable roadside environment throughout the project.
b. Alleviation of disturbance of regional hydrological balance, in particular, drainage system, and to lessen related secondary impacts such as inundation.
c. Alleviation of secondary impacts of a large-scale subsidence around the approach roads on both sides of the Mekong River.
d. Minimize the risk of the erosion of road bank of approach roads, that may lead to new local inundation or water quality degradation, and the erosion of the riverbank of the Mekong River.
e. Alleviation of disturbance of natural fauna/flora condition over the Mekong floodplain and inside of the Mekong River throughout the project.
f. Harmonization of new transport facilities with surrounding communities.

Mitigation measures must be incorporated into tender documents prepared under the engineering component of this project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP).

(2) Implementation

Table 7.3.14 summarizes the mitigation measures for negative biophysical impacts for entire Second Mekong Bridge and its new approach roads, identified in previous section. The organizations responsible for implementing and monitoring are identified.

Table 7.3.14 Summary of Mitigation Measures (Bio-Physical Environment)

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Air Quality					
Dust during construction	Vehicles delivering materials shall be covered to reduce spill. Mixing equipment shall be well sealed, and vibrating equipment shall be equipped with dust-remove device. Wind erosion from open land can be controlled by use of the following three basic techniques (watering, use of chemical stabilizers, and wind breaks) in addition to vegetation cover. Operators shall pay attention to their health.	Dust levels controlled.	Contractor	Engineer	On-going during construction
Water Quality					
Risk of hazardous waste material exposure to major tributaries during construction.	Great care must be taken to ensure that potential contaminants do not enter any tributaries while appropriate construction method that would have less risk of water quality degradation shall be selected. Water quality tests for surface/subsurface water shall be conducted periodically. All chemicals (oil, petrol etc.) must be kept in securely bonded areas with a capacity greater than volume of chemical to be stored. Oily wastes must be stored to suitable disposal sites. Contractor must submit written emergency procedures to be followed in the event of accidental spillage.	Risk of pollution reduced but not eliminated.	Contractor	Engineer	On-going during construction.
Potential for water quality degradation due to erosion during/and after construction	Appropriate anti-erosion measures shall be implemented for the protection of road bank. Water quality tests for surface/subsurface water shall be conducted periodically. Periodic direct observations of regional drainage system such as channel/tributaries/ ponds shall be conducted in order to find out change in color of water as quick as possible.	Risk of water quality degradation reduced, but not eliminated	Contractor	Engineer to monitor water quality degradation during construction while MPWT during operation.	On-going monitoring during construction. Carry out follow-up monitoring periodically after construction.

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Soil and sedimentation					
Potential for soil erosion during/and after construction.	All earthworks shall be undertaken as far as possible prior to the start of rainy season. All earthworks shall be minimized to be as small as possible. Disturbed soils must be re-vegetated. Invasive species such as Mimosa pigra must be avoided in selection of vegetation. Appropriate geophysical and geo-chemical studies shall be conducted for selection of embankment material.	Soil erosion minimized, but not eradicated.	Contractor	Engineer to monitor soil erosion during construction while MPWT during operation	On-going during construction. Carry out follow-up monitoring periodically after construction.
Potential for sedimentation due to erosion during/and after construction	Periodic direct observation of regional drainage system such as channel/tributaries/ ponds shall be conducted in order to find out newly generated sedimentation process as quick as possible.	Sedimentation minimized, but not eradicated.	Contractor	Engineer to monitor sedimentation while MPWT during operation.	Same as above
Potential of cross-sectional seepage of approach roads after construction	Proper seepage-related monitoring program (e.g., check erosion, crack, slip and so on) shall be established. Appropriate seepage-related mitigation measures such as design of clay barrier shall be considered. More detailed study will be carried out in engineering section of this main report.	Potential of cross- sectional seepage minimized, but not eliminated.	Contractor Engineer	Engineer to monitor seepage occurrence during construction while MPWT during operation	On-going monitoring during construction. Carry out follow-up monitoring periodically after construction.

Table 7.3.14 Summary of Mitigation Measures (Bio-Physical Environment, continued)

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Waste Disposal					
Preparation of Excavated soil dump site.	Inventory of possible construction wastes shall be summarized. Selection of soil dumping sites shall be well-discussed with relevant agency such as MoE. Soil dumping sites shall be well-spread over entire project site to avoid local traffic congestion.	Illegal dumping of construction material/or soil avoided.	Contractor	Contractor	Before construction
Preparation of waste disposal sites for household wastes to be generated from construction workers.	Total amount of household wastes to be generated from construction yard shall be estimated based on construction schedule and workforce assignment. Treatment of those household wastes shall be integrated into current regional waste disposal system as much as possible.	Illegal dumping of household wastes avoided	Contractor	Contractor	Before construction
Noise/vibration					
Noise and vibration during construction period	It is recommended that Environmental Standards for Construction Sites be adhered to. Mobile equipment shall be in compliance with Cambodian noise emission standards. Machinery and vehicles shall be well-maintained in order to keep their noise at a minimum.	Noise/vibration nuisance reduced and controlled.	Contractor	Engineer	On-going during construction
Subsidence					
Potential of subsidence during/and after construction	Appropriate geophysical and geo-chemical studies shall be conducted for selection of embankment material. Comprehensive subsidence-related geophysical study is to be carried out in engineering sections of this main report. Proper subsidence-related maintenance program shall be established.	Potential of significant soil subsidence reduced, but not eradicated	Contractor Engineer	Engineer monitor subsidence during construction while MPWT during operation.	On-going during construction. Carry out follow–up monitoring periodically.

Table 7.3.14 Summary of Mitigation Measures (Bio-Physical Environment, continued)

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Topography and Geology (Flood and inundation)					
Local flood/or inundation caused by excessive water blockage of drainage system due to construction work.	Temporary and/or permanent drainage systems are designed to minimize occurrence of local flood/or inundation and impact on the water quality of several tributaries. Surface run-off water must be collected in sediment ponds. Drainage system must be periodically cleared so as to ensure smooth water flow.	Local flood/or inundation minimized but not eliminated.	Design Engineer.	Contractor.	On-going during construction.
Worsened local flood/ inundation after construction	Drainage systems that establish design integrity between local drainage system and ones of new roads are designed to minimize occurrence of local flood/or inundation. Drainage system must be periodically cleared so as to ensure smooth-running water flow.	Same as above.	Same as above.	MPWT	After Construction
Risk of waterborne disease outbreak from newly created inundated area.	Drainage systems that establish local drainage system and ones of new roads are designed to minimize occurrence of long-term inundation that would become possible origins of waterborne disease or outbreak of mosquitoes. Drainage system must be periodically cleared so as to ensure smooth water flow. Basic health and safety education must be given to all construction workers prior to starting work, and adequate medical facilities shall be provided, to help reduce risk of spreading infectious diseases. Any effective prevention drug shall be taken regularly before moving into areas, during stay, and for several weeks after departing.	Risk of waterborne disease infection minimized. No newly created inundations happen.	Design Engineer, Contractor	Contractor	On-going during construction.

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Potential of seepage/or recharge from Mekong River to flood-free land drainage system during/and after construction	Proper seepage-related monitoring (e.g., temporal variation of water level/or amount of water collected within drainage system) program shall be established Appropriate regional water balance and seepage study shall be carried out. Discharge method of collected run-off water across flood-free land shall be discussed based on results of those studies. More detailed discussion will be presented in hydrological study section of this main report.	Potential of seepage/or recharge from Mekong River minimized, but not eliminated.	Contractor Engineer	Same as above	On-going monitoring during construction. Carry out follow-up monitoring periodically after construction.
Potential of erosion of riverbank of Mekong River.	All earthworks shall be minimized to be as small as possible. Disturbed soils must be re-vegetated. Invasive species such as Mimosa pigra must be avoided in selection of vegetation. Appropriate anti-erosion measures shall be implemented for protection of riverbank. More detailed discussion will be presented in hydrological study section of this main report.	Potential of erosion minimized, but not eliminated.	Same as above	Same as above	Same as above
River Bed (e.g, benthos)					
Temporal disturbance to river bed condition (e.g., benthos) during the construction.	Appropriate river-inside construction method/or scheme that would not cause severe water quality degradation of surrounding water body shall be selected.	Potential of river bed disturbance reduced but not eliminated.	Engineer Contractor	Contractor	On-going during construction.

Table 7.3.14 Summary of Mitigation Measures (Bio-Physical Environment, continued)

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Flora/Fauna					
Destruction of natural floodplain vegetation.	Planting shall be done wherever possible with native species which are likely to require little maintenance and may prove beneficial in maintaining ecosystem integrity with coordination of MoE and/or MAFF. In cases where non-native species are deemed essential, careful monitoring shall be planned.	Destruction of natural vegetation minimized, not eliminated.	Contractor	Contractor	Before construction.
Disturbance to birds and wildlife during construction.	Although birds and wildlife may be disturbed during construction activities, effect is likely to be very minor, and birds and wildlife will relocate to areas further away from construction site. After construction, birds and wildlife will return, depending on scale of construction activities. MoE and/or MAFF must be consulted. Timing, shaping and sizing operations must be concluded to avoid breeding or nesting season and trees, protecting key food, cover, and water resources. Fencing will keep large mammals from direct contact with toxic chemicals in sedimentation ponds and from roadway to reduce number of roadkills. It is recommended to create conservation pond for turtles around old-river on eastside of Mekong River as mitigation. More detailed discussion about this pond is carried out in following section.	Animals and birds will move away.	Contractor	Contractor	During Construction
Illegal fishing/or hunting activities by bridge construction worker.	Special seminars for construction workers shall be held to enhance their understanding about the importance of local fauna/flora including the local fishery resources around Neak Loeung. Periodical on-site inspection shall be conducted if there is illegal fishing/or hunting by construction worker in collaboration with both Kandal and Prey Veng Fisheries Department.	Illegal fishing/or hunting by construction worker minimized.	Contractor	Contractor	During Construction

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Habitat change due to physical change/or damage on Mekong River	Minimize discharge of construction materials into main river and pollution, avoiding blockage of the river or modification of main river channel. Maintaining the river's natural flow should all be prioritized during the bridge construction phase.	Habitat change minimized.	Contractor	Contractor	During Construction
Risk of pollution on aquatic species during construction.	Great care must be taken to ensure that potential contaminants do not enter Mekong River and its surrounding floodplain or any other water courses while appropriate construction method that would have less risk of water quality degradation shall be selected. All chemicals (oil, petrol etc.) must be kept in securely bounded areas with a capacity greater than volume of chemical to be stored. Concrete batching plant must be located away from the riverbank, and effluent neutralized prior to disposal. Oil interceptors shall be used, and oily wastes must be stored to suitable disposal sites. MoE and/or MAFF must be consulted. Buffer strips must be left between construction sites and waterways. All streams restoration is to include alternating patterns or riffles, pools, and drops. Contractor must submit written emergency procedures to be followed in event of accidental spillage.	Risk of water pollution minimized, not eliminated.	Contractor	Contractor	During construction
Disturbance to animal path after construction	Local ecosystem such as access to drinking and feeding places shall be well-studied. Animal path, fence, and/or cage must be designed to lessen impact of fauna community separation. Create new feeding/drinking sites far distant from roadways.	Roadkills by traffic accident decreased, not eliminated.	Government of Cambodia	Contractor in collaboration with MPWT	After construction

Table 7.3.14 Summary of Mitigation Measures (Bio-Physical Environment, continued)

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Water Resources					
Pollution of existing wells.	Contractor must take adequate steps to prevent pollution, including bounding area at where any hazardous liquids such as oil or petrol are stored. Contractor must submit written details of procedures to be implemented in event of pollution incident.	Risk of groundwater pollution or depletion minimized but not eliminated.	Contractor	Contractor	Engineer On-going during construction
Demolition of shallow wells	New wells and/or alternative water supply system provided. Total number of wells to be demolished is to be studied within the social survey.	Alternate water supply system prepared.	Government of Cambodia.	Contractor in collaboration with MPWT	Before demolition begins.
Accidents					
Worsened traffic accidents	During construction period, trucks delivering materials to site shall thoroughly be checked to ensure that they are road worthy and that brakes are in full working order. Where feasible, trucks shall avoid driving through residential areas. Trucks used for transportation of material shall be routed, where feasible, to avoid residential area.	Risk of accidents reduced but not eliminated.	Contractor	Engineer	On-going during construction
New discovery of UXOs and landmines	Use UXO-detector before earthwork/or excavation start. Comprehensive UXO-related treatment program shall be established. Continue collection of UXO-related information from local communities.	Potential of UXO-hitting reduced but not eliminated.	Contractor MPWT	Contractor in collaboration with MPWT	Before construction starts
Vessel collision	Safe and smooth ferry/barge operation shall be established during construction period. Enough navigation clearance shall be kept.	Risk of vessel-related accidents reduced but not eradicated.	Contractor	Contractor	On-going during construction

(3) Conservation Pond of Box Turtle

1) Introduction.

Within the biological environmental survey, carried out within this EIA study, it is found that the following four "IUCN-vulnerable" box turtles including Asian Box Turtle (*Cuora amboinensis*), Black Marsh Turtle (*Siebenrockiella crassicollis*), Malayan Snail-eating

Turtle (*Malayemys subtrijuga*) and Asiatic Softshell Turtle (*Amyda cartilaginea*) occur around the project route on the east side of the Mekong River (photographic data of each box turtle are attached in Appendix 7.3).

After a series of discussions with several environmental research groups, it was agreed that appropriate mitigation measures such as the creation of the conservation pond shall be implemented.

2) Outline of Conservation Pond

Since there is no specific design standards for this kind of ponds, preliminary design of the conservation pond was carried out through several interviews and discussions with several environmental researchers and/or research groups (Holloway 2005, Davidson 2005, and Walston 2005). The following is a summary of remarks obtained from those discussions.

Remark 1.	A relatively shallow pond and plant with lots of vegetation is preferred (the more vegetation, the better).
Remark 2.	A hectare with adjoining nesting habitat should be sufficient (the bigger, the better).
Remark 3.	Appropriate protection facilities such as fence shall be implemented around the pond from illegal hunting of box turtles.
Remark 4.	It is better to place some interpretative facilities (e.g., signboards) in strategic locations in order to raise the public awareness of box turtle conservation.

3) Location of Conservation Pond.

Several natural ponds (portions of an old river) that have shallow water depth with sufficient surrounding vegetation throughout the year exist along the project route on the east side of the Mekong River. (Photographic data of these ponds are attached in Appendix 7.3).

Based on discussions with several environmental research groups and/or researchers, it was concluded that these natural ponds are the most suitable for the creation of the conservation ponds from the construction and conservation points of views. Relevant construction work for the creation of the conservation pond would cost less money and time (only fence and several signboards). Also, it is agreed that a conservation pond to be created around this area would be almost maintenance free except several relevant works such as monitoring of illegal poaching and others.

4) Conservation and Management

Freshwater turtles and tortoises are among the most important components of Cambodian biodiversity. However, they are not as well-known or popular as the sea turtles. Freshwater turtles and tortoises are mostly utilized and traded for human consumption (meat and eggs are consumed for food and medicine). With the growing human population and economic growth in East and Southeast Asia, the demand for turtles and tortoises for pets, food, and medicine is increasing. It can be predicted that without any further control on the trade, these species will certainly decline, as trade still continues even for protected species.

In the past, some of the wetland area or marsh, important habitat for freshwater turtles and tortoises, have been conserved in the form of National Parks in Cambodia. The challenge for the conservation of the Mekong floodplain area is to integrate the management of basin-wide floodplain area with conservation of biodiversity, including freshwater turtles and tortoises.

In order to lessen the occurrence of illegal hunting and trade, some programs for control measures shall be undertaken. The programs are not always specifically designed for turtles but for general wildlife conservation and trade monitoring and control. These include:

a. Undertaking consistent law enforcement, especially for protected and CITES (Convention on International trade in Endangered Species of Wild Fauna and Flora)-listed species which are under the responsibility of MAFF. Specially trained-personnel/or field officers shall be assigned in the regional office for the conservation of the biological resources.
b. Undertaking close coordination with MAFF at central and local levels in the conservation management of non-protected and non-CITES species.
c. Undertaking education and extension for the general community concerning conservation of turtles.

7.3.5 Environmental Management

(1) Introduction

Effective environmental management during pre-construction and construction requires the establishment of effective institutional arrangements for the implementation of the Environmental Management Plan (EMP). In general, any environmental management programme should be carried out as an integrated part of project planning and its execution, making a significant and continuous contribution to the overall development of the scheme. It must not be regarded merely as an activity limited to monitoring and regulating activities using a pre-determined checklist of required actions. Rather, it must interact dynamically as the project implementation proceeds, dealing flexibly with environmental impacts – both expected and unexpected as they arise. For this reason, the plan provides for periodic audits, which will evaluate compliance of on-site environmental management practices with the EMP requirements and also to refocus the plan itself in the light of experience and issues arising.

(2) Scopes and Objectives

EMP is concerned with the environmental impacts due to the construction of both new bridge and approach roads and these controlling procedures. The main purpose of EMP is to ensure that the various environmental protection measures selected through the project-planning phase are implemented during the construction phase, so that the environmental degradation and pollution resulting from construction activities will be minimized. Specific objectives of the plan are to:

a. Define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of staff, coordination, liaison and reporting procedures.
b. Discuss procedures for pro-active environmental management, so that potential problems can be identified and mitigation measures to be adopted prior to the construction commencement.

(3) Methodology

The basic approach to prepare the management plan comprises the following parts:

1. Reviews of the mitigation plan.
2. Discussions with engineering staff engaged on the design phase of the project.
3. Experience gained through past relevant environmental monitoring activity.

(4) Environmental Management Plan (EMP)

Within the EMP, the Engineer's role is to monitor the activities of the contractors and to take action under the terms of the contract to prevent and minimize the environmental damage. Basically, there are three factors to be considered in order to have an organized and efficient EMP: (1) the contractors' organization, (2) the resident engineer's organization, and (3) the liaison, coordination and reporting among each sections of the project.

1) Contractors' Organization.

The tender documents should require the contractor to state its environmental policy clearly. The clear specification of the responsibility for the environmental protection within the contractor's organization is a critical factor for the achievement of a good environmental control. So, it is necessary to ask contractors for submission of their proposals for the environmental management. Basically, this proposal must contain following items:

a. Clear statement of their environmental policy.
b. Their own organizational framework, in particular, the assignment of an engineer to take overall responsibility, to manage environmental control facilities on daily basis and to liaise with the Resident Engineer's monitoring team.
c. Principal pollution control facilities, including procedures of the construction wastes disposal, and of contingency plans in the event of facility failures.
d. Proposed environmental monitoring procedures in order to ensure that facilities are operating satisfactorily and problems are being dealt with promptly.
e. Environmental awareness training programme for the workforce.

2) Resident Engineer's Organization (REO)

The following arrangement might be necessary when the staffing structure for the project is finalized. Ultimate responsibility for environmental matters within the REO will rest with the Project Manager (PM), and with the Chief Resident Engineer (CRE) being responsible for daily direction and management. It will be necessary to have an Environmental Monitor (EM) who will be able to make occasional visits to sites, and a full-time local Assistant Environmental Monitor (Assistant EM) who will be responsible for daily monitoring of projects. The Environmental Monitor (EM) should have suitable experience in the environmental management.

The following is a brief description of the responsibilities of each team members.

a) Environmental Monitor (EM)

The EM has to act on two different levels. Firstly, the EM has to give overall advice and define the general procedures which will include environmental reports. Secondly, the EM will be involved in the establishment of the daily monitoring procedures. The following are major tasks for the EM:

First Level

a. To review and make him/or herself familiar with the EMP, including advice on:
   - The environmental management framework.
   - Reporting and liaison requirements.
   - Key environmental issues.
   - Monitoring strategy.
   - Data management.
   - Environmental control measure.

b. To carry out periodic environmental audits of the project in order to:
   - Identify any environmental performance deficiencies and advise how to address these.
   - Assess the degree of compliance with the EMP achieved on site.
   - Review the continuing relevance of the EMP in the light of experience, and instigate changes where appropriate.
   - Review the organization and administrative frameworks for the environmental management.
   - Review environmental monitoring data and its management.
   - Review environmental problems arisen and how these have been dealt with.
   - Propose changes to the environmental management procedures and framework and identify the need for additional measures to control environmental degradation.

c. To provide ad-hoc advice on environmental issues to the PM, CRE and Assistant EM.

Second Level

d. To establish an effective environmental monitoring, sampling and analysis programme.
e. To establish routine management, liaison and reporting systems, including the establishment of the environmental database.
f. To evaluate the results of the monitoring programme and to advise REs of required action.
g. To prepare routine management reports.
h. To advise the CRE/PM on the contractors' proposals for site establishments in terms of landscape, drainage, erosion control, liquid and solid hazardous waste management, fuel and chemical storage and site restoration.
i. To review the contractors' proposals for pollution control facilities and to advise on its adequacy.
j. To study the mitigation measures proposed by the contractors and to recommend safeguards.
k. To co-ordinate the sampling and analysis programme with a nominated laboratory.
l. To liaise and report on a routine basis with the MPWT, MoE and/or MAFF.
m. To train and support the Assistant EM.
n. To recommend the procurement of the equipment required for the environmental monitoring.
o. To advise on the need for expert assistance.

b) Assistant Environmental Monitor

The followings are fundamental routine tasks for the Assistant EM:

a. To undertake environmental monitoring through site inspections on a daily basis and to notify the EM/or the REs of any problems.
b. To conduct the routine sampling and analysis programs, and to take ad-hoc samples when necessary.
c. To look after the environmental monitoring equipment and to advise the EM or REs of defects, problems or replacement/or additional requirements.

d. To assist the EM in the analysis of results, preparation of reports and with other duties as required.
e. To be responsible for the daily management of the database system to be established.
f. To liaise with the local communities and to act as a channel for their concerns.

Sometimes, the Assistant EM has to take over tasks f, g, k and l of EM's, summarized earlier.

3) Liaison, Co-ordination and Reporting

a) Liaison with the Contractors
The Assistant EM will attend a weekly site meeting of the relevant contractors' staff and address environmental shortcomings arisen there. From the contractor's side, the attendance of the senior manager and the engineer responsible for the environmental protection would be preferable for this meeting. From the consultant's side, the EM or Assistant EM and the RE/or CRE will attend. These meetings should be minuted.

b) Liaison with Central Government.
As mentioned above, the Assistant EM will prepare a short monthly report for the submission to the relevant agencies such as the MPWT and the MoE and/or MAFF, and will be available to attend progress meetings when required.

c) Liaison with the Local Community
Liaison with the local community will be important during the construction period in order to ensure that their views are being taken into account and that problems and nuisances such as noise and dust are reduced to the minimum. All complaints must be recorded, and also, these records should show what action was taken, and when, and what monitoring is necessary.

d) Consultant's Internal Co-ordination and Reporting
The Environmental Monitoring Team will prepare a monthly report, which should not be lengthy, but will summarize issues carried over from the previous report, stating whether they have been resolved or are on-going, and new issues arising. This should be included in a general monthly progress report to be submitted to the MPWT. It is not envisaged that formal meetings will be required for the internal management of the environmental programme, or that ad-hoc meeting would be adequate.

4) Environmental Management and Audit Programme

The first several months of the construction phase will be important for the EMP establishment. It is anticipated that the Programme should be audited annually, but that the first audit should be carried out after six months in order to review the establishment of the management systems and procedures. The processes of environmental management should be continuously evolving and improving as the project proceeds.

7.3.6 Environmental Monitoring

(1) Introduction

Main objectives of the environmental monitoring are to provide a continuous feedback on project implementation to identify actual or potential successes/or problems at early stage, and to implement timely adjustments to whole project management work. Monitoring is a continuous assessment of project implementation and must be an integrated part of good management during the construction.

(2) Objectives

The objective of the monitoring system is to assist the project management by:

a. Defining requirements and procedures for the environmental monitoring (type of equipment to be used, monitoring schedule, parameters to be monitored and so on).
b. Identifying targets and objectives for the project implementation.
c. Keeping environmental records for the project evaluation.
d. Identifying problems arising from the project, and figuring out procedures for the environmental remediation in the event of the pollution or similar incidents.
e. Providing readily available results of related environmental analysis for the decision making.

(3) Scope of the Monitoring Plan

The scope of the monitoring plan is:

a. To identify the monitoring tasks to be undertaken by EM during the construction phase.
b. To identify the nature and the schedule of the monitoring.
c. To identify samples to be taken for analysis and parameters to be measured.

(4) Methodology

The basic approach to prepare this monitoring plan is comprised of following components:

a. Reviews of the mitigation plan discussed in previous section, and in particular, of the monitoring requirements identified for the construction phase of the project.
b. Discussions with engineering staff engaged in the project design and planning.
c. Consideration of the environmental monitoring experience.

Agency coordination will be addressed; coordination with the on-going monitoring program such as monthly water quality survey at the Mekong River by DoHR, MoWRM is vital in the development of post-EIA monitoring system. The monitoring objectives should be related to the anticipated impacts of the action. Comprehensive and/or targeted monitoring can be planned. Several iterations may be necessary to achieve a workable monitoring system. Flowchart diagram of monitoring system at developmental stage is attached in Appendix 7.3.

(5) Environmental Monitoring

The aim of the monitoring plan is to develop a cost-effective approach to monitor the contractors' environmental performance. Certain parameters (e.g., roadside air quality, noise and vibration, surface/subsurface water quality around the project area and so on) can be monitored through measurements, and others can only be monitored through the observation (e.g., tree cut-down, roadkill, unusual death of species). Careful observations made through this monitoring work, established by a forward planning, is a key part for a successful environmental management to prevent problems (or at least to limit their effects).

Baseline data to be summarized in this project will help to define the requirements for the site restoration and provide a basis for the comparison of effects during the construction. Post project audit should be carried out to examine the success of the site restoration and evaluate the effectiveness of the mitigation measures adopted.

(6) Monitoring Requirements

The monitoring requirements of the Monitoring Programme were identified in the Mitigation Plan. The Engineer should be responsible for the monitoring the activities of the contractor, and the EM and the Assistant EM should assist the Engineer in the monitoring which requires measurements, based on responsibilities listed in previous chapter.

The monitoring activities can be divided into following two groups: (i) one which can be carried out through measurement, and (ii) one which will be carried out through observation.

Table 7.3.15 provides more detailed descriptions of the activities to be undertaken for each of the monitoring requirements. It is strongly recommended that corresponding clauses should be developed for the inclusion in the bid documents. The monitoring requirements for the air quality, noise and vibration, groundwater level, and surface and subsurface water quality to be followed will be the responsibility of the EM.

Table 7.3.15 Monitoring Activities and Indicators

Monitoring Issue	Monitoring Method	Positive Indicator
Air Quality	Observations should be made on the level of dust generated during construction activities. Damping down should be carried out if levels are unacceptable. Further details on the method to be used are provided in following sections.	Deposition of dust on surfaces should decrease with increased dampening.
Water Quality	Engineer should monitor the water quality of the Mekong River, and tributaries running into the Mekong River during the construction activity.	No accidental spillage of construction wastes into the Mekong River nor relevant significant water quality degradation recognized throughout construction period.
Soils and sedimentation (erosion and seepage)	Engineer should make a daily inspection of earthworks, and ensure that slopes are suitably graded. Once earthworks are complete, Engineer should monitor restoration measures implemented by Contractor, such as re-vegetation or use of gabion mattress as well as occurrence of seepage-related erosion.	Absence of rills, gullies or other erosion features. No significant seepage-related erosion recognized.
Soils and sedimentation (sedimentation)	Engineer should monitor sedimentation of major tributaries and sandbar generation at downstream side of new routes for safe flood control.	No trace of significant sedimentation and of new sand bar generation. Secure safe river space and make local water flowing smooth.
Waste Disposal	Engineer to ensure waste dumping site for construction waste material, soil, and so on.	No illegal disposal of waste material.
Noise/ Vibration	Noise measurement should be carried out at the boundary and the inside of the work site and at the nearest sensitive receiver. Vibration measurement should be carried out within the residential area.	Noise levels at the nearest sensitive receiver should not exceed the Cambodian environmental standards.
Subsidence	Engineer should monitor the subsidence around the project site.	No differential settlement that would cause cracks/or partial destruction of the road will not be occurred.

Monitoring Issue	Monitoring Method	Positive Indicator
Bad Smell	Engineer to ensure that no illegal dumping of household waste from the construction yard nor newly created permanent inundation area on where plants will be forced to be submerged for the long term.	No complaints about the compost smell to be generated from submerged and decayed plants.
Topography and Geology	Engineer should monitor occurrence of newly developed inundation or flooding events around the project site.	No trace of permanent inundation and/or flooding.
	Engineer should monitor regional groundwater level distribution and enhanced consolidation to be caused by groundwater level drawdown, periodically.	No big groundwater level fluctuation. No regional vegetation change and/nor enhanced aquifer consolidation.
River Bed (e.g., benthos)	Engineer should monitor the water quality (e.g., turbidity, TSS and others) of the Mekong River as well as temporal disturbance to the river bed condition.	No significant disturbance to the river bed condition (e.g., benthos) recognized during the construction period.
Flora/Fauna (Vegetation)	Engineer should ensure that excessive clearance of vegetation is avoided. Contractor must seek approval of Engineer prior to clearance. Re-planting or relocation of trees should be done with the coordination of MoE and/or MAFF.	Area of vegetation to be cleared minimized. Relocation/or replanting be coordinated with MoE and/or MAFF.
Flora/Fauna (Birds/wildlife/ aquatic species)	Engineer should examine the timing, shaping and sizing operations to avoid breeding or nesting season and trees, protecting key food, cover, and water resources. The number of roadkill and unusual death of aquatic species shall be counted.	No trace of roadkills, unusual death of any species.
Flora/Fauna (Conservation pond for box turtles)	Engineer should inspect the creation of conservation pond such as accidental spillage of construction waste or illegal dumping of waste into the pond.	No significant water quality degradation nor disturbance to local environment of conservation pond recognized.
Flora/Fauna (illegal fishing/or hunting)	Engineer should monitor in collaboration with both Kandal and Prey Veng Fisheries Department if there is illegal fishing/or hunting of local species.	No report of illegal fishing/or activities by construction worker.
Water Resources	Engineer should monitor the water quality of wells located around the project site as well as the occurrence of dried-up wells to be caused by groundwater level drawdown during the construction period.	No significant water quality degradation and/or dried-up wells recognized throughout construction period.
Accidents (road safety)	Engineer should monitor the condition of trucks arriving at the site and keep a record of night driving.	No road accidents related with project. Night driving kept to minimum.
Accidents (UXOs)	Engineer to ensure that UXOs within the project site cleared completely.	No additional discovery/or hitting of UXO during the construction period.
Accidents (Vessel collision)	Engineer should monitor the condition of barges operating at the site while have coordination with current maritime operation of the Mekong River (e.g., ferry, container ship and others).	No vessel accidents related with project.
Complaints	Engineer should inspect the record of complaints made by local residents, to be kept by Contractor, and should check that action is taken quickly and that the number of complaints does not rise significantly.	Number of complaints decreases.

1) Noise and Vibration

The purpose of the noise and vibration monitoring is to limit nuisance to local residents and to the workforce, and the noise should be measured frequently during the construction. Potential sources of the noise include a heavy construction plant and vehicles. An ad-hoc approach should be taken, depending on the type of activities in progress and their location on site in relation to sensitive receivers. Background noise and vibration level must be measured before the project commencement. Parameters to be monitored for the noise and vibration are Leq (dBA) and L10 (dB), respectively. Remedial measures will be taken when Leq value exceeds the Cambodian environmental standard. In Cambodia, no environmental standards for vibration is established, yet, but there would be likelihood to have property damage due to the roadside vibration to some extents when the traffic volume will be increased during both construction and operation periods. So, it is wise to use other ISO-based vibration standards such as the one implemented in Japan for the vibration monitoring.

2) Dust

The objective of the dust monitoring is to control nuisance to both local residents and the workforce on site. Monitoring site should be located in areas where there are sensitive receivers. Generally, dust generation is the most severe along unpaved access roads and at areas where loose materials are handled (e.g., industrial wastes site, stockpiles, and so on). Based on those facts, the monitoring station sites should be determined. Parameters to be monitored are PM-10 and/or the weight of the dust accumulated within a specific time period (e.g., 1 week – 1 month). Background dust level must be measured before the project commencement, and remedial measures will be taken where more than 50% increase of the background dust level occurs or when PM-10 value exceeds the Cambodian environmental standard.

3) Groundwater Level

The objective of the groundwater monitoring is to observe a change in the regional water balance during construction. Several monitoring wells should be installed in order to establish a proper monitoring network, and the monitoring will determine whether there is a severe drawdown/or uprising, that will lead to regional aquifer consolidation/or vegetation change.

4) Groundwater Quality

Parameters to be monitored include: organoleptic conditions such as color and odor; physico-chemical characteristic such as turbidity, conductivity, sulfate and aluminum content; undesirable substances such as nitrates and hydrocarbons; toxic substances such as chromium, lead and pesticide. Polluted discharge from road surfaces can be assessed either by heavy metal content, oil or suspended matter. Also, spillage of untreated household effluents can be detected by BOD, COD, Coli-form, grease and other common parameters.

5) Surface Water Quality

It is essential to have periodical water quality tests during the construction phase of the project in order to check the water quality pumped from excavations and discharges from construction sites, and to monitor the effects of any localized pollution due to human activities and spills. In particular, intense water quality monitoring program should be implemented around the project site of the Mekong River. Monitoring of the ambient water quality will determine whether there are likely to be problems for downstream users, whereas monitoring of the effluents will help to identify the source of the problem and the remedial action. Parameters to be monitored should reflect the type of contaminants likely

to be detected. For example, contamination caused by concrete may be detected through increased pH levels.

6) Conservation Pond

It is essential to prepare a proper field surveillance/or monitoring program in order to establish a well-managed conservation pond and to avoid/or lessen the occurrence of illegal hunting therein. As described in previous section, the alternative site for the conservation pond is ex-old river and several ponds and natural vegetation already exist. So, construction itself (e.g., setting up of fence and signboard) would not take relatively long time nor huge man power, and it is expected to this newly created conservation pond would become a full-fledged sanctuary within relatively short time period (Walston, personal communication, 2005). However, it is recommendable to assign a special trained-personnel/or field officer in the regional office for the periodic on-site check of the conservation pond status (e.g., direct observation of pond, water quality, number of turtles recognized within this pond, occurrence of any damages to the fence, and so on).

7) Fish

As mentioned in the early section, there is little information on the ecology and distribution of most of these species, especially their local status around Neak Loeung. It is, accordingly, essential to monitor the impacts on fish, especially such critically endangered species as Mekong Giant Catfish, during/after the construction of the project bridge, using fisheries catch data and local ecological surveys, in order to mitigate these adverse impacts on them.

(7) Implementation and operation of monitoring program

In general, implementing the monitoring system requires considerable efforts in obtaining specific inter-agency agreement and necessary funding. This step mainly involves data collection, analysis, and evaluation. Impact evaluation will involve the pre-determination of criteria to be used for the interpretation. These criteria should be based on legal, institutional limits, professional judgments and/or public inputs. Development of appropriate response plans to impact trends can be time-consuming and technically difficult, and may require considerable coordinating efforts. It is important that such plans be developed prior to implementation of the monitoring system. It is also very important that periodical summary reports be prepared in order to document the finding and resultant response to the post-EIA (or EIS) monitoring program. Flowchart of this implementation and operation of monitoring system is shown in Appendix 7.3.

(8) Manpower and Budgeting

It is envisaged that the Engineer will carry out the environmental monitoring programme as a part of the contract throughout entire construction work. The EM will be employed on a full-time basis. Also, the Assistant EM will be full-time, and will report to the Engineer, and the EM. The cost of implementing the monitoring plan will include the full-time salary of the EM and Assistant EM. It may be necessary to employ an international environmental expert for the initial training of EMs and subsequently to attend at audit time.

(9) Environmental Management Costs

Environmental protection costs are of two types: (i) sub-components of bridge/approach road structures (e.g., drains, vegetation, fence and other relevant facilities), and (ii) technical support and management. Generally, the cost of direct environmental protection measure such as drains and fence construction works is included within the estimation of the direct construction cost. So, here, the cost for the later item is summarized as

environmental management costs, and is usually included within the administration cost.

The environmental technical support for the project consists of following five components: (1) hiring environmental personnel, (2) local consultation, (3) training and coordination meeting, (4) facilitation, and (5) periodic environmental surveys.

From the economic points of view, it is strongly recommended to carry out periodic on-site monitoring such as roadside air quality, noise and water quality survey not by another contracted survey company but by EMs themselves. Besides, these survey instruments manufactured recently are very portable and accurate, so that the feedback of those survey results to environmental monitoring program will be quick.

Mainly, the environmental management cost to be associated with this bridge construction project consists of following two components: (1) periodical environmental monitoring activities around the study area, and (2) the conservation activities of the box turtle (IUCN Vulnerable). Periodical environmental monitoring activities cover from water quality survey of the surface water (e.g., the Mekong River) and the groundwater (e.g., wells located around the study area) to the roadside noise survey. The annual cost of the proposed environmental monitoring program excluding the cost of the box turtle conservation pond, described later, would be US$ 116,200/year (see Table 7.3.16). Entire bridge construction work would take roughly five years, so it can be assumed that relevant environmental monitoring activities summarized within its environmental program will be and/or must be carried out continuously/or periodically during this period. Thus, the total cost of this environmental monitoring work would be US$ 581,000.

Table 7.3.17 summarizes the cost estimate to be required for the conversion of the ex-old river ponds into the conservation pond for the box turtles (IUCN Vulnerable). Here, it is assumed that the conservation pond can be constructed within five months, provided that the detailed design of the conservation pond is finalized. In addition, relevant monitoring activities such as periodical site inspections will be required for at least five years after the conservation pond construction is completed. The construction and relevant monitoring and follow-up work would cost US$ 95,850. As a total, whole environmental cost to be associated with this bridge construction project would be US$ 676,850.

Table 7.3.16 Cost Estimates of Environmental Program for 2nd Mekong Bridge Construction Project

Item	Unit Price [US$]	Quantity	Amount [US$]
Hiring Environmental Staff			
Environmental Monitor	48,000	1 person/yr	48,000
Assistant EM	24,000	1 person/yr	24,000
Short-Term Consultation Services			
Contractor Crew Briefing on-site		L.S.	1,000
Base Technical Support and Assistance			
Periodic water quality survey (6 pts x 10 parameters, monthly)	1,200	12 times	14,400
Periodic groundwater quality survey (4 pts x 10 parameter, monthly)	800	12 times	9,600
Periodic air quality survey (2 pts x 2 parameters, monthly)	1,100	12 times	13,200

Periodic Roadside noise survey (2 pts x daytime only & monthly)	500	12 times	6,000
Total			116,200

Note: The Box Turtle pond construction cost is not included in this valuation.

Table 7.3.17 Cost Estimate of the Creation of the Conservation Pond

Item	Unit Price [US$]	Quantity	Amount [US$]
Construction Phase			
Construction Worker	70/month/person	5 workers over 4 months	1,400
Restoration Worker	70/month/person 200/month	5 worker over 3 months	1,050
Local Management	1,000/month	1 person over 12 months	2,400
Management and Supervision		1 person over 12 months	12,000
Development and production of educational materials (e.g., leaflets, fence, signboard and others)		L.S.	2,000
Sub Total			18,850
Monitoring and follow-up Phase			
Local Management	5,000	1 person/half year over 5 years	25,000 50,000
Management and Supervision	10,000	1 person/half year over 5 years	2,000
Conservation-related Social Survey	1,000	2 times	
Subtotal			77,000
Total			95,850

7.3.7 Recommendation

Throughout this EIA study on the natural environment, it was found that potential impacts on the water quality, inundation, and subsidence[4] would not be negligible. Also, it was found that several important reptile species with IUCN "Vulnerable" status occur on the east side of the Mekong River, so the conservation of those species is one of important and critical discussion points. As mentioned earlier, the key components of the local fauna/flora conservation of the Mekong floodplain area is to establish well-coordinated link with a basin-wide LMB management program while undertaking education and extension for the general community concerning biodiversity conservation. It is quite essential to establish comprehensive and effective environmental mitigation/management programs during the project-planning phase of this project.

7.4 Impact Assessment of Social Environment

Based on the comprehensive literature reviews and the collection of the up-to-date baseline social information/data, the social environmental conditions around the study area of Neak Loeung were profiled, and potential social impacts were qualitatively and quantitatively identified. In addition, more in-depth field survey covering a wide range of socio-economic information were conducted in order to obtain the full-scale data and information to identify those impacts.

Regarding the spatial range in which potential social impacts were assessed, the Study covered the project affected area under the proposed *"Ferry+Bridge Option (Route A)"* across the following 12

[4] The detailed engineering discussion on both inundation and subsidence is explored in Interim Report and Progress Report (2) of this Study.

villages in 4 communes.

Table 7.4.1 Study Area related to EIA Study (Social Environment)

Province	District	Commune	No. of Villages
Kandal	Leuk Daek	Kampong Phnum	2
Prey Veng	Peam Ro	Preak Khsay Ka	2
		Preak Khsay Kha	6
		Banlish Prasat	2

Regarding the time range in which potential social impacts were assessed, the Study covered the pre-construction period, the construction period, and the post-construction period under the proposed *"Ferry+Bridge Option (Route A)"*.

More concretely, the EIA study on social environment was based on more in-depth qualitative and quantitative data analysis resulting from a series of field surveys in order to assess the following potential social impacts.

Table 7.4.2 Summary of Possible Impacts (Social Environment)

No.	Environmental Factors	Remarks of Possible Impacts
1	Migration of Populations and Involuntary Resettlement	1) Involuntary resettlement of houses and land due to the acquisition of land needed before the construction period
2	Impact on Local Economy (Employment, Livelihood, etc.)	1) Possibility of increase in unemployment of vendors at the ferry terminals due to decrease in the demand stemming from the abolishment of the ferry services after the construction period 2) Possibility of decrease in sales of local restaurants and retail shops due to decrease in the demand stemming from the abolishment of the ferry services after the construction period 3) Possibility of unemployment of local workers and staff of the Neak Loeung Ferry after the construction period
3	Utilization of Land and Local Resources	1) Slight possibility of reducing the production of agriculture and fishing in the flood-free area due to the change of the land use pattern during and after the construction period. 2) Almost no possibility of increasing forest crimes due to the opening of the bridge after the construction period
4	Social Institutions (Social Capital and Local Decision-making institution)	1) Slight possibility of hampering communes' and villages' official decision-making process after the construction period
5	Existing Social Infrastructure and Services	1) No adverse impacts on various social capitals such as norms, network and social bond of the local communities after the construction period 2) Improvement in accessibility to various social services such as educational and medical services after the construction period
6	Vulnerable Social Groups	1) Possibility of adverse economic impacts on vulnerable households who will be resettled before the construction period 2) Possibility of decreasing vulnerable households' income due to the abolishment of the ferry services after the construction period
7	Equality of Benefits and Losses and Equality in Development process	1) Possibility of unequal distribution of economic benefits between the rich and the poor after the construction period 2) Possibility of incurring the disparity in geographical advantages between well-located households and badly-located households after the construction period
8	Local Conflicts	1) Slight possibility of incurring economic conflicts such as land disputes between flooded area and flood-free area due to the creation of the flood-free area after the construction period
9	Gender	1) Possibility of decreasing women's cash income or

No.	Environmental Factors	Remarks of Possible Impacts
		unemployment due to the abolishment of the ferry services after the construction period 2) Possibility of increasing the risk of occurrence of sexual exploitation such as trafficking of women due to the increase in traffic after the construction period 3) Possibility of increasing prevalence of women's HIV/AIDS due to the massive inflow of construction workers during the construction period
10	Children's Rights	1) Possibility of decreasing children's cash income due to the the abolishment of ferry services after the construction period 2) Possibility of increasing the risk of occurrence of sexual exploitation such as trafficking of children due to the increase in traffic after the construction period
11	Cultural Heritage	1) No resettlement of archeological heritage sites and religious monuments before and during the construction period
12	Infectious Diseases (HIV/AIDS)	1) Possibility of increasing prevalence of HIV/AIDS due to the massive inflow of construction workers during the construction period 2) Possibility of increasing prevalence of HIV/AIDS due to the improvement of mobility of the people to and from urban areas after the construction period

7.4.1 Description of Impacts on Social Environment

As a preliminary step for grasping the snapshot of the socio-economic profile of the project affected area, the basic demographic baseline data of the area were identified. The project affected area is composed of 6 communes in 2 districts which administratively belong to Kandal Province and Prey Veaeng Province, respectively. The total number of households and population in the project affected area is 7,614 and 39,238, respectively. The area is divided into the western side of the River which enjoys geographical proximity and access to Phnom Penh, the nation's capital, and the eastern side of the River which is a hub for commercial transactions in the project affected area. The employment structure of the area is also shown below. The main activities in the community areas along the Route A are lowland rice production, livestock rearing, fruit tree production and small scale vegetable growing. Some families engaged in the fishing business during the wet season and most of fishing activities take place to supply food for the family. Preak Khsay Kha Commune is the commercial center of the region where the rate of the agricultural activities is relatively small compared with other communes (the location of communes/villages can be seen in Figure 2.1.5, Chapter 2 of Main Report).

Table 7.4.3 Number of Households and Population by Village in the Project Affected Area

Commune	Village	Number of Households	Population
Banlich Prasat	Preak Cham	378	1,994
	Preak Reang	155	824
Sub Total		533	2,818
Preak Khsay Ka	Udom	843	4,118
	Preak Shsay	465	2,638
Sub Total		1,308	6,756
Preak Khsay Kha	Phoum Moy	370	1,718
	Phoum Pir	298	1,658
	Phoum Bey	291	1,432
	Phoum Boun	448	1,965
	Phoum Pram	598	2,779
	Phoum Prammoy	428	2,356
Sub Total		2,433	11,908

	Neak Loeung	Neak Loeung	415	2,255
		Preak Tasor	176	873
	Sub Total		591	3,128
	Kampong Phnom	Ampil Tek	874	4,469
		Koh Chamrean	358	1,831
	Sub Total		1,232	6,300
	Preak Tonloab	Kampong Chamlang	922	4,728
		Spean Deak	595	3,600
	Sub Total		1,517	8,328
Total			7,614	39,238

Source: Commune Offices, 2004

Table 7.4.4 Employment Structure by Commune in the Project Affected Area

Commune		Agriculture & Fishing	Whole Sale & Retail	Transportation	Manufacturing	Officials	Others
	Banlich Prasat	86.4%	2.6%	1.1%	0.1%	1.3%	8.5%
	Preak Khsay Ka	16.9%	28.2%	16.7%	7.9%	8.6%	21.7%
	Preak Khsay Kha	5.3%	42.1%	18.2%	5.8%	6.9%	21.7%
	Neak Loeung	65.6%	7.7%	4.3%	2.9%	3.1%	16.4%
PreyVeaeng Side Subtotal		23.5%	30.3%	14.5%	5.3%	6.4%	20.0%
	Kampong Phnum	69.0%	6.1%	7.8%	1.7%	4.0%	11.4%
	Preak Tonloab	25.8%	24.0%	17.0%	3.8%	3.8%	25.6%
Kandal Side Subtotal		43.3%	16.7%	13.3%	2.9%	3.9%	19.9%

Source: Calculated from Results of Census 1998

In addition to the general snapshot of the project area, the socio-economic profile survey for PAPs was conducted to accurately grasp the baseline socio-economic situations of the PAPs, the results of which are separately reported in section 7.5.

7.4.2 Summary of Impacts on Social Environment

(1) Involuntary Resettlement

1) Baseline Information

Involuntary resettlement should be one of the most critical social impacts in project identification. The items to be compensated in case of resettlement include loss of arable land, loss of residential or commercial land, loss of structures, loss of crops, and etc. Adverse impacts caused by the Project should be mitigated so that it enables the project affected persons to improve their living standards, income opportunities or at least to restore their living including their income to the pre-project level. The socio-economic status of the PAPs is separately discussed in section 7.4.2 (6) and 7.5.

2) Description of Impacts

The most important direct impact in terms of social environment will be acquisition of the land needed for the works associated with *the pre-construction period* of the Bridge. These works would include the construction works for approach roads, shoulders, embankments, side drains, box culvert sites, and etc. In addition, the land would be necessary for the construction yards for contractors' stationing which will be composed of offices, workshops, storage, handling yards, and etc. While, at the time of designing the tentative alignment of the route of the Bridge, the number of the PAPs in the tentative "Construction Area" was estimated at 54 households, at the time of revising the alignment of the route,

the number of the PAPs in the planned "Construction Area" who would be resettled was finally estimated at 131 households. In addition to these PAPs, 129 landowners inside the "Construction Area" were also regarded as PAPs. Totally, 260 households are finally regarded as PAPs. These PAPs are distributed across the route of the Bridge in 5 clusters of communities in Kampong Phnom, Preak Khsay Ka, and Preak Khsay Kha communes. The detailed explanation of the impacts on these PAPs is discussed in section 7.5.

(2) Impacts on Local Economy

1) Baseline Information

In the project affected area, while the eastern side of the River has a larger market area being a commercial center in the region, the economic level of the western side is not so active in spite of its proxy to Phnom Penh. More specifically, it is reported that, while the average monthly income per household at the eastern side is USD 289, that of the western side is USD 170, indicating that the estimated gross regional income in the project area is estimated at USD 22.73 million per annum, as the below Table shows. The economic profiles of PAPs including the PAP's income level in the communes on Route A are separately reported in section 7.5.

Table 7.4.5 Monthly Income and Estimated Gross Income in the Project Affected Area

Side	Number of Households	Monthly Income (USD / month)	Estimated Gross Regional Income per Annum (USD million / year)
Eastern Side	4,977	289.0	17.26
Western Side	2,682	170.0	5.47
Total	32.3	-	22.73

Source: Calculated from the Socio-economic Survey conducted by the JICA Study Team, 2004

In addition to the income level, the income distribution in the project affected area represented by relevant poverty and inequality indices is critical. Although there is a limitation of availability of the commune-wise poverty indices such as poverty head count, poverty gap rate and square poverty gap rate, the poverty profile is indicated using the existing data in provinces including the project affected area. It can be observed that the situation in the eastern side (Prey Veaeng side) is worse than the western side (Kandal side) in all the indices. Since the project affected area is close to the commercial hubs of both provinces, it is estimated that the actual poverty indices in the specific area would be better than these available data.

Table 7.4.6 Poverty Indices in Provinces including the Project Affected Areas

Province	Poverty Head Count (%)	Poverty Gap Rate (%)	Square Poverty Gap Rate (%)
Kandal	28.0	4.3	1.1
Prey Veaeng	48.1	8.8	2.2
Rural Provinces Average	40.1	6.9	2.1
Phnom Penh	9.7	2.0	0.6
Cambodia Nation-wide	35.9	6.5	2.0

Source: Poverty Profile Survey (calculated based on 1999 CSES) by in Cambodia, JBIC, December 2001

Other critical indicators include inequality index represented by Gini coefficient. Although there is a limitation of availability of the commune-wise Gini coefficient, the inequality profile is indicated using the existing data in provinces including the project affected area.

It can be observed that the situation in the western side is worse than the eastern side in Gini coefficient, implying a slightly more unequal income distribution in the western side. Since the project affected area is close to the commercial hubs of both provinces, it is estimated that the actual inequality index in the specific area would be to some extent worse than these available data, taking into account the fact that the Gini coefficient of the urban area is generally higher than that of the rural area in Cambodia.

Table 7.4.7 Gini Coefficients in Provinces including the Project Affected Areas

Province	Gini Coefficient
Kandal	0.197
Prey Veaeng	0.185
Rural Provinces Average	0.172
Phnom Penh	0.340
Cambodia Nation-wide	0.287

Source: Poverty Profile Survey (calculated based on 1999 CSES) in Cambodia, JBIC, December 2001

a) Market, Retailers and restaurants

In the project affected area, there are two large markets at both sides of the River; '*Preak Tomloadb Old Market (Phsar Char)*' proximately situated in the western ferry terminal, and *Neak Loeung New Market (Phsar Thmey)*' proximately situated in the eastern ferry terminal.

In the western market, there are 124 shops, 138 stands, and 78 stalls. The vendors daily open their stores from 6 AM to 5 PM. The majority of the sales are generated from sale of local products, and the type of goods include vegetables, meat, clothing, fish rice, shoes, and other daily products for local people. The outline of the western market as well as the general location map of the western terminal is described below.

Note: This figure shows the result of sampling survey and only the samples surveyed are colored.

Figure 7.4.1 Snapshot of Western Terminal

Table 7.4.8 Outline of the Western Market

No.	Shops/Stands/Stalls	Size	Number of Retailers	Annual Rent
1	Shop	2 x 4 m	67	USD 120
2	Shop	2 x 3 m	10	USD 120

No.	Shops/Stands/Stalls	Size	Number of Retailers	Annual Rent
3	Shop	2 x 2 m	41	USD 60
4	Shop	1.5 x 2 m	6	USD 60
5	Stand/Bed	2 x 2 m	64	Riel 15,000 (Monthly)
6	Stand/Bed	1.2 x 2 m	74	Riel 12,000 (Monthly)
7	Open Air		78	Pay Daily Tax
	Total		340	

Source: Kampong Chamlang Market Bureau

Table 7.4.9 Business Information of Retailers at Large Market at Western Ferry Terminals

No.	Years of Business	Kind of Products	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	7	Shoes, Belts	5,500	10	20.0	Decrease customers.
2	5	Clothes, Trousers	5,000	5	10.0	Decrease customers.
3	15	Clothes	2,500	5	10.0	Decrease customers.
4	14	Grocery, Cake, Beverage	3,500	3	0.0	No Problem.
5	25	Fruit	4,500	5	5.0	No problem.
6	20	Grocery	25,000	10	10.0	No Problem.
7	10	Rice	4,500	5	0.0	No Problem.
8	10	Fire Wood	2,500	6	10.0	Lose profit.
9	10	Grocery, Meat	15,000	10	50.0	Lose profit.
10	10	Clothes	15,000	10	0.0	No problem.

Source: Survey Results of Study Team, August 2005

Out of these retailers, 10 shops were interviewed to grasp the economic profile of retailers in the market. Each shop received from 3 to 10 customers a day. Averagely, one customer spent from Riel 2,000 up to Riel 30,000, depending on the type of and amount of goods bought. Most of the customers were local residents of Neak Loeung. This suggests that despite the ferry being moved or abolished in future, it will have little negative impact on the vendors' income. Nevertheless, some have expressed concerns that they would lose some customers since local residents would buy goods from Phnom Penh or elsewhere when they can get easy access to other business locations through the Bridge, while some of them said they had no concern. They, however, have requested the government or the local authority to develop the existing ferry to be the port or build factories in the area so that their economy can be sustained or improved.

In the eastern market, there are 788 shops (only 528 shops in operation, 260 not in operation), 60 stands outside the market, and 201 stalls located around the market. They are selling all kinds of daily products such as meat, vegetables and other goods. The vendors daily open their stores everyday from 6 AM to 5 PM. The majority of the sales are local products, and the type of goods include vegetables, meat, clothing, fish rice, shoes, etc, other daily products for local people. The outline of the eastern market as well as the general location map of the eastern terminal is described as below. The annual rent of shops in the eastern market is much higher than that in the western market, reflecting the fact that the eastern market is the commercial hub of the region.

Note: This figure shows the result of sampling survey and only the samples surveyed are colored.

Figure 7.4.2 Snapshot of Eastern Terminal

Table 7.4.10 Outline of the Eastern Market

Items	Number of Retailers	Size	Annual Rent
Gold	28	4 m x 6 m	USD 1,500-1,800
Clothes	200	4 m x 6 m	USD 1,500-1,800
Chinese noodle	10	4 m x 6 m	USD 1,500-1,800
Desert	5	4 m x 6 m	USD 1,500-1,800
Grocery	230	4 m x 6 m	USD 1,500-1,800
Rice pot, china wares	30	4 m x 6 m	USD 1,500-1,800
Stationary	25	4 m x 6 m	USD 1,500-1,800
Total	528		
Shops outside market	60	4mx 6m	USD 8,000-9,000
Other shops	201	1.2 x 1.2 m	Riel 15,000 (Monthly)
Grand Total	789		

Source: Neak Loeung Market Bureau

Table 7.4.11 Business Information of Retailers at Large Market at Eastern Ferry Terminals

No.	Years of Business	Kind of Products	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	10	Cloths	9,500	10	30.0	No Problem.
2	8	Cloths, Shoes	22,500	10	40.0	No problem.
3	9	Grocery	35,000	20	0.0	No Problem.
4	9	Kitchen Material	24,000	5	10.0	Lose customers.
5	20	Pork	15,000	10	30.0	No problem.
6	12	Gold, Watch	15,000	3	2.0	No Problem.
7	4	Shoes, Bags	7,500	4	20.0	Lose customers.
8	20	Monk Cloths	4,500	4	20.0	No problem.
9	25	Mosquito Net, Belts	25,000	4	20.0	No problem.
10	14	Clothes, Bags	7,500	10	20.0	No problem.

Source: Survey Results of Study Team, August 2005

Out of these retailers, 10 shops were interviewed to grasp the economic profile of retailers in the market. The number of customers ranges from 5 to 20 customers a day. Averagely one customer spent from Riel 100 up to Riel 30,000, depending on the type of and amount of goods bought.

On this eastern side, buyers came from different places. According to the interview, it suggested that Neak Loeung market received a considerable number of outsiders. Some vendors have expressed concern that their customers may move to buy in Phnom Penh or other business locations when the ferry is moved or abolished in the future, while the majority had no concern. Although the majority of their business is for local people, there might be some decrease in their business in case of the abolishment of the ferry services.

In addition to the retailers in the large markets of the both terminals, there are small-scale retailers and restaurant owners who are doing business in both terminals. The economic profiles of these people are summarized below; the results show that the sales of these small-scale shops and restaurants are also generated from outsiders such as passersby of the terminals.

Table 7.4.12 Business Information of Retailers (Western Terminals)

No.	Years of Business	Kind of Products	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	17	Gold, Mobile Phone	30,000	15	30.0	No Problem.
2	2	Motor Repair	5,000	3	40.0	No problem.
3	5	Money Change, Phone	25,000	15	0.0	No Problem.
4	25	Grocery Cake	15,000	20	90.0	Lose customers.
5	14	Grocery, Money Change	20,000	50	30.0	No problem.
6	15	Watches, Glasses	4,000	3	2.0	No Problem.
7	15	Stationary, Photocopy	7,500	10	20.0	Lose customers.
8	20	Newspaper, Cigarette	7,500	5	80.0	No problem.
9	25	Watches, Glasses, Gold	40,000	5	20.0	No problem.
10	3	Second-hand Bicycle	8,000	1	10.0	No problem.

Source: Survey Results of Study Team, August 2005

Table 7.4.13 Business Information of Retailers (Eastern Terminals)

No.	Years of Business	Kind of Products	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	10	Cloths	9,500	10	20.0	No Problem.
2	8	Cloths, Shoes	22,500	10	10.0	No problem.
3	9	Grocery	35,000	20	0.0	No Problem.
4	9	Kitchen Material	24,000	5	5.0	Lose customers.
5	20	Pork	15,000	10	10.0	No problem.
6	12	Gold, Watch	15,000	3	2.0	No Problem.
7	4	Shoes, Bags	7,500	4	10.0	Lose customers.
8	20	Monk Cloths	4,500	4	5.0	No problem.
9	25	Mosquito Net, Belts	25,000	4	5.0	No problem.
10	14	Clothes, Bags	7,500	10	20.0	No problem.

Source: Survey Results of Study Team, August 2005

There are 17 restaurants situated about 100 m away from the ferry terminals. They open everyday usually from 6 AM to 6 PM, while some start earlier and close late at night. The restaurants serve Khmer, Chinese and Vietnamese food. The average daily gross profit ranges from Riel 5,000 to Riel 150,000. The number of customers for restaurants ranges from 15 to 75 customers a day. Most of restaurant owners interviewed at the both east and west terminals are serving more outsiders than local people. Some restaurant owners are worried that they might lose customers when the ferry is abolished, while others said they had no comment or are not worried.

Table 7.4.14 Business Information of Restaurants (Eastern Terminal)

No.	Years of Business	Kind of Food	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	4	Khmer, Chinese	15,000	15	40.0	Decrease customers.
2	7	Khmer	50,000	20	80.0	No comments.
3	26	Khmer, Chinese	50,000	20	100.0	Decrease customers.
4	25	Khmer	75,000	30	100.0	No comments.
5	7	Khmer	35,000	15	70.0	Move to other places.
6	23	Khmer	50,000	50	70.0	No comments
7	25	Khmer, Vietnamese	50,000	70	100.0	No comments.
8	3	Khmer	100,000	75	90.0	No comments.
9	6	Khmer	60,000	25	80.0	Decrease customers
10	2	Khmer	30,000	20	80.0	No comments.

Source: Survey Results of Study Team, August 2005

Table 7.4.15 Business Information of Restaurants (Western Terminal)

No.	Years of Business	Kind of Food	Average Gross Profit per Day (Riel)	Average Customers per Day (Persons)	Percentage of Sales to Passersby at Ferry Terminals (%)	Comments on Impacts by Abolishment of Ferry Terminals
1	25	Khmer	15,000	20	70.0	Decrease customers.
2	10	Khmer	45,000	40	65.0	No comments.
3	25	Khmer, Chinese	55,000	15	70.0	No comments.
4	20	Khmer, Chinese	150,000	50	100.0	Lose job.
5	20	Khmer	20,000	30	100.0	Lose job.
6	25	Khmer, Chinese	5,000	30	50.0	Decrease customers.
7	25	Noodles, Coffee	0	20	50.0	Lose job.

Source: Survey Results of Study Team, August 2005

b) Vendors at Ferry Terminals

Neak Loeung ferry not only provides crossing for people over the Mekong River but also provides job and business opportunities for local people who work as mobile vendors or send their kids out to sell domestic products at the terminals. There are approximate 604 mobile vendors doing their daily businesses on both terminals, east and west.

Out of 604 mobile vendors (Cambodian women, men, and children and the Vietnamese), there are 3 types of vendors:

- Vendors who spend their money to buy goods and resell them for profit (10%)
- Vendors who do not spend their money, but make profit from the commission given by the shops nearby according to the amount of goods they can sell per day (80%)
- Vendors who sell their own products (the goods that they can produce) (10%)

Vendors selling various kinds of products such as refreshments, fast food, vegetables, fruit and various sundries are active in both sides of the ferry terminals, since drivers are buying their goods at their waiting times at the ferry terminals on both sides of the River. According to the field survey conducted by the JICA Study Team, the total estimated daily earnings at both sides of ferry terminals is USD 614, as the Table below shows. The abolishment of the ferry services might have significant impacts on these economic activities.

Table 7.4.16 Estimated Number and Earnings of Vendors at Ferry Terminals

Group of Vendors		Number of Vendors	Average Daily Earnings (USD / day)	Total Estimated Daily Earnings (USD / day)
	Men Vendors	12	2.71	32.5
	Women Vendors	137	2.71	371.3
	Children Vendors	140	1.25	35.0
Western Ferry Terminal		298	-	438.8
	Men Vendors	0	-	-
	Women Vendors	9	2.71	24.4
	Children Vendors	145	1.04	150.8
Eastern Ferry Terminal		154	-	175.2
Project Area Total		452	-	614.0

Sources: Survey Conducted by JICA Study Team, December 2004

The estimated number of vendors increased from 452 as of December 2004 to 604 as of July 2005 at both sides of the terminal, reflecting the increased traffic volume at Neak Loeung. As the above study showed, the market shops (shops in the two large markets) and restaurants and shops nearby the ferry terminals not only serve local people of Neak Loeung, but also serve outsiders or the ferry users such as drivers and passengers. All the drivers and passengers who were interviewed insisted that they would use the resting facilities of the roadside station near the planned Bridge, if available.

There are also a dozen of physically-handicapped persons who are begging moneys at the ferry terminals. Five physically-handicapped persons were interviewed, and their basic profiles are shown below.

Table 7.4.17 Profiles of Physically-handicapped Persons at Ferry Terminals

No.	Terminal	Handicapped	Years of Stay	Age	No. of Family Members	Monthly Income (Riel)	Monthly Income of Other Family Members (Riel)	Total Monthly Family Income (Riel)
1	East	Blind	30	83	6	90,000	310,000	400,000
2	East	Blind	12	39	6	150,000	0	150,000
3	West	Right Leg	3	53	1	90,000	0	90,000
4	West	Left Leg	8	39	6	200,000	300,000	500,000
5	West	Left Leg	10	40	4	90,000	90,000	180,000
Ave.			12.6	50.8	4.6	124,000	140,000	

Source: Survey Results of Study Team, August 2005

c) Neak Loeung Ferry

The Ministry of Public Works and Transport are presently operating 7 ferry boats for 4 ferry crossing points of the Mekong River. The Neak Loeung Ferry has 130 staff in its offices of both sides of the Mekong River at Neak Loeung. The annual budget in the fiscal year 2003 for the Neak Loeung Ferry is estimated at USD 894,800. It is estimated that approximately 80% of the amount of salaries and wages will not be consumed in Neak Loeung in case of the abolishment of the ferry services.

Table 7.4.18 Actual Budget of Neak Loeung Ferry for Fiscal Year 2003

No.	Budgetary Category	Actual Budget in Fiscal Year 2003 (Thousand USD)
1	Oil, Gasoline and Spare Parts	632.5
2	Repairing and Maintenance	15.0
3	Procurement of Services	32.3
4	Taxes	36.8
5	Salaries and Wage for Staff and Employees	72.6
6	Special Payment	10.8
7	Payment for Management	7.3
8	Installment	87.5
Total Budget (Actual)		894.8

Source: Neak Loeung Ferry, MPWT

The Neak Loeung Ferry employed 127 staff under the state contract, most of them living in Neak Loeung area. They are working in the security unit, ticket sales unit and maintaining order unit. The Neak Loeung Ferry paid them USD 25 to 50 per month.

Their main concern is that when the ferry moves to other crossing points, they would lose their jobs and their government status would not be recognized due to the fact that they are unstable contracted workers. They are requesting the government to recognize them as full government workers.

Table 7.4.19 Number of Personnel of Neak Loeung Ferry

No.	Group	Number of Personnel
1	Management	3
2	Administration and Security Control Group	60
3	Accountant and Fare Group	30
4	Planning Group	3
5	Technical Group (Ferry Operator, Equipment, Workshop)	31
Total		127

Source: Neak Loeung Ferry, MPWT

MPWT has no plan to lay off its workers, since the ferry boats will move to other crossing points and keep its staff and workers.

The contract-based staff and workers of the Neak Loeung Ferry were interviewed to obtain their economic profiles, and it was found that their economic status is rather vulnerable due to the fact that their main income source is the wage from the Neak Loeung Ferry, although there are other income sources of other family members. They are worried about the their job status, and are willing to be transferred to full government worker status.

Table 7.4.20 Profiles of Contract-based Neak Loeung Staff and Workers

No.	Position	Years of Work at NF	Age	No. of Family Members	Monthly Wage from NF (USD)	Monthly Income of Other Family Members (USD)	Total Monthly Family Income (USD)
1	Security, Deputy	14	37	6	50	50	100
2	Security Guard	7	44	3	45	0	45
3	Ticket Seller	18	50	6	40	340	380
4	Security, Deputy	13	33	4	50	50	100
5	Security Guard	25	45	6	40	25	65
6	Ticket Seller	7	46	5	40	0	40
7	Ticket Seller	7	46	5	40	0	40
8	Ticket Seller	9	35	2	40	0	40
9	Security, Deputy	25	45	6	45	40	85
10	Ticket Seller	8	38	4	25	0	25
11	Security Guard	13	34	4	40	0	40
12	Security on Boat	3	22	5	40	40	80
13	Security on Boat	18	35	4	40	0	40
14	Security on Boat	13	34	5	40	0	40
15	Security on Boat	17	36	3	40	30	70
Ave.		13.1	38.7	4.3	41	38.3	79.3

Source: Survey Results of Study Team, August 2005

Table 7.4.21 Concerns and Requests of Neak Loeung Ferry Staff and Workers

No.	Concerns	Requests to Neak Loeung Ferry
1	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
2	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
3	No concern.	Transfer to a full government worker.
4	Lose job. Lose his wife's job.	Transfer to a full government worker, or provide compensation for termination of contract.
5	Lose job.	Transfer to a full government worker.
6	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
7	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
8	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
9	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
10	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
11	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
12	Lose job.	Transfer to a full government worker.
13	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
14	Lose job.	Transfer to a full government worker.
15	Lose job.	Transfer to a full government worker.

Source: Survey Results of Study Team, August 2005

2) Description of Impacts

After the construction period, the opening of the Bridge will be associated with the abolishment of ferry services, which might have significant economic impacts on the economic situations of local stakeholders such as whole sellers, retailers, vendors and etc., unless necessary mitigation measures are taken. Since the portion of sales to drivers and passengers is estimated to be relatively small in the business communities such as large markets and relatively large in small-scale business communities such as restaurants, retail shops and mobile vendors around the both ferry terminals, the economic impacts might remain trivial in large markets and serious in small-scale business communities. For example, the below calculations are estimated impacts based on the existing data collected through the field survey, unless proper mitigation measures are taken.

a) The total annual profit reduction for 17 small restaurants at both terminals is approximately estimated at USD 51,900 on the condition that the portion of sales to drivers and passengers for these small restaurants is 77.4% which is the average rate found in the field survey.

b) The total daily reduction of earnings for 604 mobile vendors at both terminals is approximately estimated at USD 740 on the condition that the portion of sales to drivers and passengers for these vendors is 90.0% which is the average rate found in the field survey.

During the construction period, the massive inflow of construction workers for the construction of the Bridge might have significant economic impact on the local economy. The business community could also benefit if the contractor is encouraged to buy local materials where appropriate *during the construction period*. In addition to that, it is estimated that the local portion of the temporary works cost in the Project whose major portion is the procurement of the unskilled labor is estimated at USD 0.3 million *during the construction period*.

Although, *after the construction period*, it is likely that some dozens of locally-employed workers of the Neak Loeung Ferry might lose their job opportunities, it might be solved by shifting these workers and their families to other ferry-crossing points.

(3) Utilization of Land and Local Resources

1) Baseline Information

Land is one of the most important resources in the rural areas of Cambodia. There are 2 types of title documents to claim their ownership of properties, receipt and certificate.

a) “Receipts” mean ownership documents used for claiming properties which are issued by commune chiefs.

b) “Certificates” mean official title documents used for claiming ownership of properties in accordance with the property law in Cambodia.

In most of properties acknowledgements, transactions that involve the commune authorities are the most common means of property transfer of ownership. In rural areas, either “Receipts” or “Certificates” are not in compliance with the formal procedures which normally need cadastral officers’ involvement during the whole transactions. In practice, most of Cambodian property owners use “Receipts”, rather than “Certificates” which will impose a lot of tax payments and other service fees.

The Tables below show recently transacted land prices of the region in comparison with those of Phnom Penh.

Table 7.4.22 Transacted Land Prices (Agricultural Land)

Province	Price (Riel/sq.m)	Price (Median) (Riel/sq.m)	Number of Samples (n)
Phnom Penh	4,750	4,000	140
Kandal	11,140	7,400	378
Prey Veng	n.a.	n.a.	n.a.

Source: A Preliminary Review of Secondary Data and Primary Data from Four Recent Studies, Land Ownership, Sales and Concentration in Cambodia, Working Paper 16, September 2000

Note: The above land prices are based on part of transactions in each region, and do not necessarily represent statistically reliable regional prices.

Table 7.4.23 Transacted Land Prices (Residential Land, Urban)

Province	Price (Riel/sq.m)	Price (Median) (Riel/sq.m)	Number of Samples (n)
Phnom Penh	593,800	216,600	1,136
Kandal	921,400	254,600	40
Prey Veng	2,200	700	60

Source: A Preliminary Review of Secondary Data and Primary Data from Four Recent Studies, Land Ownership, Sales and Concentration in Cambodia, Working Paper 16, September 2000

Note: The above land prices are based on part of transactions in each region, and do not necessarily represent statistically reliable regional prices.

Table 7.4.24 Transacted Land Prices (Residential Land, Rural)

Province	Price (Riel/sq.m)	Price (Median) (Riel/sq.m)	Number of Samples (n)
Phnom Penh	n.a.	n.a.	n.a.
Kandal	10,300	2,500	454
Prey Veng	3,000	960	461

Source: A Preliminary Review of Secondary Data and Primary Data from Four Recent Studies, Land Ownership, Sales and Concentration in Cambodia, Working Paper 16, September 2000

Note: The above land prices are based on part of transactions in each region, and do not necessarily represent statistically reliable regional prices.

Other local resources include forestry resources. Illegal logging is notorious for forest crime such as “Made in Vietnam, Cut in Cambodia”. Vietnamese loggers have been illegally felling trees in Cambodia to obtain wood to be used in manufactured garden furniture exported to Europe.

Vietnamese loggers obtain cheap raw material and part of the money goes to fund Cambodia’s “parallel” military budget, since members of the Royal Cambodian Armed Forced are in charge of protecting illegal logging activities.

There are currently 15 timber concessionaires in Cambodia, which operate 21 concessions and effectively control 4,239,528 hectares of land or 26% of Cambodia.

In late 1999, Global Witness, London-based international NGO, was contracted as the independent monitor of the Forest Crimes Monitoring and Reporting Project (FCMRP). Global Witness’ role as an independent monitor was essentially to audit government

records and determine whether two institutions, the Department of Forestry and Wildlife (DFW) and the Ministry of Environment's Department of Inspections (DI) were effectively carrying out their respective mandates under the project. *"Deforestation without limits"* in July 2002, the forest crime report, was provided by Global Witness to the Forest Crime Monitoring and Reporting Unit (FCMU) in compliance with the project document reporting procedures for FCMRP but were not made public at the time of submission of this report.

While more than two-thirds of Cambodia was covered with forests in the 1970s, experts now say that the country could be totally logged in as little as three years. It has been said that commercial cutting has continued despite Cambodia's announcement of a temporary moratorium on logging and the transport of timber that started in January 2002.

More recently, SGS (Societe Generale de Surveillance), Geneva-based international inspector, another independent monitor of the Forest Crimes under contract with the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries, submitted *the Forest Crime Monitoring Report 2005*. The SGS focused on the transport monitoring of old logs approved by the Government, reporting that SGS filed 5 forest crime incidents during the period 1st January to 31st March 2005. According to the report on the details of the Ministry of Environment forest crime suppression operations, forest crimes in 2004 are as shown below.

Table 7.4.25 Summary of Forest Crimes

Protected Area	Logs, poles and timber confiscated and destroyed (units)	Square logs and sawn timber confiscated and destroyed (cubic meter)
National Parks	2,456	900
Wildlife Sanctuaries	59	25
Multiple Used Areas	0	0
Total	2,515	925

Source: Independent Monitor: Forest Crime, First Quarter 2005 Report, SGS, May 2005

Some witnesses reported that timber companies were trucking logs from the concessions to Phnom Penh under cover of darkness and sending the rigs back empty by day. However, the construction of the 2nd Mekong Bridge might have little possibility of increasing these risks, since those illegal timber companies are not presently active to transport them to Vietnam under cover of night using the 24-hour crossing situation at Neak Loeung.

The project affected area, especially the eastern side of the River, is generally flood-prone area. More specifically, the location of the Prey Veaeng side bordering the Mekong River and its flat topography make it highly vulnerable to flood disasters, with more than 80% of the Province being inundated in 2000 and 2001, of which the details are discussed in Progress Report (2) of the Study. In this way, flooding, which is a determining factor for the basic land use in the project affected area, influences the value of land.

The area receives a lot of its water from the Mekong River system with the remaining coming from rainwater, and the area acts as a storage basin or outlet for the Mekong River system during the monsoon season. The ecosystem is fundamental to the local fishery production as well as the soil for agriculture. The high organic contents of the flood-prone area further supports fish expansion as well as the rice production.

Economically, it is obvious that the value of the land is affected by various conditions such as situations of flooding, and so forth.

2) Description of Impacts

The construction of the Bridge will make the local land use more valuable and multi-purpose even in the rainy season. The flood-free land will be created by triangle spaces surrounded by National Road No.1, National Road No.11, and an approach road which is associated with the construction of the Bridge. In this case, there is a slight risk that, due to the created flood-free land *after the construction period*, production activities of several hundred farmers and fishermen might be affected. In the long run, *after the construction period*, there might be a change of the land use pattern due to the creation of the flood-free land. Especially, those impacts as well as the change of the land use pattern in the created flood-free land might provoke the diminution in local people's animal protein intakes associated with the reduction in domestic consumption of fish, although its economic impacts on their cash income are limited due to their relatively small portions in their household revenues. In this connection, these impacts on fishery productions in the flood-free land should be continuously monitored by relevant governmental organizations such as the Department of Fishery.

The access to sufficient quantities of animal fodder and outbreaks of disease are on-going problems for farmers who have livestock, and these problems are greatly exacerbated by flooding and drought. During flooding families move cows and buffaloes to high areas in their villages or nearby hills so that they do not stand or lie in water. In times of flooding, there are few areas for the animals to graze and much of the straw is damaged by flood-water and so it becomes difficult for farmers to get enough food for the animals. The creation of flood-free area *after the construction period* will increase the area for the evacuation of buffaloes in case of flooding.

These positive impacts in the flood-free area depend on the condition that the well-managed drainage function of the area, and it is strongly recommended that additional activities in order to maintain the function of the flood-free area by the relevant ministries.

Although it is unlikely that forestry crimes under cover of night which might be caused by the 24-hour smooth traffic of trucks will increase *after the construction period*, they should be continuously monitored taking their slight possibilities into account.

The figure 7.4.3 illustrates an image of the creation of flood-free land.

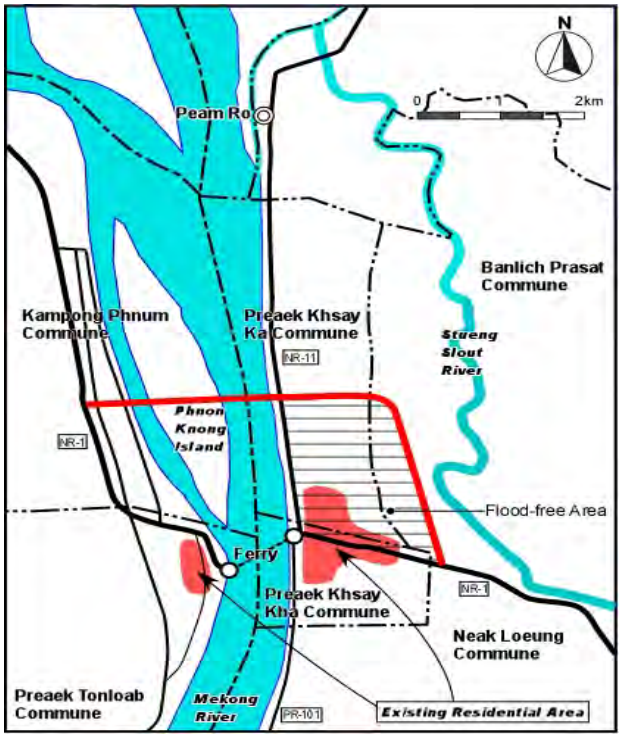


Figure 7.4.3 Image of Creation of Flood-free Land

(4) Social Infrastructure

1) Baseline Information

It is widely argued that lack of social capital deprives the poor of their opportunity to attack poverty. The social capital could be in the form of norms, trust, reciprocity, network, association, legally recognized traditional community, or social bond which could reduce the vulnerability of the poor. The social capital in Cambodian society was totally destroyed by the Khmer Rouge and protracted civil conflict. The situation is even worse where community or social infrastructure is lacking. It is widely argued that the density of social relationships within and between villages, as well as with outside communities and markets further away, will indeed thickened after the construction of a bridge. Such a thickening of social relationship covers a variety of interactions including networks of families and friends, trade network, religious activities, public services, and entertainment.

In addition to these soft infrastructures, social infrastructure includes basic services such as facilities and measures for providing education, healthcare, community development, employment and social welfare. The concept of social infrastructure broadly covers various aspects of delivery of public services. In rural areas of Cambodia, long distance, lack of adequate transport network, and remote villages hamper the government to deliver ample health services to people. The improvement of the crossing service will greatly facilitate access to Phnom Penh and the border to Vietnam. Currently, there are only health centers and no district-level referral hospitals with doctors in the project affected area. The personnel in health centers usually consist of medical assistants, nurses and other staff members.

There is some evidence that a road or bridge plays an important role in promoting people's access to health services. There is also a difference between rich and poor in terms of health center attendance.

It is the fact that the road or the Bridge will enable the government and other service providers to increase their presence at health centers. Healthcare staff will be able to provide vaccination services to people when a road or bridge is built. The construction of the Bridge will allow health staff and veterans to come to vaccinate people and animals in the villages more easily.

Table 7.4.26 Number of Health Centers, Doctors and Medical Staff by Communes in Project Affected Area

Commune	Number of Health Center	Number of Doctors	Number of Medical Staff
Banlich Prasat	1	0	8
Preak Khsay Ka	0	0	0
Preak Khsay Kha	1	0	10
Neak Loeung	1	0	55
Prey Veaeng Side Subtotal	3	0	73
Kampong Phnom	1	0	4
Preak Tomloab	1	0	7
Kandal Side Subtotal	2	0	11
Project Area Total	5	0	84

Source: Field Survey Conducted by JICA Study Team, December 2004

Education is the backbone of social and economic development. Net enrollment ratio as well as drop-out ratio in both primary and secondary educations are most common indicators of the success of the education system. The status quo of these education statistics in the project affected area is shown below, indicating that the situation in Prey Veaeng, the eastern side of the River, is unsatisfactory compared with the western side of the River.

Illiteracy is a barrier for the poor since they are excluded from the development process either intentionally or unintentionally.

Table 7.4.27 Education Statistics by Commune in the Project Affected Area

Province	Primary Education		Secondary Education		Literacy Rate
	Net Enrollment Ratio	Drop-out Ratio	Net Enrollment Ratio	Drop-out Ratio	
Kandal	71.2%	12.9%	11.4%	3.0%	42.7%
Prey Veaeng	56.6%	18.9%	12.1%	1.7%	48.2%
Provinces to which the project affected area belong					
Phnom Penh	83.7%	14.2%	28.8%	4.0%	57.9%
Nation-wide Cambodia	61.8%	16.6%	12.3%	2.6%	37.1%

Source: Calculated from Data from CSES1999

Table 7.4.28 Number of Schools, Teachers and Students by Commune in the Project Affected Area

Commune		Primary School			Junior High School		
		Number of Schools	Number of Teachers	Number of Students	Number of Schools	Number of Teachers	Number of Students
	Banlich Prasat	4	44	1534	0	0	0
	Preak Khsay Ka	2	77	2018	0	0	0
	Preak Khsay Kha	1	39	1371	1	80	840
	Neak Loeung	4	53	2012	0	0	0
Prey Veaeng Side Subtotal		11	213	6935	1	80	840
	Kampong Phnom	3	60	2744	1	69	1468
	Preak Tomloab	3	59	2190	0	0	0
Kandal Side Subtotal		6	119	4934	1	69	1468
Project Area Total		17	332	11869	2	149	2308

Source: Filed Survey Conducted by JICA Study Team, December 2004

Accessibilities to other infrastructure such as access to clean water, toilet facilities and electricity in the project affected area are generally poor compared with the urban area and the national average. Indicators on accessibilities to basic human needs such as clean water, toilet facilities and electricity are shown below, indicating that the situation in Prey Veaeng, the eastern side of the River, is unsatisfactory compared with the western side of the River.

Table 7.4.29 Access to Various Basic Human Needs by Commune in the Project Affected Area

Commune		Access to Clean Water	Access to Toilet Facilities	Access to Electricity
	Banlich Prasat	1.9%	3.8%	0.9%
	Preak Khsay Ka	47.1%	40.6%	27.1%
	Preak Khsay Kha	86.7%	45.1%	46.1%
	Neak Loeung	15.3%	9.1%	4.1%
Prey Veaeng Side Subtotal		58.6%	35.7%	31.4%
	Kampong Phnom	7.4%	18.0%	3.5%
	Preak Tomloab	24.7%	22.8%	22.2%
Kandal Side Subtotal		17.7%	20.9%	14.7%
Project Area Total		44.3%	30.5%	25.6%

Source: Calculated from CSES 1999

2) Description of Impacts

Basically, it is expected that the improvement of crossing the Mekong River *after the construction period* will provide people with improved access to a wide rage of social capital such as education and health services. For instance, it is obvious that the bridge will be able to provide people with 24-hour crossing service so that people will be able to access to the hospital. In addition, there are no sensitive receptors such as social capital as health centers and schools which will be resettled *before the construction period*.

In summary, the construction of the Bridge will improve accessibility to high-level medical services on 24-hour basis and other social services *after the construction period*. There will be no resettlements of health centers and schools *before the construction period*.

In addition to these short-term impacts, there might be long-term impacts on the local

communities due to the increase in local people's mobility. Those long-term impacts include a possibility that the easier access to Phnom Penh *after the construction period* might bring about younger and educated generations' drain to the capital over the long-term period. On the other hand, the long-term impacts include positive effects such as increase in local job opportunities and a possibility of the relocation of the provincial capital of Prey Veaeng due to the fact that the flood-free land will be created *after the construction period*.

(5) Existing Social Institutions

1) Baseline Information

Cambodia has recently made progress in developing a multi-level government system, particularly with respect to the elected commune/sangkat[5] (CS) council system. The progress is noteworthy given Cambodia's historically heavy centralization, extreme poverty, and institutional weakness. In this way, communes play central roles for providing villages with information. Decentralization requires responsibility and extensive participation of community people through commune council elections, as well as participation in village and commune affairs in accordance with legal procedures. People in local communities have made important contributions such as participating in the development planning process, requesting appropriate responses from commune councilors, paying taxes and other rental costs in accordance with the law, and monitoring implementation of development plans of commune councils. Such participation helps commune find the needs and interests of the community and in the creation of programmes to meet those needs.

Cambodia is presently promoting decentralization which empowers local communities by introducing the elected commune/sangkat (CS) council system. Local communities are required to make important contributions such as participating in the development planning process, the financial management of commune expenditures through the commune/sangkat fund (CSF), and implementation/monitoring of development plans of commune councils. In this way, the social or decision-making institution in local communities totally depends on the CS system. In this connection, intra-commune communication as well as information sharing among villages and is a key to an appropriate, transparent and democratic decision-making under the CS system which affect the allocation of the local resources such as VDCs (Village Development Committee). Actually, such information disclosure as well as the grievance resolution mechanism will be provided through the commune offices. In addition to the intra-commune communication inside communes, inter-commune communication is also critical when important decisions are made among communes.

2) Description of Impacts

During and after the construction period, the division of communities and the restriction of access among communes as well as among villages has a slight risk that may affect people's unity and participation, thereby hampering close intra- and inter-communications in the project affected area. Meanwhile, there could be a slight risk that an approach road associated with the construction of the bridge might slightly hamper the smooth communication among communes or villages. However, the possibility, in which the situation *during and after the construction period* will hamper any function of decision-making activities of communes in the project affected area, remains trivial.

[5] Sangkat is an administrative area which divides the Special Administrative Region, such as Phnom Penh and Siem Reap and is equivalent to the commune.

(6) Vulnerable Social Group

1) Baseline Information

Although Cambodia now achieves peace and stability, and enjoys some development fruits, the majority of its population remains vulnerable to poverty and food security. The most vulnerable groups consist of internally displaced people and returnees, HIV/AIDS victims, war widows and female-headed households, orphans, street children, squatters, people with disabilities and isolated ethnic minorities. Other vulnerable groups include those who lived in areas contaminated with landmines and UXOs, and in areas affected by natural disasters such as flood and drought.

In the project affected area, there are a wide range of vulnerable social groups to whom special attention must be paid in assessing the impacts by resettlement and other project components. They include ***'landless farmers'***, ***'physically-handicapped persons due to war and mines'***, ***'female-headed households'***, and so forth.

Even after the constitutional reform in 1989 which enabled farmers to have their own farm land, there are considerable number of households who sold their farmland for their survival and are regarded as ***'landless farmers'***. It is reported that the rate of landless farmers in Kandal Province stood at 16.2% in the previous nation-wide socio-economic survey (CSES1999), which is much higher than the national average.

It is also reported that the proportion of '***the physically-handicapped population'*** due to war and land mines account for more than 20% in all Cambodia; the exact number of the physically-handicapped persons in the project affected area is not available.

Since a large number of males were killed during the Pol Pot regime, ***'female-headed households'*** are frequently seen in Cambodia. Divorced women and widows are common. The rate of divorced female-headed family as well as the widowed-headed families is extremely high.

Table 7.4.30 Rates of Divorced-female-headed or Widow-headed Households

Commune	Rate of Divorced Female Head	Ratio of Widowed Head
Banlich Prasat	1.9%	13.4%
Preak Khsay Ka	2.7%	11.7%
Preak Khsay Kha	3.6%	9.2%
Neak Loeung	2.9%	12.4%
Prey Veaeng Side Subtotal	3.1%	10.7%
Kampong Phnum	4.2%	14.4%
Preak Tonloab	5.8%	15.0%
Kandal Side Subtotal	5.1%	14.7%
Project Area Total	3.8%	12.1%

Source: Census 1998

Most Vietnamese are illegal immigrants. The commune authority controls them and grants them Vietnamese immigration status. The total number of the Vietnamese population is 3,449 which is 8.8% of the total population in the project affected area. The figure is relatively higher than the nationwide average of approximately 7.0%. Although the biggest Vietnamese community is in Preak Khsay Kha with residential areas located on Route C, there is no Vietnamese community. According to the Preak Khsay Kha Commune office, out of 3,449 persons, 1,224 persons are recognized as having legal status with legal

immigrant documents (black documents) provided by the government in 1960s. They are mostly self-employed in specialized rudimentary technical services such as machine workshop, small repair shop, barbers, vendors, scavengers, and so-forth. In spite of these facts, there are no PAPs in the Vietnamese population inside the "Construction Area" of the Bridge.

Table 7.4.31 Number of Vietnamese and Cham People in Project Affected Area

Commune	No. of Village	Total Population	Vietnamese Population	Cham Population	PAPs
Preak Khsay Kha	6	11,908	2,146	0	0
Neak Loeung	2	3,128	409	0	0
Kampong Phnom	2	6,300	107	0	0
Preak Tonlob	2	8,328	553	0	0
Preak Khsay Ka	2	6,756	234	9	0
Banlich Prasat	2	2,814	0	0	0
Total	16	39,234	3,449	9	0

Source: Commune Offices, 2004

According to the interview survey on 8 physically-handicapped persons who are begging money at the ferry terminals or on ferry boats, they made Riel 90,000 to Riel 210,000 per month by begging money everyday during the operation hours of the ferry boats. Of 10 mobile Vietnamese vendors interviewed, their monthly income ranged from Riel 100,000 to Riel 300,000. Most of the Vietnamese vendors had additional income from their family members who are running their own businesses. All of them are concerned about their losing jobs when the ferry is abolished. They stated, however, they would use other facilities associated with the Bridge to sell their goods, if available.

In addition to the above general profiles of the vulnerable group in the project affected area, the following surveys which were conducted in the Study can be used in order to more specifically grasp socio-economic situations of vulnerable PAPs and other vulnerable households who are not PAPs but exist in the project affected area.

(a) Socio-economic profile survey covering 131 PAPs (PAPs who own houses) out of all 260 PAPs (PAPs who own only land are excluded.)

(b) Socio-economic profile survey, which was separately conducted apart from (a), covering 24 selected vulnerable households who are not PAPs but exist in the project affected area

The major socio-economic profiles of these two groups are summarized as below.

Table 7.4.32 Number of PAPs by Type of Vulnerability

Type of Vulnerability	Preak Khsay Ka	Preak Khsay Kha	Kampong Phnom	Total
Female-headed Household	4	8	21	33
Household under Poverty Line	7	11	32	50
Household with Physically-handicapped Family Members	4	6	11	21

Source: Socio-economic Profile Survey conducted by the JICA Study Team, August 2005

Note: Out of 131 PAPs, 122 households answered to the questionnaire.

Table 7.4.33 Number of Households and Family Members of PAPs

Item	Preak Khsay Ka	Preak Khsay Kha	Kampong Phnom	Total
Total Number of Family Members	277	177	203	657
No. of Responded Households	53	31	38	122
Average Size of Family Members	5.23	5.71	5.34	5.39

Source: Socio-economic Profile Survey conducted by the JICA Study Team, August 2005
Note: Out of 131 PAPs, 122 households answered to the questionnaire.

Table 7.4.34 Number of Family Members by Age

Age	Number of Family Members by Age		Composition Rate (%)	
	Family Members of 131 PAPs	24 Vulnerable Households	131 PAPs	24 Vulnerable Households
0-9 Years Old	112	29	17.1	25.7
10-19 Years Old	173	41	26.5	36.3
20-29 Years Old	122	11	18.7	9.7
30-39 Years Old	95	6	14.5	5.3
40-49 Years Old	74	18	11.3	15.9
50-59 Years Old	44	2	6.7	1.8
Over 69 Years Old	34	6	5.2	5.3
Total	654	113	100.0	100.0

Source: Socio-economic Profile Survey conducted by the JICA Study Team, August 2005
Note: Out of 131 PAPs, 122 households answered to the questionnaire.

Table 7.4.35 Occupations of Head of Families

Occupation	Head of Families		Composition Rate (%)	
	131 PAPs	24 Vulnerable Households	131 PAPs	24 Vulnerable Households
Agriculture and Fishing	24	9	19.7	37.5
Wholesale and Retail	44	7	36.1	29.2
Transportation	14	0	11.5	0.0
Manufacturing	1	3	0.8	12.5
Officials	4	0	3.3	0.0
Jobless	2	5	1.6	20.8
Others	33	0	27.0	0.0
Total	122	24	100.0	100.0

Source: Socio-economic Profile Survey conducted by the JICA Study Team, August 2005
Note: Out of 131 PAPs, 122 households answered to the questionnaire.

Table 7.4.36 Accessibilities to Major Facilities

Facilities	Travel Time to Major Facilities in Rainy Season (Minutes)		Index of Vulnerable Group (PAPs=1.00)	
	131 PAPs	24 Vulnerable Households	131 PAPs	24 Vulnerable Households
District Center	94.0	98.3	1.00	1.05
Large Market	13.2	32.4	1.00	2.45
Secondary School	32.5	50.0	1.00	1.54
Hospital	30.5	40.4	1.00	1.32

Source: Socio-economic Profile Survey conducted by the JICA Study Team, August 2005
Note: Out of 131 PAPs, only 122 households answered to the questionnaire.

2) Description of Impacts

The above-mentioned groups are socially and economically in weak positions, and vulnerable to various social impacts. Especially, they may face difficulties in coping with involuntary resettlement *before the construction period* as well as loss of cash income due to the abolishment of ferry services *after the construction period*. Among these groups, special attention must be paid to children as well as women, which will be separately discussed later. Socially and economically, vulnerable vendors working at the both ferry terminals may be affected due to the loss of their customers who are drivers and passengers stopping over at the terminals *after the construction period*, although, *during the construction period*, their sales might temporarily increase thanks to the massive inflow of construction workers. Special attention should be paid to the livelihood of these vulnerable groups by mitigating the economic impacts.

There are considerable concerns that vulnerable groups of people and households will suffer more serious effects of involuntary resettlement as well as the decrease in their incomes in case of the construction of the Bridge.

(7) Equity of Benefits and Losses

1) Baseline Information

Poverty in Cambodia is widespread with some 36% of the Cambodian population living below the poverty line of USD 0.46 to 0.63 per person per day at the current exchange rate. More specifically, the disparity of the monthly income level between the western side and the eastern side is estimated at USD 119 per household.

Table 7.4.37 Disparity of Income in Project Affected Area

Side		Number of Households	Monthly Income per Household (USD / month)
	Eastern Side	4977	289
	Western Side	2682	170
		Total = 7659	Difference = 119

Source: Calculated from the Socio-economic Survey conducted by the JICA Study Team, 2004

There are also disparities in access to social capital and services such as access to clean water, toilet facilities and electrification.

Table 7.4.38 Disparities in Access to Social Capital and Services in Communes of the Project Affected Area

Commune	Access to Clean Water	Access to Toilet Facilities	Access to Electricity	Distance to the Nearest Road	Distance to the Nearest Market
Banlich Prasat	1.9%	3.8%	0.9%	2.5 km	0.42 hours
Preak Khsay Ka	47.1%	40.6%	27.1%	n.a.	n.a.
Preak Khsay Kha	86.7%	45.1%	46.1%	n.a.	n.a.
Neak Loeung	15.3%	9.1%	4.1%	1.7 km	0.21 hours
Prey Veaeng Side Subtotal	58.6%	35.7%	31.4%	-	-
Kampong Phnom	7.4%	18.0%	3.5%	n.a.	0.18 hours
Preak Tomloab	24.7%	22.8%	22.2%	4.8 km	0.20 hours
Kandal Side Subtotal	17.7%	20.9%	14.7%	-	-
Project Area Total	44.3%	30.5%	25.6%	-	-

Source: CSES1999

2) Description of Impacts

The improvement of crossing services will not necessarily equitably benefit all the stakeholders in the project affected area. There will be mainly 2 types of disparities in the project affected area.

The first impact is related to economic disparities. It is obvious that, while the abolishment of the ferry services *after the construction period* may cause decrease in income for poor mobile vendors without capital, the rich who will frequently use the planned Bridge will be more benefited than the poor. Lack of capital is one of the major obstacles that will prevent people from taking advantage of opportunities presented by the improvement of crossing services.

The second impact is related to geographical disparities or accessibilities. While, *during and after the construction period*, people living near the feet of the planned Bridge might be forced to take a longer route when using the Bridge, people living near the entry points to approach roads will more conveniently be able to cross the River.

In summary, the abolishment of the ferry services *after the construction period* may decrease the income of poor people such as vendors without capital, thereby enlarging the economic disparity in the project affected area. It seems that a lack of capital is one of the major obstacles that may prevent people from taking advantage of the opportunities presented by the introduction of the new Bridge. Another possible obstacle could simply be entrepreneurship in the form of new and feasible ideas for small-scale investment. It is important to introduce small-scale credit schemes along with the rural roads and to provide support for some kind of market analysis and small-scale business.

Two factors might help explain the apparent difference between the rich and the poor. The first factor is that it seems that rich families will be able to diversify into more profitable activities than the poor. For example, some of the rich people will be able to diversify into trade, while the poor people were diversifying to wage labor with smaller return. The second factor concerns the pace at which people are able to respond to the economic opportunities of the Bridge. Rich families who already have more capital assets will be able to respond more quickly and flexibly than other families with fewer capital assets.

Furthermore, the construction of the Bridge may change the crossing convenience of people, thereby enlarging the geographical disparity in the project affected area *after the construction period*.

(8) Conflicts of Interests

1) Baseline Information

It is widely observed that, among various conflicts, land disputes are one of the most serious conflicts in rural areas of Cambodia. Land disputes, in the worst cases, lead to serious crimes such as murder. Since the land distribution in Cambodia is inequitable to a large extent, the majority of the poor have only small pieces of land, while the rich occupy large areas of land. According to the village data bank 2003 of SEILA[6], it was reported that the total number of land disputes in Leuk Daek District and Peam Ro District to which the project area belongs was 203 cases, and that of serious crimes such as murder and robbery cases was 87 cases. These figures demonstrate that land disputes might involve serious conflicts, when the value of land, one of the most important resources in the project affect area, is changed by external conditions like the construction of the Bridge.

As a result of having no legal papers to clearly specify land boundary, it allows room for land disputes. Most cases were usually settled at the commune level. If the case is so serious and the commune cannot solve it, the case then is brought up to court. According to the report from Preak Khsay Kha commune, the commune solved about 120 cases of land disputes over the border last year. At least, 5 serious cases were sent to the court last year. The government has been launching a systematic registration of land in Cambodia with assistance from World Bank and donors such as Germany. The government planned to register and give land papers to 5 million land lots by 2015. The first 5-year phase (2002-2007) aimed to register and provide land papers to 1.1 million land lots.

2) Description of Impacts

The planning and construction of the Bridge might change the value of land in the project affected area which has a slight risk of inviting the conflicts in relations to land disputes *even before, during and after the construction period*. The flood-free land which will be created by triangle spaces surrounded by National Road No.1, National Road No.11, and the approach roads *after the construction period* might increase in value more than other areas, thereby raising the possibility of conflicts among land owners.

(9) Gender

1) Baseline Information

Women in Cambodia do not enjoy access to education, paid employment, land ownership and other property rights. Women also suffer from poor reproductive health services. They are generally in a disadvantaged position in both family and society.

Women in Cambodia face numerous dangers and risks in socially disadvantaged positions. Economically, women are often in low-paid, unskilled, and vulnerable positions. Domestic violence, rape and human trafficking for sexual exploitation are among the most serious violations of women's rights in Cambodia. The HIV/AIDS issue is closely linked to those serious threats to women. The Table below shows the number of cases of HIV/AIDS by gender in Kampong Phnum Commune in the project affected area, indicating that the number of cases of the epidemic of women recently increased in this commune.

[6] See http://www.seila.gov.kh/indexs.asp?language=kh&pgid=1

Table 7.4.39 Number of Cases of HIV/AIDS by Gender in Kampong Phnum Commune

Gender	2001	2002	2003	2004 (Jan-August)
Male	7	14	10	23
Female	6	14	14	24
Total	13	28	24	27

Source: Kampong Phnum Health Center

Note: The accurate number of cases of HIV/AIDS by gender is only available in Kampong Phnum Commune, and is not available in the health centers of other communes.

Trafficking in persons in Cambodia is one of the most serious human rights issues facing the country today, and there are indications that the problem is increasing. With the assistance of the Asia Foundation, the Cambodian Human Rights and Development Association (ADHOC) conducts training courses for prospective migrants in areas where trafficking is a serious problem to improve their chances of safe migration, whether from their village to an urban center, or across borders.

Human trafficking involves moving women from their communities and homes into exploitative forms of labor. Often women are promised work as a waitress, domestic worker, or garment worker, but instead they are sold into bondage in which they must work to pay debts at extremely high rates of interest. In other cases, women are sold directly by a family member to a trafficker or brothel owner. Mobility of people from the project area to Phnom Penh, the largest commercial center of the country might incur the risk of trafficking.

In addition to the above-mentioned social aspect of women, it should be noted that the economic livelihood of women in the project area depends on daily cash income earned from selling various products to drivers and passengers who stop over at both sides of ferry terminals. According to the field survey conducted by the JICA study team in December 2004, the number of female vendors at the western and eastern ferry terminals was 401.

Additionally, twenty mobile female vendors have been interviewed at both terminals in August 2005. According to the interview results, while their monthly income ranges from Riel 90,000 and Riel 800,000, their average daily gross profit ranges from Riel 3,000 to Riel 30,000. Most of the vendors had additional income from their husbands and children who are working. All of them were concerned about losing jobs when the ferry is abolished. They stated, however, they would use other facilities associated with the Bridge to sell their goods, if available.

Table 7.4.40 Number of Vendors by Gender in Ferry Terminals

Group of Vendors	Number of Vendors
Male Vendors	37
Female Vendors	252
Western Ferry Terminal Subtotal	289
Male Vendors	5
Female' Vendors	149
Eastern Ferry Terminal Subtotal	154
Project Area Total	443

Source: Field Survey Conducted by JICA Study Team, December 2004

2) Description of Impacts

The massive inflow of construction workers *during the construction period* as well as the improvement in mobility *after the construction period* might increase a risk of chronic problems such as prostitution and spread of HIV/AIDS for women.

Due to the abolishment of the ferry terminals *after the construction period*, the rate of stopovers of drivers and passengers at the terminals might significantly decrease opportunities to sell various products, thereby accordingly decreasing women's income.

(10) Children's rights

1) Baseline Information

In Cambodia, there are a wide range of serious threats to the children's rights. Major threats include poverty, street children, child labor, orphans, child abuse, and so forth. One of the most serious threats to children's rights is human trafficking and sexual exploitation. In spite of a series of efforts in Cambodia's law enforcement in recent years to prevent trafficking of children, the law has not effectively been enforced in practice. Since human trafficking is frequently found over international borders with neighboring countries such as Vietnam and Thailand, the situation in the project affected area, which is located near the international border, might be a typical case. In the project affected area, a couple of NGOs are positively assisting in providing educational services to children vulnerable to trafficking and other forms of exploitations.

Street children belong to one of the most vulnerable groups, who generally gather in Phnom Penh and in economically active towns. Currently, the estimated number of street children in Phnom Penh ranges from 10,000 to 20,000, of whom some 976 are abandoned children. The construction of the Bridge might increase the mobility of children, and the phenomenon of abandoned children is usually due to either to the break-up of families and/or poverty. Street children are increasingly vulnerable to drugs, HIV/AIDS, prostitution, other health risks, and feelings of no future and social exclusion.

Meanwhile, HIV/AIDS has substantial impacts on children, causing high morbidity and mortality and making a lot of children orphans. In Cambodia, the number of HIV/AIDS-related orphans is drastically increasing. It is reported that approximately 13,000 children have lost their mothers or both parents due to the epidemic since the beginning of its spread in Cambodia. According to the report by a NGO working for Kampong Phnum Commune and Preak Tomloab Commune at the Kandal side of the River, the number of orphans infected with the epidemic is drastically increasing recently, as the Table below shows.

Table 7.4.41 Number of Cases of HIV/AIDS by Group in Kampong Phnum Commune and Preak Tomloab Commune in Project Affected Area

Group		2001	2002	2003	2004 (Jan-August)
	Adult	3	9	5	17
	Children	0	1	1	3
	Orphan	10	20	18	27
Kampong Phnum and Preak Tomloab		13	30	24	47

Source: Home and Community Case for HIV/AIDS, 2004

Note: The accurate number of cases of HIV/AIDS by group is only available in Kampong Phnum and Preak Tomloab Communes, and is not available in the health centers of other communes.

The Asia Foundation, which gave funds to some NGOs working in human trafficking issue,

reported that about 200 children are returned weekly from Thailand to Cambodia to be rehabilitated and reintegrated. Despite that, a local NGO-Damnok Toek-Cambodia (Goutte d'eau) located in Neak Loeung (Eastern side) is working to rehabilitate children who are vulnerable to abuse and trafficking and living as beggars and scavengers.

The organization, which works in two communes of Preak Khsay Ka and Preak Khsay Kha whereby the construction of the bridge will be taking place, also provides them with shelter and education as well as vocational training.

Table 7.4.42 Statistics of Children Receiving Services from Damnok Toek-Cambodia (Jan-Jun 2005)

Communes	Male	Female	Total
Preak Khsay Ka and Preak Khsay Kha	163	115	278
From other area	35	16	51
Grand Total			329

Source: Damnok Toek-Cambodia

In addition to the above-mentioned social aspect of children, it should be noted that the economic livelihood of poor children in the project area depends on daily cash income earned from selling various product to drivers and passengers who stop over at both sides of ferry terminals. According to the field survey conducted by the JICA study team in December 2004, the number of children vendors at the western and eastern ferry terminals was 140 and 145, respectively. It was also revealed by the survey that the average daily earning per child is USD 1.25 at the western side and USD 1.04 at the eastern side, respectively.

Table 7.4.43 Number of Children Vendors at Ferry Terminals

Commune			Number of Vendors
		Girl Vendors	115
		Boy Vendors	25
	Western Ferry Terminal		140
		Girl Vendors	140
		Boy Vendors	5
	Eastern Ferry Terminal		145
Project Area Total			285

Source: Field Survey Conducted by JICA Study Team, December 2004

Twenty mobile child vendors were interviewed at both terminals. It was found that they worked 7 days a week from 6 AM to 5 PM, although some children worked late at night. They are selling corn, sticky rice cake, fried frog, lotus, eggs, crickets, soft drinks, bread, jerry, fried shrimps, beetle leaves, etc. While their monthly income ranges from Riel 90,000 to Riel 900,000, their average daily gross profit ranges from Riel 2,000 to Riel 330,000. Most of child vendors receive money from their parents, brothers or sisters who are working. All of them have expressed concern that they would lose jobs when the ferry is abolished. They said, however, they would use the market facilities associated with the Bridge to sell their goods, if available.

2) Description of Impacts.

The improvement in mobility *after the construction period* might increase a risk of trafficking of children as well as the associated chronic problems such as orphans and spread of HIV/AIDS. Due to the abolishment of the ferry terminals *after the construction*

period, the rate of stopovers of drivers and passengers at the terminals may significantly decrease, thereby accordingly decreasing children's income through selling various products.

Due to approach roads for the Bridge *during and after the construction period*, there exists a slight possibility that children will be forced to travel on detours to their schools. Depending on the location of schools, some children might be late for schools. The Tables below show the number of primary schools and secondary schools which might be divided by the construction of approach roads and Bridge inside communes, although it is difficult to estimate the exact additional time needed for the children's schoolings.

Table 7.4.44 Accessibility to Primary Schools Affected by the Bridge

Commune	Number of Primary Schools	Affected Number (Type 1)	Affected Number (Type 2)	Type of Division
Banlich Prasat	4	0	0	Not Relevant
Preak Khsay Ka	2	0	2	Approach Road
Preak Khsay Kha	1	0	1	Approach Road
Neak Loeung	4	0	0	Not Relevant
Prey Veaeng Side Subtotal	11	0	3	Approach Road
Kampong Phnom	3	0	3	Approach Road, Construction Yard
Preak Tomloab	3	0	0	Not Relevant
Kandal Side Subtotal	6	0	3	Approach Road, Construction Yard
Project Area Total	17	0	6	Approach Road, Construction Yard

Source: Field Survey Conducted by JICA Study Team, August 2005

Note 1: Type 1 means the primary schools to be resettled due to the construction of the Bridge.

Note 2: Type 2 means the primary schools whose covering schooling areas will be divided inside communes by the construction of the Bridge.

Table 7.4.45 Accessibility to Secondary Schools Affected by the Bridge

Commune	Number of Secondary Schools	Affected Number (Type 1)	Affected Number (Type 2)	Type of Division
Banlich Prasat	0	0	0	Not Relevant
Preak Khsay Ka	0	0	0	Not Relevant
Preak Khsay Kha	1	0	1	Approach Road
Neak Loeung	0	0	0	Approach Road
Prey Veaeng Side Subtotal	1	0	1	Approach Road
Kampong Phnom	1	0	1	Approach Road, Construction Yard
Preak Tomloab	0	0	0	Not Relevant
Kandal Side Subtotal	1	0	1	Approach Road, Construction Yard
Project Area Total	2	0	2	Approach Road, Construction Yard

Source: Field Survey Conducted by JICA Study Team, August 2005

Note 1: Type 1 means the secondary schools to be resettled due to the construction of the Bridge.

Note 2: Type 2 means the secondary schools whose covering schooling areas will be divided inside communes by the construction of the Bridge.

(11) Cultural Heritage

1) Baseline Information

In the project affected area, although there are no major archeological heritage sites, but there are 16 pagodas which are shown in the Table below. Pagodas are special places for Cambodian people which are centrally located in rural communities. In pagodas, people hold religious activities as well as make contributions to the Buddhist development. In addition to religious services, pagodas function as centers for providing pagoda-associated volunteers who rendering a wide range of community-based services such as health services by using their social networks. Therefore, negative impacts on pagodas should be taken into account in the same manner as environmental considerations for sensitive receptors such as hospitals and schools.

Table 7.4.46 Number of Existing Pagodas by Commune in Project Affected Area

Commune			Number of Pagodas
		Banlich Prasat	4
		Preak Khsay Ka	2
		Preak Khsay Kha	2
		Neak Loueng	3
	Subtotal of Prey Veaeng Side Commune		11
		Kampong Phnom	3
		Preak Tonlob	2
	Subtotal of Kandal Side Commune		5
Total of Project Affected Area			16

Source: Field Survey by the JICA Study Team, December 2004

2) Description of Impacts

Basically, it is anticipated that no archeological heritage sites or pagodas will be affected *during the construction period*, since those archeological heritage sites and religious places are not located in the proximity of planned sites of the Bridge or construction yard or associated approach roads. Nevertheless, in case cultural property is found *during the construction period*, they should be treated in accordance with a cultural property management plan.

RAP should document all necessary actions to protect, move, and restore, the cultural property of all effected people. Depending on the complexity of its impact, the project may require a separate cultural management plan. In this case, RAP may not have to address this issue. Nonetheless, the movement of cultural artifacts must be carried out in consultation with communities and in collaboration with the designated government agencies (Ministry of Culture and Arts). The relocation of artifacts and structures associated with religious worship can occur only after consultation with priests and spirit mediums. Sponsors whose projects affect cultural property will be expected to comply with the safeguard policy on the cultural property. In Cambodia, the Ministry of Culture and Arts are responsible for these actions.

The procedure is that the Ministry of Culture and Arts will form a Steering Committee on Cultural Property (SCCP) to address and offer advice on all architectural problems arising with the Project. Visible cultural heritage sites along the alignment have been identified. A more detailed surface archaeological survey of the road corridor will be conducted to confirm that there are no special additional sites that need conservation. A protocol and action plan will also be prepared by the SCCP, to establish exactly the procedure the

contractors must follow should a cultural feature be unearthed regardless of size. Finally, SCCP will organize a half-day training session, given by an external expert, for contractors and monitors on the bridge and road construction covering archaeological finds and key steps to follow. Attendance by contractors is mandatory.

(12) Infectious Diseases

1) Baseline Information

Cambodia faces the most serious HIV/AIDS epidemic in Southeast Asia. The epidemic currently affects men, women, and children in all of the country's 24 provinces and municipalities. The highest rates of infection are in the southeast and central provinces, and along the Thai border. Statistics released in 2002 by the Ministry of Health reveal that the spread of HIV/AIDS in Cambodia is slowing. The figures indicate that there are 157,500 HIV-infected adults (aged 15-49) nationwide, yielding a 2.6% infection rate among that age group. In 2004, Radio Free Asia reported the proportion of HIV-positive adults in Cambodia fell from 3.0% in 1997, which put adult HIV infections at 210,000, to 1.9% in 2003.

More specifically, the results of the 2000 Cambodia Demographic and Health Survey (CDHS) reported the nationwide provincial HIV/AIDS-related data. According to the report, the HIV/AIDS prevalence rate as well as the percentage of persons with knowledge of HIV/AIDS preventive measures in 2000 is shown in the Table below. It shows that in Prey Veaeng Province, to which the project affected area belongs, the HIV/AIDS prevalence rate is higher than those of both Phnom Penh and the national average.

Table 7.4.47 HIV/AIDS Prevalence Rate and Percentage of Persons with Knowledge of HIV/AIDS Preventive Measures

Commune	HIV/AIDS Prevalence Rate	Percentage of Persons with Knowledge of HIV/AIDS Preventive Measures
Kandal	n.a.	88.5%
Prey Veaeng	4.2%	89.4%
Provinces to which the project affected area belong		
Phnom Penh	4.0%	96.9%
Nation-wide Cambodia	2.9%	73.4%

Source: 2000 Cambodia Demographic and Health Survey (CDHS)

In addition to the above provincial data, the healthcare centers of two major communes in the project affected area reported the latest commune-level data on the number of cases of HIV/AIDS as shown in the Tables below. It is obvious that the latest number of cases is on an upward trend, while the nationwide figure is on downward trend.

The Table below shows the transition of HIV/AIDS-affected people living in the five communes of Banteay Dek, Samroang Thom, Korki Thom, Kampong Phnom and Preak Tonloab in Kandal Province from 2001 to 2004.

Table 7.4.48 Number of Cases of HIV/AIDS in 5 communes in Kandal Province

Year	Affected	Male	Female	Died	Total
2001	Adult	9	12	4	17
	Child	1	1	0	2
2002	Adult	34	34	37	31
	Child	4	2	1	5
2003	Adult	27	39	25	41
	Child	7	2	2	7
2004	Adult	45	56	27	74
	Child	8	6	4	10

Source: World Vision, Home Base Care Team, Samroang Thom Health Center, Kandal

2) Description of Impacts

After the construction period, the improvement of crossing the Mekong River at Neak Loeung will activate access to and from Phnom Penh, the country's capital, as well as Ho Chi Minh, the neighboring country's largest commercial center, thereby aggravating the epidemic's spread by the improved mobility of people over the international border.

In addition to the mobility effect on the epidemic, *during the constriction period*, construction activities associated with construction projects of facilities may affect the spread of HIV/AIDS. A large number of workers will be stationed at working sites in case of the construction of a bridge as well as additional piers. They are mostly seasonal workers who might be predominantly young and sexually active, leading to increasing risks of the epidemic during the construction period of facilities.

The spread of HIV/AIDS in Cambodia brings about serious loss of lives and other socio-economic impacts including:

- The United Nations study on the economic impact of HIV/AIDS in Cambodia found that even with highly interventions, HIV/AIDS would cost the Cambodian economy a huge amount of loss of the most productive segment of the labor force.
- The agricultural sector will suffer decrease in agricultural production due to the loss of agricultural labor that is likely to cause farmers to switch to less labor-intensive crops.
- Private costs such as expenditures for medical care and drugs associated with the epidemic will considerably increase.

In summary, the inflow of massive construction workers *during the construction period* as well as the mobility effect *after the construction period* may aggravate the spread of HIV/AIDS which has various negative socio-economic impacts, unless sufficient countermeasures are taken. More specifically, the improvement in mobility accrued from the construction of the Bridge will bring about a risk of increasing the prevalence ratio of HIV/AIDS from movement of groups of people. What is worse, massive numbers of construction workers needed for the construction of the Bridge have a considerable risk of increasing the prevalence ratio of the epidemic through their sexual activities.

7.4.3 Secondary, Interactive and Cumulative Impacts

Since the previous analysis focused on a wide range of direct impacts on the social environment, more in-depth analyses on the secondary, interactive and cumulative negative impacts are needed in order to obtain the clear understanding of the complicated socio-economic interrelationship in Neak Loeung. It can be argued that secondary, interactive and cumulative impacts are not

negligible even in case of the social environment. The table below outlines of the secondary, interactive and cumulative impacts among a wide range of the social environmental components.

Table 7.4.49 Secondary, Interactive and Cumulative Impacts

No.	Cumulative	Cumulative Effect	1	2	3	4	5	6	7	8	9	10
1	Involuntary Resettlement	-		→	→	→			→	→		
2	Impacts on Local Economy	-										⇔
3	Utilization of Land	-										
4	Vulnerable Social Group	Cumulative		→					→	→		
5	Equality of Benefits and Losses	-						→				
6	Local Conflicts	-										
7	Gender	Cumulative		→								
8	Children's Rights	Cumulative		→								
9	Cultural Property	-										
10	Infectious Diseases (HIV/AIDS)	Cumulative		⇔		→			→	→		

Remarks: "→" symbolizes the secondary impacts from the vertical items to horizontal items, and "⇔" symbolizes the interactive impacts between the vertical items and the horizontal items.

(1) Secondary Impacts and Interactive Impacts

Although secondary and interactive impacts are frequently discussed in terms of natural environmental issues, the following are major secondary impacts on the social environment which might be triggered by the direct impacts such as involuntary resettlement and HIV/AIDS.

1) Involuntary Resettlement →Vulnerable Group

There is a particular concern in respect of households whose livelihoods as well as property may be lost, even temporarily, as a result of the resettlement. In cases where resettlement affects the income-earning capacity of the displaced families, compensation alone does not necessarily guarantee the restoration of their living standards. It is common for households in subsistence-based economies as well as poor households in cash-based economies to divert cash compensation from long-term investment to short-term consumption. Under these circumstances, the involuntary resettlement might transform an ordinary household to a household in economically and socially vulnerable group.

2) HIV/AIDS→Vulnerable Group, Gender and Children's Rights

The HIV/AIDS in Cambodia is centrally linked to vulnerability, gender and children's rights. The low social and economic status of women and children is accelerated by HIV/AIDS, and vulnerable group such as children have more severe substantial impacts, causing high mobility and mortality among infected children and orphans.

Women and youth are more vulnerable to HIV/AIDS infection due to greater exposure to sexual exploitation and limited knowledge.

3) HIV/AIDS→Impacts on Local Economy

The agricultural sector will be severely affected by the prevalence of HIV/AIDS, since the loss of agricultural labor force is likely to cause farmers to switch to less labor-intensive crops. There would be massive expenses needed for drugs and hospitalization to provide medical care services for patients. The cause–effect relationship between HIV/AIDS and impacts on the local economy are interactively linked.

(2) Cumulative Impacts

Cumulative impact is regarded as the impact on the environment, which derives from the incremental impact of the Project when added to other past, present, and reasonably foreseeable future actions regardless of what party or person undertakes such other actions. Cumulative impacts could accrue from a wide range of accumulated factors which are individually minor but collectively significant taking place over the considerable period of time. Although each direct impact derived form the construction of the Bridge is not so serious, there might exist cumulative impacts which are collectively significant. Those cumulative impacts include impacts on children's rights, women and economically vulnerable social groups.

1) Cumulative Impacts on Children

Children are vulnerable to cumulative impacts derived from a wide range of collective and chronic problems such as:

- high rates of infant, child and maternal disease, and mortality and malnutrition due to poor access to basic health and nutrition services.
- infringement of rights of children to a quality education due to poor access to learning opportunities and disparities.
- poor legal and social protection for children against human trafficking and other serious social problems.

These accumulated factors will further accelerate other direct impacts such as the impacts on the local economy and the impacts on HIV/AIDS in the following ways:

- The abolishment of the ferry terminals might deprive children of opportunities to earn daily cash income.
- The improvement in mobility accrued from the construction of the Bridge might increase a risk of trafficking of children as well as the associated chronic problems such as orphans and spread of HIV/AIDS.

Those cumulative impacts will be continuously associated with children's withdrawal from schools. It is more likely that children will be expected to supplement family labour on farms or in income-generating activities. As a result, those cumulative impacts will leave children in the situation where they will not be able to access to a quality education over a considerable period of time. According to the NIS/LFS 2002, the labor force participation rate of children aged 10-14 years stood at 9.1%. It also reported that the labor participation rate in rural areas is higher by 11% compared to the urban sector, and concluded that higher participation in the agricultural sector and lower proportion of school attendance in rural areas could be some of the reasons for the differentials. MOP/HDR 2000 also reported that, at ages older than 5-9 years, the school attendance rate of working children is significantly lower than that of non-working children. Thus, children in poverty are often completely deprived of their education. The table below shows the general reasons for dropping-out from schools in rural areas.

Table 7.4.50 Reasons for Dropping-Out from School

Reasons	Male (%)	Female (%)
Parents' poverty	22.3	19.0
Needed at home	21.6	21.1
Poor teaching	0.4	0.4
Distance to school	2.9	2.9
Schooling is not useful	0.4	0.3
Family migration	3.9	3.9
Other reasons	11.0	8.8
No response	37.5	43.6

Source: MONEY/UNESCO (2000): Report on Assessment of the Functional Literacy Levels of the Adult Population in Cambodia

2) Cumulative Impacts on Women

Women are also vulnerable to cumulative impacts derived from a wide range of collective and chronic problems such as:

- Workload is always heavy for women compared with men due to their productive and reproductive role in the society.
- Education is always limited for women and gender disparities are evident in the adult literacy.
- Women always face higher risk to ill health, and are exposed to regular, specific and possibly life-threatening health risks.

These accumulated factors will further accelerate other direct impacts such as the impacts on the local economy and the impacts on HIV/AIDS in the following ways.

- The abolishment of the ferry terminals might deprive female vendors of opportunities to earn daily cash income.
- The improvement in mobility accrued from the construction of the Bridge might increase a risk of trafficking of women as well as the associated chronic problems such as orphans and spread of HIV/AIDS.

In Cambodia, women are bearing the burden of HIV/AIDS care, and the bulk of HIV/AIDS care happens in the community, informally, with women caring for their partners and children. It is often referred as "time poverty". In this way, a wide range of accumulative factors threatening women might be further accelerated by the risk of HIV/AIDS.

3) Cumulative Impacts on Economically Vulnerable Groups

Lack of capital is a typical cumulative factor to deprive economically vulnerable groups of opportunities to earn daily cash incomes. It seems that lack of capital is one of major obstacles that prevents people from taking advantage of the opportunities presented by the introduction of the new Bridge. The lack of capital is chronic and cumulative impacts which are frequently observed in economically vulnerable groups. These cumulative impacts will be accelerated by the abolishment of the ferry service, depriving the economically vulnerable groups of opportunities to earn daily cash incomes to accumulate their small capital to escape from the poverty.

7.4.4 Brief Reviews on Kizuna Bridge Construction Project and National Route No.1 Improvement Project

It is significant to review social impacts on the similar bridge construction project, especially, the impacts related to involuntary resettlement in case of the Kizuna Bridge construction. Under the grant aid programme of the Government of Japan, the construction project of the Kizuna Bridge began in August 1998 with the construction of the multi-steel pile foundations, and completed in September 2001. The Bridge was open to traffic on December 4, 2001.

Since the Project had been implemented before JICA embarked on drafting its guidelines for social and environmental considerations, the compensation for PAPs were conducted in accordance with the compensation table of the Ministry of Economy and Finance at that time which was applied on an ad-hoc basis without the official legal framework for the compensation and resettlement. According to the record of the Ministry of Economy and Finance, the total number of PAPs affected by land acquisition for the construction of the Kizuna Bridge was 266 households at both sides of the project sites, out of which 14 households were located at the exact western foot of the Bridge and 5 households were located at the exact eastern foot.

The occupations of PAPs at the western side include small restaurant owners, traders, retailers, transporters and farmers. It is reported that, out of 14 PAPs at the western side, 13 PAPs moved to the proxy locations in the same commune or set back their properties alongside the approach road, and one PAP switched his job from a retailer to a pharmacy in Phnom Penh. It is also reported that the livelihood of the majority of PAPs improved with some additional annual income.

Regarding PAPs at the eastern side, the occupations of PAPs include restaurant owners, retailers and farmers. Out of 5 PAPs at the eastern side, 2 PAPs moved to the proxy locations in the same commune, and 3 PAPs moved to other communes of the neighboring district. It is also reported that the livelihood of the majority of PAPs also improved.

In order to precisely verify the impacts related to resettlement, 6 PAPs (3 PAPs at the eastern side and 3 PAPs at the western side) were selected for interviews. The major profiles of these PAPs are as shown below; the results indicate that the livelihood of PAPs have been relatively improved after the resettlement, taking advantage of the benefits of the Bridge.

Table 7.4.51 Profiles of PAPs of KIZUNA Bridge Project (1)

PAPs No.	Side	No. of Family Members	Province	District	Commune
1	Eastern	3	Kampong Cham	Kampong Cham	Kampong Cham
2	Eastern	4	Kampong Cham	Kampong Cham	Kampong Cham
3	Eastern	5	Kampong Cham	Kampong Cham	Kampong Cham
4	Western	4	Kampong Cham	Tonle Bat Leu	Thbowg Khmoum
5	Western	2	Kampong Cham	Tonle Bat Leu	Thbowg Khmoum
6	Western	4	Kampong Cham	Tonle Bat Leu	Thbowg Khmoum

Source: Interview Results by JICA Study Team, September 2005

Table 7.4.52 Profiles of PAPs of Kizuna Bridge Project (2)

No.	Side	Locations of Houses (After Resettlement)	Occupation (Before Resettlement)	Occupation (After Resettlement)	Annual Income (Thousand Riel, Before Resettlement)	Annual Income (Thousand Riel, After Resettlement)
1	Eastern	In the same commune	Restaurant	Restaurant	48,000	67,200
2	Eastern	In the same commune	Restaurant	Restaurant	48,000	54,000
3	Eastern	In the same commune	Retailer	Retailer	6,000	9,600
4	Western	In the same commune	Farmer	Farmer and Retailer	3,400	5,400
5	Western	In the same commune	Retailer	Retailer	n.a.	4,800
6	Western	In the same commune	Farmer	Transporter	3,600	10,800

Source: Interview Results by JICA Study Team, September 2005

It is also useful to briefly review the improvement project of the National Route No.1 (Section C1) which is adjacent to the project affected area. According to the feasibility study report on the improvement project of the National Route No.1, taking into account the seriousness of the relocation of all the residents to outside the official 60 meter-wide ROW, it was proposed that the "provisional ROW" is set at 30 meters (15 meters each from the center line to both left and right) which is near to the net road width, and the residents within the provisional ROW are subject to be relocated to outside the provisional 30 meter-wide ROW but inside the 60 meter-wide official ROW boundary (30 meters each from the center line to both left and right). At the time of the feasibility study, the number of households within the ROW could be decreased to 1,805 houses only within the 30 meter-wide provisional ROW. (The number of households was reportedly increased to 1,898 at the time of the preparatory study of the basic design). This concept of the provisional ROW is similar to the ADB's concept of relocating the residents only within “Corridor of Impact (COI)".

In addition to the consideration on the provisional ROW, JICA has been providing IRC with a wide range of intensive technical assistances as well as consultations after its feasibility study such as technical assistance to the Simple Survey and the DMS survey, a series of consultations with IRC for the compensation rates, a series of holding stakeholder meetings to keep transparency with distributing the information brochures etc. As explained in section 7.5, the same compensation rates as the National Route No.1 (Section C1) will be applied for this Project.

7.4.5 Mitigation Measures for Social Environment

Apart from the measures to mitigate impacts on the natural environment which are incorporated into tender documents prepared under the engineering component of the Project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP), the impacts on the social environment will be basically mitigated in accordance with the Resettlement Action Plan (RAP) as well as the recommended mitigation measures with the assistance of relevant line ministries and agencies. The proposed mitigation schemes for the social environment as well as the list of programmes are summarized as below.

Table 7.4.53 Mitigation Schemes for Impacts on Social Environment

Mitigation Schemes	Impacts	Responsible Organizations	Budgetary Arrangement
Mitigations through RAP (Resettlement Action Plan)	Involuntary Resettlement	IRC, PMU/MPWT	To be incorporated into RAP
Mitigations though EMP (Environmental Management Plan)	HIV/AIDS	PMU/MPWT, MOH	To be incorporated into EMP
Mitigations through RMM (Recommended Mitigation Measures)	Other Social Impacts	PMU/MPWT, Other Line Ministries and Agencies	To be arranged by relevant line ministries and agencies

The impacts on the social environment should be basically mitigated with the assistance of the line ministries and agencies, while the mitigation measures for the involuntary resettlement is discussed in RAP of section 7.5. The mitigation package for the prevention of HIV/AIDS during the construction phase should be incorporated into EMP. The following table indicates the outline of mitigation measures for the impacts on the social environment as well as possible constraints to be overcomed; the underlined mitigation measures will be explained more in detail.

Table 7.4.54 Outline of Mitigation Measures for Impacts on Social Environment

Impacts	Mitigation Programme	Time Frame	Budgetary Arrangement
Involuntary Resettlement	a) Compensation Package for Loss of Land b) Compensation Package for Loss of Structures c) Compensation Package for Productive Trees d) Allowances for Disruption and Resettlement of PAPs e) Exemption of Taxes and Fees for Land Transactions f) Assistance to Provision of Information on Relocation g) Grievances Mechanism for Resettlement Activities	Before construction	Included in RAP
	Constraints: Budgetary and institutional capacities of IRC		
Impacts on Local Economy	a) Comprehensive Michi-no-eki (Roadside Station) Development Programme b) Smooth Transfer and Training Program for Contract-based Neak Loeung Ferry Staff and Their Families c) Participatory Maintenance Programme for Local Roads near Approach Road of the Bridge d) Micro Credit and Savings Assistance Program for Small-scale Business for Local Traders and Farmers	During and post construction	Should be arranged in collaboration with MOEF and Kandal and Prey Veaeng Provinces.
	Constraints: i) Insufficient budget for planning and implementation of the roadside station programme, ii) Lack of experiences for management and operation of the roadside station, iii) Lack of initial funds for micro- credit programme		
Utilization of Land and Local Resources	a) Supporting and Training Program for Farmers' Land Use in Flood-free Land b) Supporting and Training Program for Fishermen's Fish-catching in Flood-free Land c) Surveillance and Information Provision Program for Soils and Water Flow in Flood-free Land	During and post construction	Should be arranged in collaboration with MAFF, MWRM, MRD, Kandal and Prey Veaeng Provinces.
	Constraints: i) Lack of exact information and data on local land use, fish catch, soil and water flow, ii) Lack of budget and human resources of local offices of MAFF, MWRM, and MRD to manage the function of drainage as well as support agricultural and fishery production in the flood-free land		

Impacts	Mitigation Programme	Time Frame	Budgetary Arrangement
Vulnerable Social Groups	a) Allowances for Vulnerable PAPs b) Supporting programme for Physically-handicapped Vendors	Before, during and post construction	Should be arranged in collaboration with IRC, Kandal and Prey Veaeng Provinces.
	Constraints: Budgetary and institutional capacities of IRC		
Equity of Benefits and Losses	a) Surveillance for Indicators of Local Economic Disparity b) Surveillance for Indicators of Local Geographical Disparity	During and post construction	Should be arranged in collaboration with Kandal and Prey Veaeng Provinces.
	Constraints: i) Insufficient manpower as well as experiences to record commune-level socio-economic disparity data, ii) Insufficient manpower as well as experiences to record commune-level geographical disparity data		
Local Conflicts of Interests	a) Surveillance for Prevention Program of Land Disputes b) Land Registration Promotion Program	During and post construction	Should be arranged in collaboration with MLM, Kandal and Prey Veaeng Provinces.
	Constraints: i) Delay of land registration procedures, ii) Insufficient manpower as well as professional experiences for prevention of land disputes and promotion of land registration		
Gender	a) Supporting programme for Women's Vendors b) HIV/AIDS Prevention Package for Women c) Trafficking Prevention Package for Women	During and post construction	Should be arranged in collaboration with MWVA and MOH.
	Constraints: i) Insufficient budget and manpower of NWVA and MOH, ii) Women's reluctance to disclose relevant information on HIV/AIDS and trafficking, iii) Insufficient manpower as well as professional experiences to have consultations with women, iv) Insufficient budget to implement 100% CUP (Condom Use Programme)		
Children's Rights	a) Supporting programme for Children's Vendors b) HIV/AIDS Prevention Package for Children c) Trafficking Prevention Package for Children	During and post construction	Should be arranged in collaboration with MWVA and MOH.
	Constraints: i) Insufficient budget and manpower of NWVA and MOH, ii) Children's families reluctance to disclose relevant information on HIV/AIDS and trafficking		
Infectious Diseases	a) Comprehensive HIV/AIDS Prevention Package for Construction Workers and Local Communities	During and post construction	Should be included in MOH.
	Constraints: i) Insufficient budget to implement 100% CUP (Condom Use Programme), ii) Women's and construction workers' insufficient knowledge on HIV/AIDS		

Remarks: The mitigation measures underlined are explained more in detail.

(1) Comprehensive Michi-no-eki Development Programme

As one of the major mitigation measures to create economic opportunities for the local economy, a comprehensive "Michi-no-eki (Roadside Station)" programme is proposed in order to provide opportunities to sell local products to drivers and passengers who will stop over at Neak Loeung. Michi-no-eki is a multi-functional space for rest and exchange along a highway whose functions are linked to rural roads, creating connections between highway network and local communities. Models for roadside rest spaces like Michi-no-eki can be found along the highways of many countries. The most typical examples are stores, markets, restaurants and other facilities that emerge spontaneously along main highways and at major junctions. The main objectives of Michi-no-eki are: i) to provide drivers and travelers with places to rest, buy gasoline and have their vehicles repaired, ii) to provide drivers, travelers and local residents with market and restaurant facilities, iii) to provide drivers, travelers and local residents with simple public services such as water supply, public sanitation and health care. More specifically, the main functions of Michi-no-eki are:

- Rest: Providing highway users with a clean and comfortable rest area.
- Market: Providing a place for direct sales of products and possibly for processing those products to generate high value added.
- Terminal: Providing terminal functions for public transport.
- Public Services: Providing a wide range of public services for highway users as well as local residents.
- Sightseeing: Providing a new recreational site for visitors.

The following table explains local demands, functions and typical facilities for "Michi-no-eki".

Table 7.4.55 Local Demand, Functions and Typical Facilities for "Michi-no-eki"

No.	Local Demand	Functions	Recommended Facilities
1	Need to sell local products and find sales outlets	Sales opportunities	Direct sales facilities (Markets)
2	Need to create marketable products	Processing of products	Processing areas and restaurant facilities
3	Need to train production and marketing technologies	Technical education	Training centers and meeting halls
4	Need to develop more tourist visits and provide tourist information	Support for tourism	Tourist information center
5	Need to provide better sanitation	Sanitation services	Toilets and water supply facilities
6	Need to provide services for better health care and infectious disease prevention	Health support	Simple medical care facilities and clinics
7	Need to receive public services	Public services	Branch offices of provinces and districts
8	Need to have a safe rest area and a place for vehicle repair	Rest area	Parking area
9	Need to have a terminal for public transportation	Public transportation	Bus stops

The table below shows the results of questionnaires on driver's preference of buying goods at the ferry terminals; all kinds of drivers answered that they will use the planned roadside station by purchasing a variety of goods such as water, soft drinks, fruit and various local food. The driver-wise difference in tendencies of thier willingness to use the planned

roadside station could not be identified. The concrete blueprint for the roadside station should be proposed as one of the mitigation measures.

Table 7.4.56 Driver's Purchase at Ferry Terminals

No.	Type of Cars	Frequency of Crossing	Average Spending on Vendors per Crossing (Riel)	Average Spending at Restaurants per Crossing (Riel)	Products of Purchase from Vendors (Riel)
1	Minibus (Tourist)	2 times/month	0	15,000	
2	Minibus (Tourist)	3 times/year	2,000	50,000	Mineral Water, Eggs
3	Container	2 times/year	2,500	0	Mineral Water, Beverage
4	Truck	5 times/month	4,000	0	Mineral Water, Cake, Beverage
5	Truck	Daily	2,500	40,000	Mineral Water, Rice
6	Pick-up (Commuter)	2 times/day	5,000	5,000	Sticky Rice Cake, Bread
7	Minibus (Tourist)	Weekly	2,000	5,000	Mineral Water, Sticky Rice Cake
8	Minibus (Tourist)	2 times/month	1,000	0	Mineral Water
9	Truck	2 times/day	3,100	0	Rice, Ball Cake, Mineral Water
10	Minibus (Tourist)	3 times/week	2,500	4,000	Handkerchief, Mineral Water, Rice

Source: Survey Results of Study Team, August 2005

Table 7.4.57 Drivers' Willingness to Use a Roadside Station

No.	Type of Cars	Frequency of Crossing	Will use roadside station?	How will you use the roadside station?
1	Minibus (Tourist)	2 times/month	Yes	Buy local products for souvenirs.
2	Minibus (Tourist)	3 times/year	Yes	Take a rest. Eat lobsters and oranges.
3	Container	2 times/year	Yes	Eat rice and drink beers.
4	Truck	5 times/month	Yes	Take a rest. Eat fruit.
5	Truck	Daily	Yes	Eat or buy lobsters and turtles for family
6	Pick-up (Commuter)	2 times/day	Yes	Take a rest.
7	Minibus (Tourist)	Weekly	Yes	Eat porridge and drink coffee
8	Minibus (Tourist)	2 times/month	Yes	Eat rice and fruit. Buy mineral water.
9	Truck	2 times/day	Yes	Eat rice. Buy mineral water.
10	Minibus (Tourist)	3 times/week	Yes	Eat rice and fruit. Buy mineral water.

Source: Survey Results of Study Team, August 2005

In order to make these mitigation measures more effective, the following recommendations should be taken into account when the concrete blue print for the roadside station is designed.

(i) A simple market study on drivers' and passengers' purchasing preference of goods and meal services by each type of vehicle should be carefully conducted to grasp their demands at the proposed site of the roadside station.

(ii) A comprehensive assistance package for potential vendors such measures as:

- increasing in frequency of drivers' stopping over opportunities at the station;

- developing marketable and attracting goods and services to their clients; and
- training their sales promotion capacities

should be studied so as to keep their incomes at the pre-project level.

It seems that the central government has considerable interests in the maximum use of the construction yard for the roadside station in the flood-free area as well as a future possibility of transferring the provincial capital of Prey Veaeng to the flood-free area which will be created after the construction of the Bridge. In accordance with the government's intension for the roadside station, it is required to promote the formulation of the land use plan as well as the implementation plan for the said flood-free land, involving the provincial government. In this connection, possibilities of a follow-up survey and a sort of technical assistance might be studied.

(2) Smooth Transfer and Training Programme of Neak Loeung Ferry Staff

The present number of major ferryboats operating for crossing rivers in Cambodia is 6 at 4 crossing points. After the Bridge is open to traffic, it is projected that the ferry system at Neak Loeung will be abolished and 3 ferry boats (TA PHROM, VISHNU and PEACE-2) will be deployed to other ferry terminals. Since there are many possibilities but uncertainties for future ferry development, several development scenarios were explored. In any event, the potential demand for ferry transport in Cambodia is evident along such large rivers as the Mekong River, Tonle Sap River and Bassac River. MPWT will be able to transfer staff to other crossing points. The table below shows an example of the scenarios for the deployment of the Neak Loeung Ferry. In addition to the transfer, MPWT is required to provide the training and consultation programme for the staff and their families, considering their concerns and requests, as shown in the table below.

In summary, MPWT is strongly recommended to take into account the following actions in case of transferring its Neak Loeung ferry contracted-based staff and workers.

(i) Staff and workers who will wish to work at new crossing points should be given priorities in their work contracts.

(ii) Even if staff and workers do not prefer working at newly assigned remote crossing points, they should be transferred to other appropriate sections of MPWT, or should be assisted in their job seeking activities to the maximum extent, after carefully hearing their requests.

Table 7.4.58 Present and Future Deployment of Neak Loeung Ferry

Ferry Boat	Neak Loeung	Preak Tamak	Preak Kdam	Stung Treng
TA PHROM	●		○	
VISHNU	●	○		
PEACE-2	●	○		

Remarks: ● Present Deployment, ○ Future Deployment

Table 7.4.59 Concerns and Requests of Neak Loeung Ferry Staff and Workers

No.	Concerns	Requests to Neak Loeung Ferry
1	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
2	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
3	No concern.	Transfer to a full government worker.
4	Lose job. Lose his wife's job.	Transfer to a full government worker, or provide compensation for termination of contract.
5	Lose job.	Transfer to a full government worker.
6	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
7	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
8	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
9	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
10	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
11	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
12	Lose job.	Transfer to a full government worker.
13	Lose job.	Transfer to a full government worker, or provide compensation for termination of contract.
14	Lose job.	Transfer to a full government worker.
15	Lose job.	Transfer to a full government worker.

Source: Survey Results of Study Team, August 2005

(3) Participatory Maintenance of Local Roads connecting to Approach Roads of the Bridge

In addition to the Michi-no-eki, the participatory maintenance of local roads connecting the approach roads of the Bridge would be another economic opportunity to create job opportunities for the local people.

Providing immediate and direct income from labor-based construction and maintenance of approach roads, improving critical small-scale civil works, and developing the local small-scale contracting industry, are important in terms of the rural development and the provision of economic opportunities.

Gravel or laterite surfacing is widely adopted for low cost rural roads and access roads in many developing countries. Participatory maintenance of local roads connecting to the approach roads of the Bridge using low-cost and labor-based approach aims to provide the community with sizable amount of job opportunities. The community participation of rural roads to connect to the approach roads is effective, and periodic re-gravelling is also an effective way.

(4) Micro Credit and Savings Assistance Programmes for Small-scale Business for Local Traders and Farmers

In order to stimulate the local economy, the micro credit and savings assistance programme for small-scale business for local traders and farmers are proposed as one of the mitigation measures. It is expected that there would be more outside traders who come to buy and sell

various things after the opening of the Bridge. Especially, it is expected that more traders come to buy livestock and vegetables. There is much consumption of livestock and vegetables in Phnom Penh which would be more easily accessed by the Bridge. Families can increase raising cows, buffaloes, pigs, chickens and ducks. Access to micro credit is extremely important for people to invest on the increase in livestock and vegetable productions. Saving assistance programs should be also set up to encourage local people to save money for investment during the post-construction period by taking advantage of a series of special demand expected to be generated by the massive inflow of construction workers during the construction period.

(5) Comprehensive HIV/AIDS Prevention Package for Construction Workers and Local Communities

The mitigation measures of HIV/AIDS during and after the construction period of the Bridge are critical to provide a wide range of prevention and support programmes targeting construction workers and local people. Generally, HIV/AIDS prevention programmes include:

- high-level commitment to addressing and advocacy on HIV/AIDS.
- good sentinel surveillance system.
- ongoing behavioral research.
- blood safety measures.
- prevention interventions focused on “core groups” such as construction workers and sex workers.
- condom promotion campaign.
- HIV/AIDS community-based prevention programs.
- prevention of mother-to-child transmission of HIV.
- implementation of the 100% Condom Use Program.
- provision of counseling and testing services.

The following categories of people are the general target of the HIV/AIDS prevention programme:

- direct female commercial sex workers (DFSWs, meaning brothel-based SWs) and their clients
- indirect female commercial sex workers (IDFSWs, including beer promotion girls, bar women, and women working in karaoke lounges and massage parlors)
- military and police
- fishermen
- men who have sex with men (MSM)
- pregnant women attending antenatal clinics (ANCs)
- tuberculosis patients
- hospital inpatients

In many developing countries, large infrastructure construction sites offer job opportunities that attract a large number of young people who migrate from poor rural areas nearby regions. Construction workers comprise the key mobile groups together with truckers, transport workers and itinerant traders. Many donor agencies are presently incorporating into the design of infrastructure projects HIV/AIDS prevention programmes targeting migrant construction workers and the local communities they interact with.

The Project must promote HIV/AIDS awareness and implement prevention programmes. In some cases, the need for information, education, and communication on HIV/AIDS should be the obligation of the contractors. Therefore, this obligation should be included

into EMP in addition to the mitigation measures for the impacts on the natural environment during the construction phase. The program will consist of 4 components:

Advocacy actions on HIV/AIDS to be organized through workshops targeting local resident communities in the Project area, bridge contractors, and transportation companies.

(i) Information and education campaign on HIV/AIDS through posters, pamphlets, launch events, and focus group discussions at the construction worksites and resident community level in the project area.

(ii) Surveillance and monitoring activities of HIV/AIDS prevalence.

(iii) The 100% condom use program (CUP): CUP was pilot tested in Sihanoukville in 1998. After the pilot phase of CUP was evaluated in late 1999, and the National Policy on 100% Condom Use was approved. The Government prepared the National Strategic Plan for a Comprehensive and Multi-sectoral Response to HIV/AIDS 2001-2005 (NSP). Several Ministries are undertaking major HIV/AIDS activities, including National Defense; Social Affairs, Labor, Vocational Training and Youth Rehabilitation; Women's and Veteran's Affairs; Education, Youth and Sports; and Culture and Religion. CUP should be implemented before starting the construction of the Bridge.

7.4.6 Monitoring Plan

While the main objectives of the environmental monitoring on the natural environment during the construction phase are to provide a continuous feedback on the project implementation in order to identify actual or potential environmental problems at the early stage and to implement timely adjustments to environmental management works, the monitoring on the social environment is basically a continuous assessment of a wide range of indicators as the Table below shows. The monitoring would be conducted under RAP in case of involuntary resettlement, and would be conducted by the relevant responsible organizations except for the impacts on HIV/AIDS which would be conducted in the framework of the EMP.

Table 7.4.60 Proposed Monitoring Activities and Indicators for Social Environment

Impacts	Monitoring Scheme	Proposed Monitoring Indicators	Time Frame	Responsible Organization
Involuntary Resettlement	Monitoring under RAP	a) Monitoring Indicators Specified in RAP	Before construction	RU/IRC, PMU/MPWT
Impacts on Local Economy	Monitoring under RMM (Recommended Mitigation Measures)	a) Per-capita Income Index of Vendors b) Per-capita Income Index of Small Business Communities c) Number of Transferred Staff of Neak Loeung Ferry	During and post construction	MPWT, MEF, Kandal Province, Prey Veaeng
Utilization of Land and Local Resources	Monitoring under RMM	a) Yield of Various Crops in Flood-free Land b) Fish Catch in Flood-free Land	During and post construction	MPWT, MAFF, MORD Kandal Province, Prey Veaeng Province
Vulnerable Social Groups	Monitoring under RMM	a) Wide Range of Poverty Index	Before, during and post construction	MPWT, RU/IRC, Kandal Province, Prey Veaeng Province
Local Conflicts of	Monitoring under RMM	a) Number of Cases of Land Disputes	During and post	MPWT, MOLM, Kandal Province,

Impacts	Monitoring Scheme	Proposed Monitoring Indicators	Time Frame	Responsible Organization
Interests			construction	Prey Veaeng Province
Gender	Monitoring under RMM	a) Per-capita income of Women Vendors b) Prevalence Ratio of HIV/AIDS among Women c) Number of Trafficking Cases	During and post construction	MPWT, MWVA, MOH Kandal Province, Prey Veaeng Province
Children's Rights	Monitoring under RMM	a) Per-capita income of Children Vendors b) Prevalence Ratio of HIV/AIDS among Children c) Number of Trafficking Cases	During and post construction	MPWT, MOYES, MOH, Prey Veaeng Province
Infectious Diseases	Monitoring under EMP	a) Wide Range of HIV/AIDS Surveillance Indicators	During and post construction	MPWT, MOH, Kandal Province, Prey Veaeng Province

7.5 Framework for Resettlement Action Plan (RAP)

7.5.1 Objectives of Framework for RAP

Resettlement Action Plan (RAP) is a document required for any project which results in the physical resettlement of people, and it must specify the procedures and actions it should take in order to properly resettle and compensate the affected people and communities. It is required as a minimum condition that RAP must ensure that their incomes and living standards of the affected people are restored to pre-project levels and are not worse off than they would have been without the project. More specifically, a full-scale RAP should be prepared as a detailed plan for mitigating the land acquisition impacts, the largest social impact, by *the ferry plus bridge option (Route A)* of the 2nd Mekong Bridge Project in an attempt:

- To ensure that the social and economic condition of the affected people is recovered at least the pre-project level.
- To provide policy and procedural guidelines for the acquisition of land and other assets, compensation, and resettlement.
- To identify households that will be adversely affected by the Project, where they are located, what compensation and related alleviating measures are to be provided and how and when these measures will be implemented.
- To provide a plan for the community participation of PAPs could be involved in the various stages of the project, including the implementation of RAP.
- To estimate an overall budget of the required resources needed and the actual assessed compensation to implement RAP.

7.5.2 Cambodia's Legal Framework and Practices for Compensation and Resettlement

(1) Legal Framework

The 2001 new Land Law that replaced the 1992 Land Law, is the basic legal framework that defines the regime for ownership of land in Cambodia. The new Land Law includes some provisions and articles in relation to involuntary resettlement and entitlement policy formulation. Article 5 of the new Land Law stipulates that "No person shal1 be deprived of his ownership unless it is in the public interest. Ownership deprivation shall be carried out

in accordance with the forms and procedures provided by law and regulations and only after the payment of fair and just compensation".

On the other hand, the Constitution of Cambodia consists of some articles relevant to the involuntary resettlement. The land acquisition for public purposes is stipulated in Article 44 of the Constitution which requires separate law or procedure to be able to acquire land from any person only after paying *"fair and just"* compensation. However, the Article does not state legal or illegal status of the person.

However, in relation to the land acquisition for the construction of roads, there had been no specific legal framework specifying the Right of Way (ROW) until the Prakas No. 006 on "Measures to Crack Down on Anarchic Land Grabbing and Encroachments" was issued on September 27, 1999. The Prakas No.006 specifies that the ROW is 25 meters from the center line of the national roads with a one-digit number (NR 2, 3, 6, and 7) except for NR 1, 4, and 5 (30 meters from the center line), while the ROW of the national roads with a two-digit number (Road No 11, 22, 64, and 78) is 25 meters from the center line.

Nevertheless, in order to minimize the impact on the people inside ROW, IRC and the international donor community created various Corridors of Impact (COI) in locations where houses and activities is concentrated, particularly in urban centers. The employed COI ranges from 10 to 25 m. Technical assistance has been also extended to drafting of the Road Law and relevant sub-decree on ROW in order to provide more comprehensive legal framework for ROW.

(2) Practices for Compensation and Resettlement

Under these legal circumstances, the international donor community has been trying to rectify the present insufficient resettlement policy in Cambodia.

1) Common Principles

The common goal of the international donor community is to assist PAPs to improve their former production and livelihood levels, at least, to restore their income earning capacity and living standards to pre-project levels.

The common underlying philosophies of the donor community are summarized as below:

- Acquisition of land and other assets as well as the scale of the resettlement should be minimized as much as possible by studying possible alternative project options, and appropriate social, economic, operational and engineering solutions that have the least impact on PAPs.
- All the identified PAPs should be entitled to be compensated for their lost assets at full replacement cost and provided with the sufficient rehabilitation measures to restore their livelihood.
- All PAPs should be equally eligible for compensation and rehabilitation assistance, regardless of tenure status, social or economic standing and any such factors that may discriminate against achieving the objectives of RAP.
- Special measures shall be incorporated in RAP and complementary mitigation and enhancement activities to protect socially and economically vulnerable groups such female-headed households, children, physically-handicapped persons, people living below the poverty line.
- Common principles are to avoid adverse social and environmental impacts as result of its development projects; if not avoidable the impact shall be minimized and the quality of life of PAPs shall be restored to at least pre-project level; and mitigated the social

impact by providing compensation and rehabilitation measures and assistances to PAP. Compensation shall be in full amount at replacement cost and at current market value of their affected assets.

2) National Resettlement Policy

Under the technical assistance of ADB, National Resettlement Policy (NRP) was drafted in 2002, and is currently under review by IRC. When drafting the NRP, it has been pointed out that there are considerable gaps between Cambodia's present legal framework and the international best practices as shown below.

- Compensation for land and assets is performed without a comprehensive legal framework, using the resettlement plans or simply a governmental authority's discretion. There are no ample rules and procedures for compensation or valuation other than what may be contained within a resettlement plan.
- While an individual's rights to ownership and compensation are protected as defined under the various articles, there is no clear mechanism for the land acquisition and amounts of compensation. At present, there is no formally enacted national policy for resettlement in Cambodia.
- There are no effective regulations on how to determine whether compensation is just or fair.
- There are no clear procedures and guidelines to guide development of the implementation plan and how the livelihood of recipients is restored after moving to the uncertain resettlement sites.
- Livelihood and income restoration is still limitation stating by the current domestic laws and policies. There has been insufficient effort to address income restoration so that PAPs who are left without a source of income are assisted to restore income to its pre-project level.

In summary, since there are no systematic, consistent and comprehensive resettlement policies in Cambodia, donors are extending cooperation on ad-hoc basis, depending on the particular donors' specific requirements.

In response to these present situations, ADB also embarked on the regional technical cooperation in the field of the resettlement, which is RETA 6091 in 2004. Through this regional technical assistance, ADB is presently giving assistance to the more practical approach to transform the recommended NRP into the actual enactment in terms of mitigating the various resettlement risks of PAPs. A MOU has been signed on May 2005 during the ADB Resettlement Review Mission in the agreement to mitigate risks arising from Highway No.1 Project as identified during the resettlement audit.

In this way, the Government of Cambodia is in a transitional position, trying to fill the gap between the international best practices and the existing policy with the assistance of donor agencies. Therefore, it should be noted that the proposed RAP should be more realistic and take a practical approach for Cambodia's smooth transition to the right track. Through the application of its own guidelines to the actual projects, JICA is also promoting this step-by-step approach, in harmony with other donor agencies, in order to make steady progress in the field of the resettlement.

7.5.3 Conditions for Framework for Resettlement Action Plan (RAP)

There are a couple of conditions to formulate the framework for RAP.

(1) Economic Profiles Survey and RAP

Since RAP proposed in this report is a draft framework for RAP, the full-scale RAP should contain a wide range of clear information such as various types of surveys needed to be conducted in order to get a clear idea of the extent of loss due to the land acquisition. The census and inventory of assets frequently are combined into one survey establishing basic data on the general magnitude of impact since both surveys require visit to every household. A census and socio-economic survey, including a detailed inventory of affected assets would need to be carried out for all PAPs to prepare baseline data for the PAPs who will be affected by the Project in terms of displacement from present location, loss of fixed assets such as structures and trees, or livelihood as a result of the project implementation.

However, since the socio-economic survey is not an official census before the feasibility study is completed, the full-scale RAP should be formulated based on the DMS together with the full-scale census.

(2) Replacement Cost and RAP

Replacement cost means the cost of replacing lost assets and incomes, including cost of transaction. In case of land, the replacement cost means the cost of buying a replacement land near the lost land with equal productive potential and same legal status, including transaction costs. In case of structures, the replacement cost is the current fair market price of building materials and required labor cost without depreciation or deductions for salvaged building material or other transaction cost.

Basically, in the situations where the market functions poorly, it is rather difficult to accurately calculate the replacement cost. Under these circumstances, the donor community is flexibly adjusting the compensation rates in an effort to make the rates as close as possible to the replacement cost.

For example, through recent ADB's technical assistance for the GMS power distribution and transmission project, ADB and IRC reached a compromise in 2004 that a cost of living increase of 3% per annum for 4 years (i.e. 12%) would be added to the former compensation rates, and these new rates would be further adjusted upward at the time of the Detailed Measurement Survey (DMS).

At the same time, JICA also intensively discussed the updating of the compensation rates for National Route No.1 project, taking into account a wide range of factors such as: i) consistency with the compensation rates employed by other donors, ii) the rate reflecting Cambodia's on-going realistic efforts, iii) the long-term improvement process updating the compensation rates based on the progress of the NRP, etc.

It is often criticized that many resettlement practices in Cambodia showed that the cost estimate for affected houses is not at the replacement cost and at the current market price. However, these two cases are typical improvement process of the on-going compensation rates; key considerations in the assessment of compensation for structures include:

- Updated and current market rates for building material and labor are used for assessment reflecting the current price escalation.
- Assessed values are not depreciated.
- No deductions are made for salvaged building material.

At this stage, this kind of the step-by-step approach is a realistic and suitable way, and it should be noted that the actual enactment of NRP including the periodical updating of the compensation rates will be promoted by this approach, making IRC move forward to the right track from the transitional process of NRP. The progress of the actual enactment as

well as the enforcement of NRP will be continuously monitored in harmonization with other donor agencies.

7.5.4 Contents of Framework for RAP

The contents of the frameworks for RAP are proposed as follows:

(1) Description of the Project

In this section, the outline of the project should be briefly explained, and the boundary of the project as well as the impact area of the Project should be also indicated on the location map of the Project. It should be noted that the Study is still at the stage of the feasibility and RAP should be the framework which is not based on the results of DMS and the full-scale Census.

(2) PAPs and Impact Category

Census is an accurate count of people and households within the defined project boundaries. Census exercise requires house-to-house collection of information on PAPs. It is important that the project proponent and the PAPs clearly know the established date for eligibility of entitlement for losses. The date of commencement of census of project affected PAPs within the project area boundaries should be taken as cut-off date.

Establishment of cut-off date serves dual purposes, protecting rights of PAPs, and protecting project authorities from fraudulent claims by people who move into the area in order to claim benefits from the Project.

Since the "Construction Area" including the planned construction yards for the 2nd Mekong Bridge is not the existing ROW of the National Route No.1, the provisional declaration of the ROW as "Construction Area" for the Bridge was implemented based on the Article 13 of the 2001 Land Law stipulating the public domain of the State and Article 44 of the said Law stating the requirement for fair and just compensation. In accordance with the declaration, the cut-off date has already been set up. Although the Bridge will be a part of the National Road No.1 in near future, the area except for the planned construction yards for the Bridge should be officially declared as the new ROW of the National Route No.1 based on the Prime Minister Declaration as well as the associated Prakas 006 on 27 September 1999 stating that the ROW for the National Road No.1 is 60 meters from the center line on both sides (30 meters each from the center line to both left and right) in rural areas.

Generally, the main impact of the bridge construction works will be on houses and shops or stall sites, agricultural land use, mainly rice field on flood plains and paddy, and some grazing lands and small fruit free plantations, along the margin of the road. More specifically, there are two kinds of definitions of project affected categories for this project: (i) PAPs and ii) Project Affected Individuals.

It is more specifically explained that project affected persons (PAPs) are defined as heads of households whose houses or land will be resettled or acquired for compensation, and project affected individuals are defined as all family members who belong to the PAPs.

Table 7.5.1 Categories of PAPs

No.	Commune	Number of PAPs	Number of Asset Records (House and Land)	Number of Project Affected Individuals
1	Prek Ksay Ka	69	71	373
2	Prek Ksay Kha	81	88	437
3	Kampong Phnom	110	113	594
Total		260	270	1,404

(3) Utilization of Socio-economic Profile Survey

Census and inventory data, supplemented as necessary by information obtained through the land acquisition assessment and socio-economic surveys, are used to establish baseline information of PAPs. Socio-economic baseline information is critical for design of feasible resettlement programs and entitlements, and restoration of incomes and living standards.

Detailed Measurement Survey (DMS) will be conducted to generate inventory of households and assets in ROW land including business and community resources. The database will provide a detailed picture of the social and economic impacts and will be used for resettlement management and implementation in this project.

On the other hand, the results of the socio-economic profile survey has been utilized for the tentative calculation of the cost for RAP using the estimated quantity of assets of PAPs. For example, the Table below shows the example of provisional results of socio-economic profiles of PAPs in terms of house type.

Table 7.5.2 Example of Provisional Results of Socio-economic Profiles of PAPs

Item	Quantity (sq.m) of PAPs Assets	2000 MEF/IRC Rate (USD/sq.m)
House Type 1	745	4.50
House Type 2	4,634	12.00
House Type 3	394	85.00
House Type 4	0	140.00

(4) Resettlement Policy Framework

1) Eligibility and Entitlement Policy (Compensation Measures)

The eligibility and entitlement policy consists of a set of guidelines and criteria that define the compensation measures for each category of PAPs who are eligible to receive them. It also enables IRC to classify all identified PAPs and to allocate the appropriate compensation packages. The compensation package includes a wide range of compensation measures like cash compensation and institutional support provided to eligible PAPs. A Detailed Measurement Survey (DMS) will be carried out covering 100% PAPs to quantify and categorize the affected households and structures. The compensation/mitigation measures comprise:

- Loss of land

- Loss of structures
- Loss of productive trees
- Loss of commune and public assets
- Allowances for disruption/resettlement and for vulnerable households

Compensation for structure and other assets including trees and crops will be based on price determined by IRC. The salvaged materials of the structures will be allowed to use by the PAPs at new sites free of cost. It is noted that compensation is made one time only. The official entitlement matrix based on the following categories will be formulated in the full-scale RAP.

a) Loss of Lands

The determination of market value for land should be based on transactions that have taken place for the same type of land in the same geographic area. In Cambodia compensation for land is generally assessed based on result of DMS and land transaction survey and then the value of each land category is fixed by IRC.

Compensation for land is also dependent upon category of affected land and the type of land use rights possessed by PAPs. Values of construction and industrial lands are comparatively much higher than agricultural and forest land. The Table below shows the proposed compensation rates for both agricultural and residential land.

Table 7.5.3 Tentative Compensation Rate for Land

Item	2000 MEF/IRC Rate (USD/sq.m)	2004 GMS Transmission Line Project Rate (ADB) (USD/sq.m)	2004 National Route No.1 Project Rate (JICA) (USD/sq.m)	Tentatively Applied Rate for this Study (USD/sq.m)
Agricultural Land (Paddy Field)	0.50	0.56	0.56	0.56
Residential Land	2	2.24	2.24	2.24

b) Loss to Structures

This method requires establishing standard categories of structures based on the type and use of building material and determining cost of per unit area of each category including the cost of material and labor. The structures affected in the project are then classified into these categories and area of each affected structure is multiplied with the predetermined unit rates. The classification of all residential structures is proposed into just only four subjective categories for compensation. The below Table shows the tentative compensation rate applied to the house structures.

Table 7.5.4 Tentative Compensation Rate for Houses

Item	2000 MEF/IRC Rate (USD/sq.m)	2004 GMS Transmission Line Project Rate (ADB) (USD/sq.m)	2004 National Route No.1 Project Rate (JICA) (USD/sq.m)	Tentatively Applied Rate for this Study (USD/sq.m)
House Type 1	4.50	5.04	5.04	5.04
House Type 2	12.00	13.44	13.44	13.44
House Type 3	85.00	95.20	95.20	95.20
House Type 4	140.00	156.80	156.80	156.80

Other structures entitled for cash compensation include fence, well, grave, tomb, lotus pond, etc. Those structures are paid in lump sum. It is also a subject of price negotiation due to different size and material use of the structure. In principle,

compensation for structures is made in accordance with government price based on categories. The Table below shows the tentative compensation rate applied to wells and fences.

Table 7.5.5 Tentative Compensation Rate for Wells

Item	2000 MEF/IRC Rate (USD)	2004 GMS Transmission Line Project Rate (ADB) (USD)	2004 National Route No.1 Project Rate (JICA) (USD)	Tentatively Applied Rate for this Study (USD)
Dig Well	50.00	56.00	56.00	56.00
Pump Well	75.00	84.00	84.00	84.00

Table 7.5.6 Tentative Compensation Rate for Fences

Item	2000 MEF/IRC Rate (USD/m)	2004 GMS Transmission Line Project Rate (ADB) (USD/m)	2004 National Route No.1 Project Rate (JICA) (USD/m)	Tentatively Applied Rate for this Study (USD/m)
Wooden Fence	0.75	0.84	0.84	0.84
Concrete Fence	4.86	5.44	5.44	5.44

c) Loss of Productive Trees

Cost for crops, trees and plants are generally established based on the age and productivity of fruit and perennial trees. Cost for affected crops should be based on the farm gate prices and mandated crop valuation set by concerned government agencies. Farm gate prices can be obtained from the nearest market. In Cambodia, affected crops have been classified into two categories. All compensation rates for affected crops and trees should be based on cross harvest income taking into consideration the cost of production and material.

d) Loss of Public/Commune Assets

Community properties include commune offices, schools and temple fences and gates, community water ponds and amenities. Cost for such property should be same as cost of structures of individuals. At this stage, there are no affected assets of commune properties in the Project area.

e) Allowances for disruption/resettlement and for vulnerable households

i) Disruption and Resettlement Allowances

If income restoration measures are necessary, financial arrangements should ensure that income support is provided for a reasonable period of transition allowing restoration of income streams. However, estimating the cost of providing opportunities for those eligible for income-restoration measures is highly uncertain. A flat unit-cost is employed for these income-restoration activities, despite the high variability in actual costs.

For people whose houses are affected because their lives are disrupted, disruption allowance of USD 40.0 per household is provided as support for meal and/or income loss while reconstruction/repair of their residential houses. No disruption allowance is provided for the reconstruction of buildings other than residential purpose.

For people whose houses are affected so that they have to move to a relocation site or other places outside ROW, resettlement allowance of USD 40.0 per household is also provided in addition to disruption allowance above.

ii) Vulnerable Allowance

Vulnerable groups, who will experience a considerable degree of social and economic disruption more than the general population, such as female headed households, disabled head of households and households below the Cambodian poverty line, will be provided with special assistance. This countermeasure is part of income restoration activities. In this connection, cash allowance of USD 20.0 per household for each household applicable is provided.

2) Taxes and Government Fees

The government is responsible for all fees and taxes PAPs have to pay as a result of any transaction associated with their relocation or compensation assistance. In some projects, salvageable materials are given back to the owner free of cost but in some cases the price is deducted from compensation, in addition to the proactive deducting of a substantial percentage of the land valuation as a "contribution" for development prior to the compensation being paid. The deduction of the cost of salvageable from the compensation is not justifiable.

3) Detailed Measurement Survey (DMS)

Detailed Measurement Survey (DMS) is the survey to identify extent and effects of assets loss after the detailed design of the project. The assets to be surveyed include land, house and structure, crops and trees and other fixed structures located on the land acquired by the Project. The survey methods include 100% census of affected household and inventory of affected assets. The collected data was used to prepare a completed list of PAPs and their affected assets, who and what are entitled for compensation, and list of vulnerable PAPs who were required additional assistance.

(5) Institutional Set-up, Budgetary Arrangement, and Implementation Schedule

1) Institutional Set-up

Inter-Ministerial Resettlement Committee (IRC) is responsible for the implementation of RAP. IRC is chaired by the Under-secretary of State of the Ministry of Economy and Finance (MEF), and the members of the IRC consist of representatives of MEF, MPWT, and Governors and Deputy Governors of Kandal and PreyVeaeng Provinces. The Resettlement Unit will be set up under IRC. The IRC-WG (Working Group), which consists of personnel from the line ministries which are members of IRC, will be also set up. The Resettlement Unit will closely work with the Project Management Unit (PMU) of MPWT for the smooth implementation of the resettlement. At the provincial, district, and commune levels, the Resettlement Units will be established. Function of these Units are summarized below.

a) Resettlement Unit

A Resettlement Unit will be established under the IRC to ensure the effective implementation of the resettlement. The functions of the Resettlement Unit are:

- To conduct DMS as well as the associated official baseline census.
- To undertake overall planning, management and monitoring of resettlement programs.
- To identify all eligible PAPs and promote understandings of their entitlements.
- To train resettlement officials at provincial, district and commune level resettlement units.

- To supervise the disbursement of compensation to PAPs based on a regularly updated database for the resettlement and ensure that compensation payments are completed on schedule.
- To calculate and determine compensation and entitlements.
- To coordinate grievances of PAPs.

b) Provincial, District and Commune Resettlement Units
Provincial Resettlement Units will be established at both Kandal and Prey Veaeng Provinces, which are headed by Provincial Governors and are located within the Provincial Public Works Departments. The Units will be responsible for all aspects of the local resettlement activities within the provinces. District Resettlement Units will be in charge of the identification of resettlement sites and on-site services, while the Commune Resettlement Units will act as facilitators to guarantee the timely implementation of the resettlement activities.

2) Budgetary Arrangement

Although the cost for RAP cannot be precisely estimated at this stage, it is required to estimate the approximate cost for RAP, taking into account a reasonable margin of adjustment as well as a reliable contingency arrangement subject to the results of DMS. Based on these conditions, the budget for RAP will be prepared on the condition that there might be quantity changes after DMS as well as the official census are completed. Total budget for resettlement and implementation of RAP is estimated at USD 672,692- subject to changes after the results of DMS and the official census. The actual budget application should be based on more precise budget estimate.

In addition to direct compensation costs of RAP reflecting the eligibility and entitlements previously discussed, there would be administrative and management costs associated with the implementation of RAP. These costs will include a wide range of the resettlement assistance activities such as the implementation of DMS, grievance resolution activities, monitoring and evaluation activities. Tentatively, 15% of the direct compensation costs are included as the administrative and management cost of RAP, while 10% of the total cost is regarded as the contingency. Consequently, the tentative cost for RAP is summarized below. It should be noted that the detailed breakdown of the compensation is not specified because the quantity is not based on an official census.

Table 7.5.7 Tentative Cost Estimate for RAP

Content	Items	Quantity	Compensation (USD)	Remarks
1. Compensation	House Structure (sq.m)	5,773	103,497	
	Wells (no.)	32	2,520	
	Fences (m)	2016	10,449	
	Trees (no.)	6624	52,576	
	Allowances (no.)	227	8,460	
Subtotal		-	177,502	
2. Land Acquisition	Construction Yard (Paddy Field) (sq.m)	161,038	90,181	
	Residential Land (sq.m)	70,807	158,608	
	Paddy Field (sq.m)	188,359	105,481	
Subtotal		420,204	354,270	
3. Management Cost			79,766	15% of (1+2)
4. Contingency			61,154	10% of (1+2+3)
Total			672,692	

3) Implementation Schedule

The detailed implementation schedule for RAP should be specified in the full-scale RAP, taking into account the availability of the funds and the timing of the construction of the Bridge. Figure 7.5.1 shows tentative implementation schedule for compensation and resettlement. The implementation schedule will be divided into the preparation stage, the implementation stage, and the supervision/monitoring stage. At present, step 1 and 2 of the preparatory stage have been already been completed. The following work components of these stages are examples, and more detailed implementation schedule should be prepared in the full-scale RAP.

a) Preparatory Stage

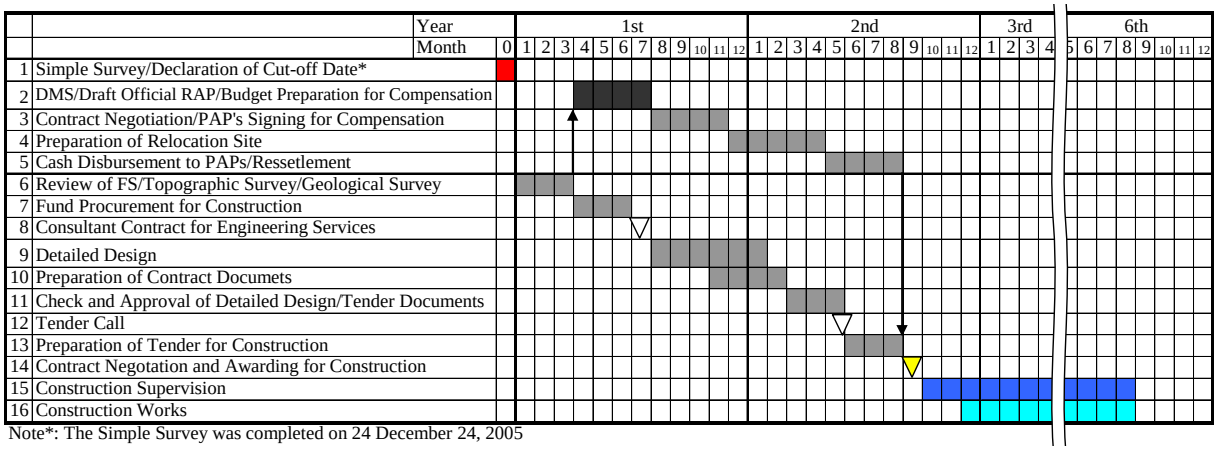
1. Implementation of Simple Survey
2. Declaration of Cut-off Date
3. Formulation of Draft RAP
4. Establishment of Grievance Redress Committee
5. Selection of External Monitoring Organization
6. Holding Preliminary Public Information Meetings
7. Holding Stakeholder Meetings
8. Conducting Basic Design Study
9. Implementation of Detailed Measurement Study (DMS)
10. Implementation of Official Census
11. Issue of Certificates of Entitlements
12. Preparation of Draft Official RAP
13. Prepare Compensation Budget and List Comparison of Grouping of PAPs and Compensation Rights.
14. Government Approval of Draft Official RAP
15. Official Public Information Campaign to PAPs
16. Prepare Procedural Guide for Compensation Payment

b) Implementation Stage

17. Cash Disbursement to PAPs
18. Assistance to Relocation of Houses
19. Relocation of Houses to Resettlement Sites

c) Monitoring and Evaluation Stage

20. Preparation of Monitoring Report
21. Preparation of Evaluation



Note*: The Simple Survey was completed on 24 December 24, 2005

Figure 7.5.1 Tentative Implementation Schedule for Compensation and Resettlement

(6) Information Disclosure and Community Participation

Transparent information disclosure is a key to promoting effective community participation for planning and implementation of RAP. In other words, keeping PAPs fully and transparently informed of their rights and obligations is crucial to the success of the implementation of RAP. In order to make the information understandable and accessible for PAPs, relevant information should be translated into local languages, paying special attention to accessibility of vulnerable groups of people. An information booklet containing the following contents should be compiled by MPWT and IRC to deliver the required information to all PAPs.

- Definitions of terms in the RAP
- Frequently asked questions and answers over the Project
- Detailed explanation on the Project
- Scope and categories of PAPs and predicted impacts
- Details of eligibility and entitlements under the RAP
- Implementation schedule together with the timetable for the delivery of entitlements
- Compensation policies and rates
- Procedures for the grievance redress
- Outline of the community participation

A series of public information meetings will be held in the relevant communes of both Kandal and Prey Veng Provinces to ensure that PAPs do participate in the process of the planning and implementation of RAP.

(7) Grievance Resolution Mechanism

It is critical to allow PAPs to lodge complaints or claims with the assurance of timely and satisfactory resolutions of those complaints or claims. The main objective of the grievance procedure is to provide PAPs with ample opportunities to ensure that the compensation and resettlement programme will be implemented accurately and fairly.

Two provincial-level Grievance Committees (GCs) will be established in Kandal and Prey Veng Provinces, and these GCs will be composed of the provincial governors, heads of relevant communes, heads of relevant villages, a staff of MEF, staff from provincial PWT as a technical advisor/observer , and also a secretary from governor's office.

In order to resolve any problem or constraints for smooth operation of the resettlement activities, GC should act as a legal platform for the PAPs to solve their complaints. The formation of GCs as above should be notified through gazette. The functions of the grievance redress process will be: i) to make all PAPs aware of the process of RAP and entitlement policy together with the timetable for implementation, ii) to provide support for PAPs on problems derived from the adjustment to their new living environments, iii) to record grievances of PAPs and streamline those grievances which need to be resolved by the GCs, etc.

More detailed procedures as well as mechanizm for the grievance resolution should be clarified in the full-scale RAP in order to guarantee the proper function of the grievance resolution mechanism which provides PAPS with opportunities to express their grievances. All administrative and legal costs incurred in pursuant to the grievance redress procedures by PAPs or their representatives at the level of GCs, IRC and the Court of Law will be covered by the Project. Claims of all such costs are to be submitted to the Project authorities by the PAPs. A copy of the claims should also be submitted to IRC for recording.

(8) Monitoring, Evaluation and Reporting

1) Monitoring

One of the major objectives of monitoring is to provide the project promoter with opportunities to identify obstacles and constraints as early as possible in order to facilitate timely adjustment of implementation arrangements. Monitoring for the implementation of RAP is of critical importance in all projects involving involuntary resettlement in terms of the following factors:

- Measurement of input indicators against proposed timetable and budget including procurement and physical delivery of goods, structures and services.
- Tracking effectiveness of inputs against baseline indicators and assessment of PAPs' satisfaction with inputs.
- Measurement of output indicators such as livelihood restoration an development impact against baseline.

The staff of the IRC-WG in close collaboration with PMU will be responsible for infernal monitoring activities. They will collect information from the respective commune regularly. Based on this data collection, they will maintain database of resettlement monitoring information in IRC and PIU, which will be successively updated every month.

In addition to internal monitoring, external monitoring is normally required to provide an independent periodic assessment of resettlement implementation and impacts, to verify internal reporting and monitoring, and to suggest adjustment of delivery mechanisms and procedures as required to function effectively. Project promoters are responsible to contract a suitable and experienced external monitoring agency which is required to keep its neutrality, and the budget for the said external monitoring should be provided in RAP. The results of the external monitoring should be properly reported to PAPs and relevant stakeholders in appropriate timings.

2) Evaluation and Monitoring Indicators

The main indicators which should be regularly monitored are:

- Entitlement policies as well as basic policies of the full-scale RAP are in line with the planned framework of RAP.
- Agreements to resettlement to PAPs are properly obtained.
- Entitlements of PAPs are in accordance with the approved entitlement policies.
- Assessment of compensation is carried out in accordance with agreed procedures.
- Payment of compensation to the affected people in the various categories according to the level of compensation as described in RAP.
- Public information and public consultation and grievance procedures are followed as described in RAP.
- Relocation and payment of subsistence and shifting allowances are made in timely manner.
- Smooth linkage of resettlement and commencement of civil works.

3) Monitoring Reports

This overall monitoring and reporting framework should include the following outputs for external monitoring:

- Brief inception report submitted to the IRC and PMU at the beginning of the assignment.
- Monthly progress report prepared for the monitoring period and submitted to IRC and PMU.
- Wrap-up monitoring reports submitted to IRC and PMU for the monitoring period.

7.5.5 Simple Survey

"Simple Survey" was conducted as a milestone to confirm PAPs' basic agreement to the Project. Since the "Simple Survey" was implemented before the feasibility study stage is completed, PAPs' socio-economic profile survey which had been completed in advance of "Simple Survey" could not be regarded as the official baseline survey of PAPs associated with "Simple Survey". The socio-economic profile survey of PAPs was conducted as the general economic profile survey or the provisional baseline survey of PAPs.

Simple Survey commenced from November 28, 2005 and was completed on December 24, 2005. The simple survey team consisted of two groups, each of which is made up of two 4-men subgroups, respectively.

TThe number of PAPs stated here is the number of house and landowners. House owners mean having plural houses and some rent them to tenants. The Table below shows the number of PAPs interviewed in "Simple Survey".

Table 7.5.8 Number of PAPs

No.	Province	District	Commune	Number of PAPs	Number of Assets Recorded (Land and Houses)
1	Prey Veng	Peam Ror	Prek Ksay Ka	69	71
2	Prey Veng	Peam Ror	Prek Ksay Kha	81	88
3	Kandal	Leuk Dek	Kampong Phnom	110	113
Total				260	270

The result of "Simple Survey" was that out of 260 PAPs identified as of December 24, 2005, 98.8% (257 PAPs) were in agreement to the Project. Two PAPs expressed their objections to the Project, and one PAP had no comments. The reasons for the objections are that they are generally concerned about the livelihood after the resettlement. Most of those who agreed did so conditional to compensation. The detailed information of PAPs is in Appendix 7.5.

The survey was monitored by the external monitoring organization in order to ensure that: i) interviewers speak to PAPs clearly and amicably, ii) interviewers do not force PAPs to quickly reply and to draw a positive reply, and iii) interviewers do not deprive the PAP of the freedom for the expression of their ideas. As a result of monitoring, it is reported that none of interviewers violated these interview codes, and all the interviews were conducted in the appropriate manner.

7.5.6 Recommendation for Assistance to Relocation

Assistance to relocation of PAPs is critical, and the following factors should be taken into account. It is recommended that the full-scale RAP include the activities needed for assistance to PAPs such as consultations regarding the following relevant information on the smooth relocation.

- Location of replacement land and the timing of relocation
- Schedule for the project site clearance and start up of the physical works
- PAPs should be given sufficient time to harvest their crops prior to start-up of civil works.

- PAPs should be assisted in relocation to their new sites by providing assistance in settling and counseling.
- It is important to establish a policy framework and a system to define the replacement cost.

The two critical concerns in selecting a resettlement site are location and community, and the following selection criteria would be set up for the selection of relocation sites, when PAPs are required to be consulted.

- Closeness to the present location of PAPs
- Accessibility to various facilities and services
- Topography of the site
- Population density in the host community
- Capacity of host community to absorb further development
- Ability to accommodate the minimum number of PAP households to minimize land acquisition and site development costs
- Demographic and socio-cultural systems of the host community
- Existing population density and carrying capacity of the area
- Land use patterns and property practices
- Community organizations and needs
- Cultural pattern
- Reception for new relocated persons

CHAPTER 8

PUBLIC CONSULTATIONS

8. PUBLIC CONSULTATIONS

8.1 JICA Guidelines for Environmental and Social Considerations

8.1.1 Outline of JICA Guidelines

In December 2002, JICA established a committee for revising its guidelines for environmental and social considerations. One of the major objectives of the committee was to comprehensively review the guidelines, thereby enhancing the environmental and social considerations for all of JICA's development practices. After a series of discussions and exchanges of public comments, JICA completed the new guidelines in March 2004. In accordance with the guidelines, JICA is required to encourage the recipient governments, by conducting cooperation activities, to implement the proper measures for environmental and social considerations. In the guidelines, it is emphasized that democratic decision-making is essential for environmental and social considerations, and, in order to achieve an appropriate decision-making process, it is critical to ensure stakeholder participation, information transparency, accountability and efficiency as well as the respect for human rights.

In the guidelines, JICA regarded the following concepts as important principles of the guideline.

- A wide range of impacts to be addressed is covered.
- Measures for environmental and social considerations are implemented at an early stage.
- Follow-up activities are carried out after cooperation projects are completed.
- JICA is responsible for accountability when implementing cooperation projects.
- JICA asks stakeholders for their participation.
- JICA discloses information.
- JICA enhances organizational capacity.

The guideline also stipulated the process of environmental and social considerations in the following ways.

- Information disclosure
- Consultation with local stakeholders
- Impacts to be assessed
- Inquiry to advisory council of environmental and social considerations review
- Categorization
- Laws and standards of reference
- Concerns about social environment and human rights
- Decision-making by JICA
- Ensuring appropriate implementation of and compliance with the guidelines
- Implementation and review of the guidelines

The guidelines cover all of JICA activities including development studies, preliminary studies of grant aid projects and other technical cooperation projects, and urges the recipient governments to consult with local stakeholders through means that encourage reasonably broad public participation, in order to consider environmental and social factors in the way that it is the most suitable to local situations and to reach an optimum consensus. The public consultations in the Study have been in compliance with the procedures in case of Category A stipulated in the guidelines.

8.1.2 Application of JICA Guidelines for the Study

The guidelines came into force on April 1, 2004, and it is required that projects proposed after April 1, 2004 are subject to the guidelines. Although the Study was proposed before the fiscal year 2004, it was agreed between the JICA preliminary mission and the Royal Government of Cambodia that the Study is subject to the procedures of the guidelines to the extent possible.

JICA classifies projects into 3 categories in accordance with the extent of environmental and social impacts, taking into account an outline of the project, the scale, the site condition, and the environmental impact assessment scheme. This Project is classified as Category A which is regarded as a project which:

- might have significant negative impacts on the environment and society.
- might require a detailed environmental impact assessment under environmental laws and standards of the recipient governments.
- might affect an area broader than the project sites or facilities subject to physical construction.

Consequently, the public consultations in the Study are required to be in compliance with the procedures stipulated in Clauses 3.2.3 and 3.3.3 of the guidelines.

8.2 Procedures for Public Consultations

8.2.1 Procedures for Stakeholders Meetings (Overall Meetings)

The Study was divided into 2 stages: the master plan stage (IEE-level study stage) and feasibility study stage (EIA-level study stage) with main tasks as follows:

- Master plan stage: the main task is to study the optimum method and route to cross the Mekong river at Neak Loeung.
- Feasibility study stage: the main task is to examine the feasibility of the selected crossing method and route from engineering, environmental and financial viewpoints.

For the master plan stage, it is stipulated by Clause 3.2.3.3 of the JICA guidelines that, for Category A studies, JICA consults with local stakeholders in collaboration with the recipient governments after disclosure of drafts of scoping, and incorporates results of consultation into the TOR of the environmental and social considerations studies. It is also demanded by Clause 3.2.3.5 that, in accordance with the TOR and in collaboration with the recipient governments, JICA conducts IEE-level environmental and social considerations studies, and analyzes alternatives including a “without project” situation.

On the other hand, for the feasibility study stage, it is stipulated by Clause 3.3.3.1.3 of the JICA guidelines that, for Category A studies, JICA consults with local stakeholders in collaboration with the recipient governments and incorporates results of consultation into the TOR of the environmental and social considerations study. It is also required by Clause 3.3.3.1.5 that, in line with TOR and in collaboration with the recipient governments, JICA conducts EIA-level environmental and social considerations studies including monitoring plan, an institutional arrangement, and mitigation measures to avoid, minimize or compensate for adverse impacts.

In summary, the guidelines demand that, in both IEE-level and EIA-level environmental and social considerations studies, JICA holds at least 3 stakeholder meetings at the time of the drafts of scoping, the time for considering the rough outline of environmental and social considerations, and the time for preparing a draft of the final reports. Table 8.2.1 shows the relevant clauses of the JICA guidelines which are directly related to the procedures for stakeholder meetings.xxx

Table 8.2.1 Relevant Clauses of JICA Guidelines Corresponding to Procedures for Stakeholder Meetings

Level	Relevant Clauses	Relation with Stakeholder Meetings
IEE	3.2.3.3	Stakeholder meeting at the time of scoping
IEE	3.2.3.6	Stakeholder meeting at the time of considering the rough draft of environmental and social considerations

Level	Relevant Clauses	Relation with Stakeholder Meetings
IEE	3.2.3.7	Stakeholder meeting at the time of preparing a draft of the final report of environmental and social considerations
EIA	3.3.3.1.3	Stakeholder meeting at the time of scoping
EIA	3.3.3.1.6	Stakeholder meeting at the time of considering the rough draft of environmental and social considerations
EIA	3.3.3.1.7	Stakeholder meeting at the time of preparing a draft of the final report of environmental and social considerations

In addition to these minimum requirements demanded by the guidelines, the kick-off stakeholder meeting (Stakeholder Meeting 1-1) was held in order to introduce the Project and share the information among all stakeholders at the early stage of the Project. The additional special session (Stakeholder Meeting 1-2) at Neak Loeung was held to further enhance stakeholders' accessibility to the information on the kick-off stakeholder meeting. The subsequent stakeholder meetings correspond to the requirements of the guidelines as below.

- The Stakeholder Meeting 2-1 meeting corresponds to Clause 3.2.3.3 of the guidelines which stipulate the consultation at the time of scoping for the IEE-level study.
- The Stakeholder Meeting 2-2 corresponds to Clause 3.2.3.6 of the guidelines which stipulate the consultation at the time of the rough draft of environmental and social considerations for the IEE-level study.
- The Stakeholder Meeting 2-3 corresponds to Clause 3.2.3.7 of the guidelines which stipulate the consultation at the time of preparing a draft of the final report for the IEE-level study.
- The Stakeholder Meeting 3-1 corresponds to Clause 3.3.3.1.3 of the guidelines which stipulate the consultation at the time of scoping for the EIA-level study.
- The Stakeholder Meeting 3-2 corresponds to Clause 3.3.3.1.6 of the guidelines which stipulate the consultation at the time of the rough draft of environmental and social considerations for the EIA-level study.
- The Stakeholder Meeting 3-3 corresponds to Clause 3.3.3.1.7 of the guidelines which stipulate the consultation at the time for preparing a draft of the final report for the EIA-level study.

As a result, the following 8 stakeholder meetings have been held. Table 8.2.2 indicates the procedures for those stakeholder meetings, respectively.

Table 8.2.2 Procedures for Overall Stakeholder Meetings

No.	Meeting	Level	Objective	Timing
1	SHM 1-1	Kick-off	Introduction of the Project, explanation on procedures for public consultations, and preliminary scoping of environmental and social considerations study	May 2004
2	SHM 1-2	Kick-off	Same as above (Special Session at Neak Loeung)	June 2004
3	SHM 2-1	IEE	Consultation at the time of scoping of environmental and social considerations	October 2004
4	SHM 2-2	IEE	Consultation at the time of preparing a rough outline of environmental and social considerations	December 2004
5	SHM 2-3	IEE	Consultation at the time of preparing a draft of the final report (Consensus was made among the stakeholders on the selected optimum method)	March 2005
6	SHM 3-1	EIA	Consultation at the time of scoping of environmental and social considerations	June 2005
7	SHM 3-2	EIA	Consultation at the time of preparing a rough outline of environmental and social considerations	September 2005
8	SHM 3-3	EIA	Consultation at the time of preparing a draft of the final report	January 2006

Remarks: SHM means Stakeholder Meeting

8.2.2 Procedures for Stakeholder Meetings (Minority Groups)

According to the basic concept for the JICA new guidelines, consultations with local stakeholders should be implemented regardless of ethnicity. In the project affected area, there are 3449 Vietnamese people and 2 Cham people as Table 8.2.3 shows, and much attentions were paid to these people to hold special consultations with these minority groups of people in order to reflect their voices on the Project.

Table 8.2.3 Vietnamese and Cham Stakeholders in the Project Affected Area

Commune	No. of Village	Total Population	Vietnamese Population	Cham Population	Proposed No. of Vietnamese Stakeholders	Proposed No. of Cham Stakeholders
Preak Khsay Kha	6	11908	2146	0	20	0
Neak Loeung	2	3128	409	0	5	0
Kampong Phnom	2	6300	107	0	5	0
Preak Tonlob	2	8328	553	0	5	0
Preak Khsay Ka	2	6756	234	9	5	2 (Heads of 2 families)
Banlich Prasat	2	2814	0	0	0	0
Total	16	39234	3449	9	40	2 (Heads of 2 families)

Therefore, in addition to the overall stakeholder meetings, the following 3 special stakeholder meetings for the minority groups were held during the master plan stage (the IEE-level study stage), as Table 8.2.4 shows. Since, in the feasibility study stage (the EIA-level study stage), there were no minority groups as the PAPs in the selected route for the 2nd Mekong Bridge, the special stakeholder meetings with the minority groups were not held.

Table 8.2.4 Procedures for Stakeholder Meetings with Minority People

No.	Meeting	Level	Objectives	Date
1	2-1-a	IEE	Consultation at the time of scoping of environmental and social considerations	October 2004
2	2-2-a	IEE	Consultation at the time of preparing a rough outline of environmental and social considerations	December 2004
3	2-3-a	IEE	Consultation at the time of preparing a draft of the final report	March 2005

8.2.3 Selection of Stakeholders

(1) The Master Plan Stage (The IEE-level Study Stage)

The scope and selection method of stakeholders is always a controversial issue in public consultations. It is widely argued that, at the early stage of public consultations, the scope of stakeholders should not be narrowed, and a wide range of possible participants such as promoting agencies (governmental organizations), non-governmental organizations, potential opponents, local people who might be project affected persons (PAPs), donor agencies, research organizations, the private sector, and other concerned parties, should be included in the scope of stakeholders. Therefore, at the IEE-level study stage, the following 94 stakeholders were selected to cover all parties who are interested in the project.

Table 8.2.5 Selected Stakeholders for the Overall Meetings at Phnom Penh

No.	Category	Number of Stakeholders
1	Ministries and Agencies	25
2	Representative from People in Neak Loueng	12
3	Management and Staff of Neak Loueng Ferry	5
4	International Organizations and Donor Agencies	20
5	Local Governments	5
6	NGOs	15
7	Private Sector	7
8	Universities and Research Institutions	5
Total		94

Regarding the NGOs, invitations were handed over to the representatives of the NGO forum and CCC (Cambodia Cooperation Committee), 2 large federations of international and local NGOs in Cambodia, as well as the representative of RAN (Resettlement Action Network), an affiliated organization inside the NGO forum who has keen interests in resettlement issues.

In order to provide sufficient and substantial opportunities with village stakeholders in the project affected area, the stakeholder meetings together with special workshops for village stakeholders were separately held, although 12 chiefs and deputy chiefs from 6 communes participated in the overall meeting on behalf of the village stakeholders.

In addition to the stakeholders for the overall meeting, 80 village people were selected as local stakeholders who will separately participate in the local stakeholder meetings as well as workshops. Five participants were selected from each village in accordance with the following criteria in an attempt to represent the local situations in the project affected area. Participants were selected in consultation with each village chief.

- Preferably a housewife, otherwise a representative from the selected households
- Persons aged between 18 and 25 years old
- Workers (employed or self-employed in the secondary/tertiary sectors)
- Persons engaged in agriculture or fishery sectors
- Vulnerable groups of people.

A commune chief invited heads of relevant villages and requested them to select appropriate participants from the above-designated categories and different households who were concerned about the Project. Then, a list (name, address, occupation, and category) of participants recommended by the village chief were submitted to MPWT with a copy to the commune chief.

50% of the participants, namely 40 participants, were continuously selected from the same villagers who participated in the Stakeholder Meeting 1-2 at the kick-off stage, taking into account the continuity of public consultations *(Regular Member)*. On the other hand, other 40 participants were selected from villagers who did not participate in the Stakeholder Meeting 1-2 and will participate only once in each stakeholder meeting and workshop, taking into account the assurance of opportunities for new comers. *(Rotating Member)*. Consequently, 80 participants were selected from 16 villages of the following 6 communes as Table 8.2.6 shows.

Table 8.2.6 Selected Village Stakeholders for the Local Stakeholder Meetings and Workshops at Neak Loeung in the EIA-level Study Stage

Commune	Number of Villages	Number of Stakeholders		
			Regular Members	Rotating Members
Kampong Phnum	2	10	5	5
Preak Tonloab	2	10	5	5
Preak Khsay Ka	2	10	5	5
Preak Khsay Kha	6	30	15	15
Neak Loeung	2	10	5	5
Banlich Prasat	2	10	5	5
Total	16	80	40	40

(2) The Feasibility Study Stage (The EIA-level Study Stage)

In the beginning of the public consultations of the feasibility study stage (the EIA-level study stage), the Project Affected Persons (PAPs) were selected as one of the most important participants instead of general village stakeholders in the master plan stage (the IEE-level study stage). The most important direct impact in terms of social environment is acquisition of the land needed for the construction works associated with the Bridge. These works will include the construction works for approach roads, shoulders, embankments, side drains, box culvert sites, etc. In addition, the land will be necessary for the construction yards for contractors' stationing which will be composed of offices, workshops, storage, handling yards, and etc. Consequently, the PAPs were tentatively identified as core participants for the EIA-level study stage of the Study in the following "Construction Area" of the Project.

- Tentative right of way (ROW) as part of the National Road No.1
- Land needed for by-passes and approach roads connecting to the Bridge
- Land needed for the construction yard
- Other land needed for the construction of the Bridge

While, at the time of designing the tentative alignment of the route of the Bridge, the estimated number of the PAPs on the tentative ROW was originally estimated at 54 households, at the time of revising the alignment of the route, the revised number of the PAPs in the planned "Construction Area" was estimated at 131 households, the details of which are as per Table 8.2.7. These PAPs are distributed across the route of the Bridge in 5 clusters (Cluster A, B, C, D, and E) of communities in Kampong Phnom, Preak Khsay Ka, and Preak Khsay Kha commune as shown in Figure 8.2.1.

Table 8.2.7 Tentative Number of PAPs (Households) in the Planned "Construction Area"

Location	Commune	Village	Number of PAPs
A	Kampong Phnom	Ampil Toeuk	29
B	Kampong Phnom	Ampil Toeuk	19
C	Kampong Phnom	Koh Chamroeun	4
D	Preak Khsay Ka	Phum 4	34
E	Preak Khsay Kha	Phum 3	45
Total			131

In addition to these PAPs, 99 landowners were separately identified as additional PAPs inside the "Construction Area" required for the Bridge. Eventually, 230 PAPs (131 households and 99 landowners) were identified as the tentative PAPs in the "Construction Area" at the time of the Stakeholder Meeting 3-1. (However, the final number of PAPs for the "Simple Survey" was revised to 260 households and landowners.)

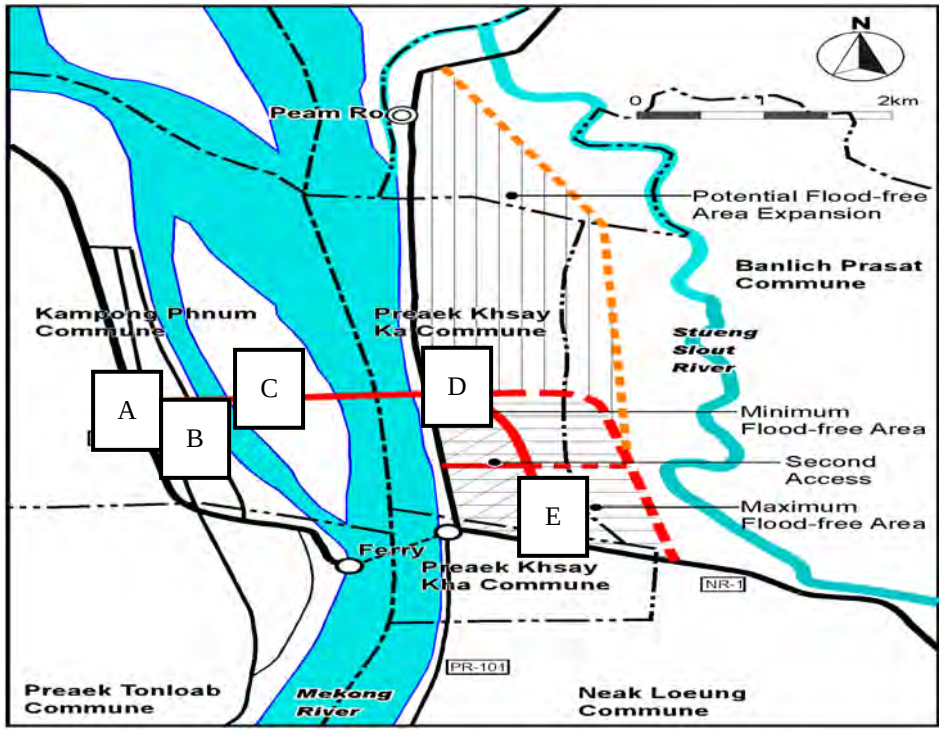


Figure 8.2.1 Clusters of Communities inside the "Construction Area" for the Bridge

Apart from the directly affected PAPs, the following indirectly affected persons by the Project have also been included in the stakeholders.

Table 8.2.8 Indirectly Affected Persons as Stakeholders

No.	Category	Number of Stakeholders
1	Mobile Vendors at Ferry Terminals	30
2	Owners of Restaurants and Retail Shops at Ferry Terminals	30
3	Locally-employed Staff of Neak Loeung Ferry	20
Total		80

Consequently, out of a wide range of 310 stakeholders (230 directly affected persons and 80 indirectly affected persons), 80 stakeholders were selected for the participants in the stakeholder meetings of the feasibility study stage.

8.2.4 Information Disclosure

The information disclosure by public consultations is one of the integral parts of the basic principle of the guidelines. The guidelines state that, while the recipient governments disclose information about environmental and social considerations of projects, JICA is required to assist the recipient governments by implementing cooperation projects. Table 8.2.9 shows the forms of information disclosure throughout a series of public consultations. Special attention was paid to assure

stakeholders' accessibility to all the relevant information related to the Project and the public consultations.

Table 8.2.9 Forms of Information Disclosure

No.	Form of Information Disclosure	Type of Communication Tools
1	Stakeholder Meeting	Face-to-Face
2	Documents and Materials at the Commune Office	Written Documents
3	Documents and Materials at the Headquarter of MPWT	Written Documents
4	Website (http://www.2ndmekongbridge.com)	IT
5	Documents on Demand	Written Documents

Clause 2.1.9 of the guidelines states that JICA will prepare documents in cooperation with the recipient governments in an official or familiar language and an understandable form for local people. In response to these requirements, all the related documents such as presentation materials and minutes of meetings related to the public consultations will be translated into Khmer language, which is the official language of Cambodia, in order to ensure that all the stakeholders can access to the related information.

The website for information disclosure specifically designed for the Study was created by the Study team. The URL for the website is http://www.2ndmekongbridge.com. Especially, the website includes the function of provision of downloadable documents, and the contents of the website are available in both Khmer language and English language. In an attempt to guarantee the accessibility of IT-illiterate stakeholders in Neak Loeung, the same documents were prepared in relevant commune offices to facilitate stakeholders' easy access to the related information.

8.3 Results of Stakeholder Meetings

8.3.1 Results of Stakeholders Meetings at the IEE-level Study Stage

(1) Stakeholder Meeting 1-1

The Stakeholder Meeting 1-1 was held as the kick-off meeting at the conference hall of MPWT in Phnom Penh on May 24, 2004. Totally, 158 persons from a wide range of stakeholders were invited, and 140 persons actually participated in the meeting, the detailed list of which is attached in Appendix 8.3.

The major objectives of the Stakeholder Meeting 1-1 were to kick off the public consultation for the purposes of:

- introducing the outline of the Project and the Study
- introducing the basic principles and process of the JICA environmental and social considerations guidelines
- explaining the procedures for the public consultations
- consulting with stakeholders on the preliminary scoping for the IEE-level environmental and social considerations study
- sharing all the related information among stakeholders.

Two sets of power point equipment as well as a simultaneous translator in and between Khmer language and English language were arranged for better communication among stakeholders. The ownership of MPWT in organizing the Stakeholder Meeting was generated, since the venue for the meeting was at the office of MPWT. The meeting was videotaped and recorded in the whole session for transparency with minutes of meeting for information disclosure.

The programme of the Stakeholder Meeting 1-1 was divided into 2 parts. While the first part was composed of 4 presentations (Part I - IV) by the officials of MPWT and IRC (Inter-ministerial Resettlement Committee) as well as the JICA study team, the second part covered the exchanges of views and the Q&A session among all stakeholders. The outline of programme is shown in Table 8.3.1, and the detailed contents of the powerpoint presentations are attached in Appendix 8.3.

Table 8.3.1 Outline of the Programme for the Stakeholder Meeting 1-1

No.	Programme	Organization in Charge
1	Registration	MPWT
2	Opening Remarks	Chairman of Steering Committee
3	Introduction of Stakeholders	MPWT
4	Presentation I (Outline of Project and Study)	MPWT
5	Presentation II (Outline of New JICA Guidelines)	JICA Study Team
6	Presentation III (Procedures for Public Consultations)	IRC
7	Presentation IV (Scoping for IEE-level Study)	JICA Study Team
8	Exchange of Views and Q&A	All Stakeholders
9	Closing Remarks	MPWT

The main discussion points are as follows, and the full minutes of meeting are attached in Appendix 8.3.

- It was widely expressed by a considerable number of stakeholders that the construction of the 2nd Mekong Bridge is favorable for the enhancement of their livelihood as well as regional development.
- Majority of local government officials also expressed their strong support for the construction of the Bridge.
- A couple of stakeholders from NGOs stated that the Government of Cambodia as well as JICA is requested to ensure that transparent and meaningful opportunities to express opinions are provided for possibly project affected people, especially vulnerable people, so that their substantial participation in the decision making can be guaranteed.
- The private sector, especially a representative from the garment sub-sector, welcomed the construction of the Bridge due to the fact that the Bridge can provide large container trucks with smooth transportation services, while a representative from the NGOs concerned that economic benefit from the Bridge might not go to people in the region but go to neighboring countries.
- Some participants expressed their concerns about negative impacts by the construction of the Bridge and the compensation for involuntary resettlement, adding that thorough studies on the mitigation of those negative impacts are required.
- Regarding the draft scoping for the IEE-level environmental and social considerations studies, there was basically no objection about the full-coverage of the impacts to be assessed which are stipulated by the new guideline.
- Other technical issues such as the clearance of UXO mines at the bottom of the river, the navigation clearance of the Bridge, etc. were discussed.

In addition to the above-mentioned main discussion points, the following lessons learned were taken into account, when the subsequent stakeholder meetings were held.

- Due to the high-ranking officials' expressions of their strong support for the construction of the Bridge, it seemed that the people with negative opinions had difficulties in expressing their ideas.
- Although it was emphasized by MPWT and the Study team that the Study does not mean that the Government of Japan was committed the construction of the Bridge, the majority of the stakeholders had discussed the benefits accrued from the Bridge on the condition that there would be a grant aid from Japan.
- Since the Study was still at the early stage, the stakeholders had some difficulties in imagining the positive and negative impacts.

(2) Results of the Stakeholder Meeting 1-2

After the Stakeholder Meeting 1-1, it was pointed out by some stakeholders that there were not ample opportunities for those who might be project affected people to express their negative opinions on the construction of the Bridge due to the condition that the strong support by some top officials of the local governments might affect those opportunities. In order to provide village stakeholders with opportunities to express their opinions, a special session of the Stakeholder Meeting (Stakeholder Meeting 1-2) was held at the office of the Neak Loeung Ferry on June 21, 2004. Totally, 80 persons from 16 villages of 6 communes which might be project affected areas were invited as shown in Table 8.3.2, and 77 persons actually participated in the meeting. In addition to the villagers, 31 representatives from MPWT, the steering committee, NGOs and the JICA Cambodia office participated in the meeting as observers. The detailed list of which is attached in Appendix 8.3.

Basic facilities as well as equipment were rented from the office of Neak Loeung Ferry, an affiliated organization of MPWT, and, therefore, the ownership of MPWT in organizing the Stakeholder Meeting 1-2 was also observed. The meeting was also videotaped and recorded under the agreement among all stakeholders in the whole session for transparency with minutes of meeting for information disclosure. Representatives from NGOs contributed to the workshop as observers who can advise village stakeholders when necessary.

Table 8.3.2 Outline of Stakeholders at the Stakeholder Meeting 1-2 (Neak Loeung Session)

Province	District	Commune	Number of Villages	Number of Invited Persons
Kandal	Leuk Daek	Kampong Phnum	2	10
Kandal	Leuk Daek	Preak Tonloab	2	10
Prey Veaeng	Peam Ro	Preak Khsay Ka	2	10
Prey Veaeng	Peam Ro	Preak Khsay Kha	6	30
Prey Veaeng	Peam Ro	Neak Loeung	2	10
Prey Veaeng	Peam Ro	Banlich Prasat	2	10
Total			16	80

The programme of the Stakeholder Meeting 1-2 was divided into 3 parts. The first part was the general session, the contents of which were basically same as those of the Stakeholder Meeting 1-1 with some minor modifications in order to make them easily understood. The second part was the session for the small group discussions, where 80 villagers were divided into 8 small groups for an hour discussion on the following issues. A chairperson and a recorder were selected from each small group, respectively. Questions included:

- How is crossing the Mekong River deeply related with your life?
- At present, the ferries are operated for crossing the river. Are there any problem?
- If there are any problems, how would you like to do?

The last part was the wrap-up session to provide representatives of all small groups with opportunities to make presentations on the summaries of the discussions. Table 8.3.3 shows the outline of the programme for the Stakeholder Meeting 1-2.

Table 8.3.3 Outline of the Programme for the Stakeholder Meeting 1-2 (Neak Loeung Session)

No.	Programme	Organization in Charge
1	Registration	MPWT
2	Opening Remarks	MPWT
3	General Session (Presentation I-IV)	MPWT
4	Guidance and Grouping for Small Group Discussions	MPWT
5	Small Group Discussions	All Stakeholders
6	Wrap-up Sessions	All Stakeholders
7	Exchange of Views and Q&A	All Stakeholders
8	Closing Remarks	MPWT

The main discussion points are as follows, and the full minutes of meeting are as per attached Appendix 8.3.

- After small group discussions, the majority of stakeholders stated that the construction of the bridge at Neak Loeung is favorable because of its positive impacts on: i) poverty alleviation, ii) smooth transportation of passengers and goods, iii) quick and easy access to various social services such as education and health, iv) improvement of marketing such as on-time delivery of agricultural products, v) availability of 24-hour crossing service, and vi) increase in number of tourists, etc.
- Nevertheless, some stakeholders expressed their concerns about whether or not the government would provide them with suitable compensations for involuntary resettlements.
- A representative NGOs stated that the Government of Cambodia as well as JICA is requested to ensure that every possible stakeholder should be involved in the discussion process in order to assure that the transparency of the public consultations is met.
- A couple of representatives from NGOs were concerned about insufficient compensation for the involuntary resettlement by referring to the past experiences such as the rehabilitation of National Road No.1, etc.
- A couple of representatives from NGOs stated that the stakeholders from villages are not well aware of the negative impacts from the construction of the Bridge at this early stage, and, therefore, the Government of Cambodia as well as JICA is requested to conduct a comprehensive environmental and social considerations study and transparently disclose the results of the study.
- Regarding the draft scoping for the IEE-level environmental and social considerations studies, there was no objection about the full-coverage of the impacts to be assessed which are stipulated by the new guidelines.
- The representative from MPWT emphasized that the government guarantees democratic and transparent processes of the public consultations and welcomes any negative opinions, adding that it will improve the compensations for the involuntary resettlement.

(3) Stakeholder Meeting 2-1

The Stakeholder Meeting 2-1 was held at the conference hall of MPWT in Phnom Penh on October 7, 2004. Totally, 70 persons actually participated in the meeting, the detailed list of which is as per Appendix 8.3.

The major objectives of the stakeholder Meeting 2-1 were:

- To review the Stakeholders' Meeting 1-2 and explain the objectives of the Stakeholder Meeting 2-1.
- To explain the function of the newly-designed website to encourage the broad public participation.
- To explain the alternative options for the Mekong River crossing.
- To explain the final TOR for the proposed IEE Study.
- To explain the regional development scenario associated with this proposed project.

The programme of the Stakeholder Meeting 2-1 was divided into two parts. The first part was composed of a series of presentations (Part I - III) by the officials of MPWT, while the second part covered exchange of views and Q&A session among all stakeholders. The outline of programme is summarized in Table 8.3.4, and the detailed contents of the power point presentations are attached in Appendix 8.3.

Table 8.3.4 Outline of the Programme for the Stakeholder Meeting 2-1

No	Programme	Responsibility
1	Registration	MPWT
2	Opening Remarks	MPWT
3	Introduction	MPWT
4	Presentation Part I (Alternatives Methods to Cross the Mekong River)	MPWT
5	Presentation Part II (Final Scoping and Proposed TOR for IEE Study)	MPWT
6	Presentation Part III (Regional Development Scenarios and Projects)	MPWT
7	Discussions and Q&A Session	All Stakeholders
8	Closing Remarks	MPWT

The main discussion points are described as follows, and the full minutes of meeting are attached in Appendix 8.3.

- A lot of stakeholders favored the bridge option and stressed disadvantages of other options such as the ferry option. Some local stakeholders expressed the great concern about the resettlement issue to be caused by the proposed project.
- Several stakeholders expressed their keen interest in the TOR of the proposed IEE study and importance of several potential environmental issues around the study area were discussed.
- An official of the Ministry of Post and Telecommunication was concerned about the optical fiber cable line laid at the bottom of the Mekong River, and stressed the importance of technical integrity between the proposed Mekong crossing and the extension plan of the optical cable.

- Justification of the vertical navigation clearance of 37.5 meters was explained by MRC representative, citing World Bank study report and the case study of Nan-Jing, China. Also, the importance of the harmonization between the proposed project and the future development of Phnom Penh Port was commented upon.

(4) Results of the Stakeholders' Meeting 2-2

The Stakeholders' Meeting 2-2 was held at the conference hall of MPWT in Phnom Penh on December 27, 2004. Totally, 81 persons actually participated in the meeting, the detailed list of which is as per Appendix 8.3.

The major objectives of the Stakeholders' Meeting 2-2 were:

- To review the previous Stakeholder Meeting 2-1 and explain objectives of the Stakeholder meeting 2-2.
- To explain the function of the bulletin board system of the website.
- To explain the evaluation criteria for the selection of the best alternative options to cross the River.
- To explain the selection method of the best alternative option.
- To explain the interim results of the IEE Study.

The programme of the Stakeholder Meeting 2-2 was divided into two parts. The first part was composed of a series of presentations (Part I -III) by the officials of MPWT, while the second part covered exchange of views and Q&A session among all stakeholders. The outline of programme is summarized in Table 8.3.5, and the detailed contents of the power point presentations are attached in Appendix 8.3.

Table 8.3.5 Outline of the Programme for the Stakeholder Meeting 2-2

No	Programme	Responsibility
1	Registration	MPWT
2	Opening Remarks	MPWT
3	Introduction	MPWT
4	Presentation Part I (Evaluation Criteria for Selection of Best Alternative Methods to Cross the River)	MPWT
5	Presentation Part II (Evaluation Method for Selection of Best Alternative Methods to cross the River)	MPWT
6	Presentation Part III (Interim Results for IEE-level Social and Environmental Studies)	MPWT
7	Discussions and Q&A Session	All Stakeholders
8	Closing Remarks	MPWT

The main discussion points are described as follows, and the full minutes of meeting are attached in Appendix 8.3.

- Several technical matters with the application of AHP method into the best alternative selection process (e.g., the setting of weighting factors) were discussed.
- Three questions such as the salinity intrusion from South China Sea, potential impacts on the river bed condition of the Mekong River and UXO were presented, and importance of each question within the proposed project was discussed.
- A representative from NGOs raised a question about financing and final decision maker of the project.

- Definition of the expression, "minority people" was addressed and the validation of using this terminology to categorize the Vietnamese people was discussed.
- Negative and positive social environmental impacts to be caused by the proposed project such as resettlement or loss of current jobs were addressed by several stakeholders.

(5) Stakeholder Meeting 2-3

In the master plan stage, it has been concluded that:

a) The *"Ferry Improvement + Bridge (Route A)"* option should be selected as the optimum solution to cross the Mekong River at Neak Loeung, based on the ratings on evaluation criteria by concerned stakeholders.

b) All the concerned stakeholders, as the result of their ratings on the evaluation criteria, reached the conclusion that the *"Ferry Improvement + Bridge (Route A)"* option is given the highest priority among the alternative crossing methods, and it is justifiable from engineering, economic, social and environmental point of views.

c) Being assumed that the bridge construction will take about 6 to 8 years, including pre-construction and construction period, it is necessary to increase the existing ferry capacity to cope with the future traffic demand if the bridge is not timely open to traffic.

d) Eventually, the Second Mekong Bridge project, through the verification of the public consultation process, should be pursued and forwarded to the feasibility stage of the Study.

The Stakeholder Meeting 2-3, the last stakeholder meeting of the master plan stage of the Study, was held on March 10 and 11, 2005 in an attempt to demonstrate that the *"Ferry Improvement + Bridge (Route A)"* option was selected as the optimum solution to cross the Mekong River at Neak Loeung.

In order to further guarantee the far-reaching transparency and information disclosure to all the stakeholders, one-and-half month public comment period was set up after the Stakeholder Meeting 2-3, and, during this public comment period, the Ministry of Public Works and Transport received a wide range of comments and questions from 22 various stakeholders (17 communes, 1 private company, 1 university, 1 NGO and 2 Government organizations) as shown below.

Table 8.3.6 Number of Comments and Questions from Stakeholders

No.	Stakeholder	Number of Comments and Questions
1	Preak Khsay Kha Commune	7
2	Neak Loueng Commune	4
3	Banlich Prasat Commune	3
4	Preak Khsay Ka Commune	3
5	Private Company	1
6	University	1
7	Cambodia National Mekong Committee	1
8	Ministry of Rural Development	1
9	NGO	1
Total		22

The typical comments/questions by various stakeholders and answers by the Ministry of Public Works and Transport are listed below, and the summary of the public comments are as per Appendix 8.3.

- *Question (Commune 1): The villagers of Village 5 has a question to the Japanese Government. When will the bridge be constructed? All the people really want to know exactly.*

  Answer: The Government of Cambodia, the responsible organization of this project, is now asking the Japanese Government to provide assistance for this project. The timing of the construction will be decided after having responses from the Japanese Government. The government of Cambodia understands that the Japanese Government will make a decision on the possible assistance based on the second phase of the Study.

- *Question (Commune 2): What are the impacts on natural environment and social environment by the construction of the second Mekong Bridge? How does the government solve those problems?*

  Answer: There are a wide range of natural and social environmental impacts by the bridge construction, including considerable scale of the involuntary resettlement. The details of the results of the IEE-level environmental impact study are indicated in the documents of the stakeholder meeting 2-3. In the feasibility study stage, the Ministry, with the assistance of JICA, will study a comprehensive compensation and mitigation package to minimize those impacts, including the resettlement action plan (RAP).

- *Question (Private Company): Can the Cambodian private company take part in the bid? I notice that the previous Japanese grant aid is always tendered in Japan?*

  Answer: The eligibility of the Cambodian company to take part in the bid depends on the financial scheme of the project. Local contractors might have opportunities to become supporting companies working for and under the Japanese companies who are eligible for taking part in the bid, even in case of the grant aid by Japan.

- *Question (University): How to deal with social environmental problems that may take place during the construction period?*

  Answer: There are a wide range of the social impacts caused by the construction of the bridge. The details of the IEE-level social impacts were presented by the documents of the stakeholder meeting 2-3 which are available in the commune offices and the website. Especially, the involuntary resettlement which might be caused by the construction of the bridge will be carefully studied in the EIA of the second phase of the Study.

- *Question (International Organization): The Cambodia National Mekong Committee (CNMC) requests MPWT to keep the vessel clearance of the bridge 37.5 m high over the maximum water level in the rainy season, which is the same as MY THUON Bridge in Vietnam. After completing the feasibility study, please MPWT inform CNMC of those information in order to distribute among other member countries of the Mekong River Commission.*

  Answer: The vessel clearance of the bridge is designed to keep 37.5 m high over the maximum level in the rainy season, which is the same as MY THUON bridge in Vietnam. The Ministry will keep the Cambodia National Mekong Committee as well as other member countries of the Mekong Committee informed of the feasibility study and other required information.

After this public comment process, the Ministry of Public works and Transport as well as the Steering Committee understood that all the processes for the first phase of the Study were completed, and, accordingly, officially announced that "*Ferry Improvement + Bridge*

(Route A)" option was agreed among all the stakeholders, which could be regarded as the final consensus on the optimum solution to cross the Mekong River at Neak Loeung.

8.3.2 Results of Stakeholders Meetings at the EIA-level Study Stage

(1) Stakeholder Meeting 3-1

As the first step of the second phase of the Study, the Stakeholder Meeting 3-1 (overall meeting) was held at the Crystal Ballroom, Phnom Penh Hotel in Phnom Penh on June 7. Totally, 94 persons from a wide range of stakeholders are invited, and 82 persons actually participated in the meeting. The detailed list of participants is as per Appendix 8.3. The major objectives of the meeting were:

- To review the questions, comments and answers during the public comment period.
- To explain the scope of PAPs (Project Affected Persons).
- To explain the scope for the EIA-level social and environmental studies.
- To explain the outline of RAP (Resettlement Action Plan)

Two sets of power point equipment as well as a simultaneous translator in and between Khmer language and English language were arranged for the better communication among stakeholders. The meeting was videotaped and recorded in the whole session for keeping transparency and making minutes of meeting for the information disclosure. The programme of the meeting was divided into 2 parts. While the first part was composed of 3 presentations (Part I-III) by the officials of MPWT as well as the JICA study team, the second part covered the exchanges of views and the Q & A session among all stakeholders. The outline of programme is shown in Table 8.3.7, and the detailed contents of the powerpoint presentations as well as dozen of photos of the overall meeting are attached in Appendix 8.3.

Table 8.3.7 Outline of the Programme for the Stakeholder Meeting 3-1

No.	Programme	Responsibility
1	Registration	MPWT
2	Opening Remarks	Chairman of Steering Committee
3	Introduction (Review of the 1st Phase of the Study, Objectives of Stakeholder Meeting 3-1)	MPWT
4	Presentation I (Procedures for the Second Phase of the Study and EIA Study)	JICA Study Team
5	Presentation II (Scoping for PAPs and EIA Study)	
6	Presentation III (Outline of Contents for Resettlement Action Plan, Mitigation Measures and Monitoring Plan)	
7	Exchange of Views and Q&A	All Stakeholders
8	Closing Remarks	MPWT

The main discussion points in the meeting are as follows, and the full minutes of meeting are attached in Appendix 8.3.

- The summary of public comments from various stakeholders and answers by MPWT were fully explained by the official of MPWT to make the final consensus among all the stakeholders.
- The detailed procedures for the second phase of the Study as well as the EIA study were explained by the JICA study team.

- The detailed scope for the PAPs as well as the EIA study was also explained by the JICA study team.
- The outline of RAP (Resettlement Action Plan) was described by the JICA study team.
- Some commune officers expressed their concerns about the exact amount and contents of the compensation in case of the resettlement.
- The IRC official explained the basic principles as well as the outline of the resettlement policy of the Cambodian government.
- Some commune officers expressed their interests to take part in the construction works for the Bridge.

(2) The Stakeholders' Meeting 3-2,

The Stakeholder Meeting 3-2, the 2nd meeting at the feasibility stage of the Study, was held at the Crystal Ballroom, Phnom Penh Hotel in Phnom Penh on September 20, 2005. Totally, 94 persons from a wide range of stakeholders are invited, and 79 persons actually participated in the meeting. The detailed list of participants is as per Appendix 8.3. The major objectives of the meeting were:

- To report and discuss the interim results of the EIA-level social and environmental studies.
- To explain the outline of design and technical conditions for the Bridge.
- To explain the outline of contents for RAP (Resettlement Action Plan), mitigation measures, and monitoring plan.

Two sets of power point equipment as well as a simultaneous translator in and between Khmer language and English language were arranged for the better communication among stakeholders. The meeting was videotaped and recorded in the whole session for keeping transparency and making minutes of meeting for the information disclosure. The programme of the meeting was divided into 2 parts. While the first part was composed of 3 presentations (Part I-III) by the officials of MPWT as well as the JICA study team, the second part covers the exchanges of views and the Q & A session among all stakeholders. The outline of programme is shown in Table 8.3.8, and the detailed contents of the power point presentations are attached in Appendix 8.3.

Table 8.3.8 Outline of the Programme for the Stakeholder Meeting 3-2

No.	Program	Responsibility
1	Registration	MPWT
2	Opening Remarks	MPWT
3	Introduction (Review of Stakeholder Meeting 3-1 and Objectives of Stakeholders' Meeting 3-2)	MPWT
4	Presentation Part I (Interim Results of EIA)	MPWT
5	Presentation Part II (Outline of Design and Technical Conditions for the Bridge)	MPWT
6	Presentation Part III (Outline of Contents for Resettlement Action Plan, Mitigation Measures and Monitoring Plan)	MPWT
7	Questions and Answers, and Discussions	All Stakeholders
8	Closing Remarks	MPWT

The main discussion points in the meeting were as follows, and the full minutes of meeting are attached in Appendix 8.3.

- A lot of stakeholders had keen interest in the interim results of the EIA, and requested the Government to explain the clear results of the social impacts caused by the acquisition of the land needed for the Project.
- Regarding the contents for the Resettlement Action Plan (RAP), mitigation measures and monitoring plan, a lot of stakeholders are concerned about the level of the compensations which would be provided by the Government.

8.3.3 Results of Participatory Workshops with PAPs and Indirectly Affected Persons

In the feasibility study stage (the EIA-level study stage), the public consultations at Neak Loeung included the full-scale participatory as part of the Stakeholder Meeting 3-1 and 3-2, in order to reflect the real voices of the people in the Project.

(1) Participatory Workshop in Stakeholder Meeting 3-1

In an attempt to reflect needs and opinions of PAPs as well as indirectly affected persons by the Project, a couple of half-day-long workshops were held after the overall session in Neak Loeung as part of the Stakeholder Meeting 3-1.

The first workshop was held in the afternoon on June 7, 2005 and the second one was also in the afternoon on June 8, 2005. The venue was the meeting room of the Neak Loeung Ferry Office. The details of the programme for these workshops are attached in Appendix 8.3.

1) Results of the First Workshop (Workshop with direct PAPs: households and landowners)

a) Objectives of the workshop

Based on the presentation given in the overall session, the workshop is designed to allow participants to exchange their views on issues or concerns derived from the supposed resettlement of houses and land. The participants' opinions expressed in the workshop have been taken into consideration in such activities as formulating a RAP.

b) Procedures for the workshop

The program consisted of the following six steps: 1) orientation of the workshop; 2) self-introduction; 3) game; 4) impacts analysis; 5) problems analysis; and 6) presentation. In designing the programme for the workshop, much attention was paid particularly to participatory atmosphere for the smooth discussion among the local stakeholders. The details of the programme for these workshops are attached in Appendix 8.3.

Step 1. Orientation

Objectives of the workshop and its program was explained by the Japanese facilitator.

Step 2. Self-introduction

Participants introduced themselves to get to know each other using cards. Name of the participants, village names, number of family members and attractive points of their villages were listed by each participant on cards.

Step 3. Game

Taking into consideration the fact that some participants who might have difficulties in writing, a game-style brainstorming was conducted. As a rule of the game, each

participant was expected to express immediately his/her own idea concerning the resettlement once catching a ball thrown by another participant. All the expressed ideas were written on cards to be shared in the following steps.

Step 4. Impacts analysis

Participants discussed positive and negative impacts supposedly derived from the resettlement activities, its probability and importance of those impacts. In the discussion, participants visualized their opinions by writing them down on cards and attached them to the board called "*Impact Analysis Table*".

Step 5. Problems analysis (Group work)

Participants discussed the negative impacts supposedly derived from the resettlement activities. Participants listed their opinions by writing them down on cards and attached them to the board, too.

Step 6. Presentation of the problems analysis

Participants shared the results of the discussion, and the result of the work was presented by a representative of each group.

c) Participants for the workshop

24 participants were selected from the participants (residents and landowners) in the overall session. In the random selection of the participants, much attention was paid to their gender balance. The list of participants is attached in Appendix 8.3.

For the smooth implementation of the workshop, three Cambodian staff of the study team were assigned as facilitator to assist the discussion.

Prior to the workshop, they were instructed how to play role of facilitator by the Japanese facilitator. A Cambodian interpreter (Khmer-English) was also assigned for smooth discussion and documentation of the result of the discussion.

A Japanese facilitator, one of the staff members of the study team was assigned to support the Cambodian facilitators in designing, preparing and implementing the workshop.

d) Discussions in the workshop

a. Impacts analysis

Participants discussed the impacts derived from involuntary resettlement by the acquisition of house and land. The ideas written on cards by participants were sorted depending on probability and impacts. Such impact like "We get a new bridge" is one of the most positive and probable impacts analyzed by participants. "Save money", "The country is developed" and "The national economy increases" were also selected as relatively highly probable impacts. Among negative impacts, the following were selected as relatively highly probable ones:

- "I have little knowledge and information on the compensation".
- "I am worried about the resettlement, since we do not have enough money for buying a house to be replaced".
- "It is very difficult for me to resettle to a replaced land".

b. Measures to take for the mitigation of the impacts.

Following the impacts analysis, each group discussed causes of one of the issues.

- "I don't know about the compensation"
- "It is very difficult for me to resettle"

- "I am worried about the resettlement"
- "The compensation may not be enough to buy a replacement house".

The participants discussed also what kind of measures were to be taken to mitigate the concerns.

e) Findings from the workshop

In the discussion where the participants exchange their views and opinions by writing them down on cards, a minimum level of literacy was absolutely required. On the other hand, in the game, literacy was not necessarily required and all the participants could exchange their opinions more smoothly.

If there were some participants who did not feel easy in writing, with some help of the Cambodian facilitators and interpreters, they were actively exchanging their opinions.

Taking into consideration the limited number of Cambodian facilitators (3 persons), limited space of the workshop and time restriction, only 24 participants were invited in total (the number of groups was 3, and the number of participants of each group was 8). However, it should have been considered that the group discussion would be realized with less than 8 persons.

Attending a workshop was new to almost all the participants except one person who has been participating at the former workshops. His cooperative attitude with strong concern made the workshop more active.

At the end of the workshop, most of all the participants made comments that they felt satisfied with the workshop where clear information and explanation were given and that they had opportunity to discuss among them. It can be considered that the participatory way of discussion is very effective among local people.

It can be considered that the participants understood the positive implication that the resettlement might cause. For instance, if they can have a bridge after the resettlement, there will be an increase of the national economy and then the country's development. Saving money (if the toll in crossing the river is free) is also expected as a result of the bridge construction. In the discussion every participant agreed to the bridge construction. At the same time, they expressed their concerns about the resettlement derived from the land acquisition for the construction. The main concerning points were: 1) To lose their land, and 2) Money for the construction of a new house.

It is because, they cannot continue agriculture and they cannot afford to have a new house that will require enough money, if they lose their land.

They expressed their dissatisfaction that the necessary information and support have not been given yet by the Government and worried that the compensation by the Government would not be adequate. Some expressed that they need NGOs to do investigation.

In conclusion, information about resettlement and compensation should be given appropriately and timely from the Government to the PAPs. For the purpose of the smooth implementation of the resettlement and the support for the PAPs, the Government and NGOs should be collaborating.

2) Results of the 2nd Workshop (Workshop with Indirect PAPs: Vendors and Restaurants / Shop Owners)

a) Objectives of the workshop

Based on the presentation given in the overall session, the workshop is designed to allow participants to exchange their views on issues or concerns derived from the

supposed resettlement of houses and land. The participants' opinions expressed in the workshop will be taken into consideration in such activities as formulating a RAP.

b) Procedures for the workshop

The program consisted of the following six steps: 1) orientation of the workshop, 2) self-introduction, 3) game, 4) impacts analysis, 5) actions analysis, and 6) presentation. In designing the programme for the workshop, much attention was paid particularly to participatory atmosphere for the smooth discussion among the local stakeholders. The details of the programme for the workshop are attached in Appendix 8.3.

Step 1. Orientation

Objectives of the workshop and its program were explained by the Japanese facilitator and it was translated into Khmer.

Step 2. Self-introduction

Participants introduced themselves to get to know each other using cards. Name of the participants, village names, number of family members, etc. were listed by each participant on cards.

Step 3. Game

In the same manner as the 1st Workshop, a game-style brainstorming was conducted. As a rule of the game, each participant was expected to express immediately his/her own idea concerning the abolishment of the crossing service of the Neak Leoung Ferry once catching a ball thrown by another participant. All the expressed ideas were written on cards to be shared in the following steps.

Step 4. Impacts analysis

Participants discussed the positive and negative impacts supposedly derived from the abolishment of the crossing service of the Neak Loeung Ferry and its probability and importance of impacts. In the discussion participants visualized their opinions by writing them down on card and attached them to the board called "Impact Analysis Table".

Step 5. Action analysis (Group work)

Participants discussed the necessary action to cope with the supposed negative impacts derived from the abolishment of Neak Loeung Ferry Service. Participants listed their opinions by writing them down on cards and attached them to the board, too.

Step 6. Presentation of the problems analysis

Participants shared the results of the discussion, and the result of the work was presented by a representative of each group.

c) Participants for the workshop

18 participants were selected among the participants of the Meeting (Mobile vendors, retailers of restaurants and shops in the market and outside the market). In the random selection of the participants, an attention was paid to the gender valance of the participants. As a result, 17 persons participated in the workshop. The list of participants is attached in Appendix 8.3.

For the smooth implementation of the workshop, three Cambodian staff of the study team were assigned as facilitators to assist the discussion.

Prior to the workshop, they were instructed how to play role of facilitator by the Japanese facilitator. A Cambodian interpreter (Khmer-English) was also assigned for smooth discussion and documentation of the result of the discussion.

A Japanese facilitator, one of the staff members of the study team was assigned to support the Cambodian facilitators in designing, preparing and implementing the workshop.

d) Discussions in the workshop

a. Impacts analysis

In the "Impact Analysis", participants discussed the impacts accrued from the abolishment of the Neak Loeung Ferry. Ideas written on cards by participants were sorted depending on importance and impacts.

Positive impacts expressed such as:

- "After the construction of the Bridge, I wish to build more factories"
- "Having bridge leads to development of the country"
- "After the bridge construction the country will be developed as other countries."

At the same time, such negative impacts were expressed like:

- "It is difficult to sell goods to customers"
- "There would be no customers"
- "After the bridge construction, I am worried that my children will not be able to find a job and run a business"

b. Action analysis

Following the impacts analysis, each group discussed how to cope with the negative impacts: 1) "Actions I can take", 2) "Actions I cannot take", and 3) "Stakeholders who can take those actions".

e) Findings from the workshop

Compared to the 1st workshop, it was predicted that more participants would feel less easy in writing. Taking such participant's disadvantage into consideration, the number of the participants was reduced into 18. Number of the participants, totally 18 (6 for each group) seemed more suitable for easy participation for all the participants who had not participated in the former workshop.

The participants of the 2nd workshop were indirectly affected persons; however, they were actively exchanging their opinions in the game and in the analytical discussion, too. A special note was that there was a participant who showed his cooperative and positive mind and he helped other participants into active discussion.

At the end of the workshop, all the participants made comments that they felt satisfied with the workshop because the clear information and explanation was given and the participants could have opportunity to discuss among them. Some of them commented that the workshop was good because they got consensus among them.

It was also appreciated that that the participatory way of discussion is effective among local people even though they feel themselves not good at writing and reading.

It can be concluded that the participants understood positive implications as well as negative ones, which the abolishment of the Neak Loeung Ferry might have. In the same manner as the 1st workshop, not only any objections to construction were not mentioned but also expectation to the bridge construction was also expressed in the discussion. They expressed their strong concerns over the loss of their sales after the abolishment of the Ferry. They are willing to adapt themselves positively with a new business; however, necessary actions should be taken into consideration for them, such as promotion of the regional development including the promotion of the investment and tourism.

(2) Participatory Workshop in Stakeholder Meeting 3-2

To comply with the design of the Study, a half-day workshop was implemented as a part of the Stakeholder Meeting 3-2. The workshop was held in the afternoon on Sept. 21, 2005 at the Neak Loeung Ferry office.

a) Objectives of the workshop

Based on the presentation given in the morning session, it was aimed in the workshop that the participants could exchange their views about the disclosure of information of the resettlement. The participants' opinions expressed in the workshop helped designing of the RAP as the subsequent study.

b) Procedures of the workshop

The program consisted of the following steps: 1) orientation of the workshop, 2) self-introduction, 3) discussion on the information needed for the smooth resettlement, 4) discussion on the information disclosure, and 5) presentation of the result of the discussion. In programming the workshop, attention was paid particularly to participatory atmosphere for the smooth discussion among the local people. The details of the programme for the workshop are as per Appendix 8.3.

Step 1. Orientation

Objectives of the workshop and its program was explained by the Japanese facilitator and it was translated into Khmer.

Step 2. Self-introduction

Participants introduced themselves to get to know each other using cards. "names of the participants", "village names", "How many years I am living in my house", and "attractive points of my house", were listed by each participant on cards.

Step 3. Meaning of the resettlement and necessary information for the resettlement

Prior to the discussion of the information disclosure, the participants shared the idea of the resettlement.

Step 4. Discussion on the information disclosure

Participants discussed what kind of information they need for the smooth resettlement. Participants also discussed what kind of mechanism they need to obtain necessary information timely about resettlement.

Step 5. Discussion on grievance mechanism

Participants discussed what kind of mechanism of the grievance should be established.

Step6. Presentation of the result of the discussion

The result of the work was presented by member of the group to share the necessary ideas.

The details of the programme for the workshop are attached in Appendix 8.3.

c) Participants for the workshop

Participants were invited among the participants of the Meeting and 26 persons (households) participated. In the random selection of the participants, attention was paid to the gender of the participants.

For the smooth implementation of the workshop, three Cambodian staffs of the study team were assigned as facilitator to assist the discussion.

Prior to the workshop, they were instructed how to play role of facilitator by the Japanese facilitator. A Cambodian interpreter (Khmer-English) was also assigned for smooth discussion and documentation of the result of the discussion.

A Japanese facilitator, one of the staff members of the study team was assigned to support the Cambodian facilitators in designing, preparing and implementing the workshop.

d) Discussions in the workshop

- Participants discussed the meaning of the resettlement. There were more positive meaning cards than negative ones. It can be understood that the PAPs are thinking of their new life in the new place and they concern about difficulty brought by resettlement.
- The PAPs need information mainly about compensation like unit price of house, land and tree. They also need to know the exact time to resettle.
- The PAPs are not satisfied with the information from the Government and they call for improvement of the mechanism of information disclosure. They need to get information more exactly, sooner and easier.
- The PAPs feel difficult in complaining. They are requesting establishment of an association or committee to solve problems supposedly derived from the resettlement.

e) Findings from the workshop

In the workshop, participants expressed their dissatisfaction on the actual information disclosure by the government and they expressed their concerns over compensations for the resettlement such as unit prices of houses, land and trees. Information on the timing of the resettlement and bridge construction and on responsible organizations for the resettlement is also needed.

In response to the people's request, the usage of practical media like TV and radio and appropriate coordination between the government, constructor and NGOs should be taken into account for the establishment of the information disclosure mechanism.

For the participants who have not yet experienced the resettlement, it is not so easy to really analyze and specify the problems or difficulty derived from the resettlement. To analyze them more practically, it will be necessary to provide them some detailed information about real case of the resettlement.

At the end of the workshop, almost all the participants made positive comments that they felt satisfied with the workshop where they had opportunity to discuss among them. At the same time a participant expressed his/her negative comment that he/she is not happy because of the resettlement.

8.3.4 Stakeholder Meeting 3-3 and Final Public Comment Period

As the final stakeholder meeting of the whole study, the Stakeholder Meeting 3-3 was held in Phnom Penh on January 24, 2006, and its local session was held in Neak Loeung on January 29, 2006. The major objectives of the Stakeholder Meeting 3-3 were:

- To make a presentation on the final results for the EIA-level environmental and social considerations studies.
- To explain the final results of the feasibility study on the selected alternative option to cross the Mekong River, including the preliminary design of the Bridge.

- To propose the draft framework for the Resettlement Action Plan (RAP).
- To make the final consensus on the results of the feasibility study on the selected alternative option to cross the Mekong River.

Table 8.3.9 Outline of the Programme for the Stakeholder Meeting 3-3

No.	Program	Responsibility
1	Registration	MPWT
2	Opening Remarks	MPWT
3	Introduction (Review of Stakeholder Meeting 3-2 and Objectives of Stakeholders' Meeting 3-3)	MPWT
4	Presentation Part I (Final Results of EIA)	MPWT
5	Presentation Part II (Final Results of the Feasibility Study including Preliminary Design of the Bridge)	MPWT
6	Presentation Part III (Draft Framework for RAP)	MPWT
7	Questions and Answers, and Discussions	All Stakeholders
8	Closing Remarks	MPWT

In order to further guarantee far-reaching transparency and information disclosure to all the stakeholders, one-month public comment period was set up after the Stakeholder Meeting 3-3. During this public comment period, the Ministry of Public Works and Transport is subject to receive a wide range of comments and questions from all the stakeholders, and will answer those comments and questions to make the final consensus among all the stakeholders.

CHAPTER 9

ECONOMIC AND FINANCIAL ANALYSIS

9. ECONOMIC AND FINANCIAL ANALYSIS

9.1 Economic Evaluation of the Project

9.1.1 General

The main purpose of economic analysis is to show the effects of the project investment. Although there are many proposed projects in public sector which must be carried out for the improvement of the life of the citizens, the budget that can be outlaid is limited. The economic analysis evaluates whether or not the project investment will benefit the national economy by analyzing the consumption of national economic resources required.

The economic analysis for this study was undertaken to gage the effects of replacing the existing Neak Loeung ferry services with a cable stay bridge that has 37.5 m vertical clearance. The project is located at the point of the National Road Number 1 (NR1) crossing the Mekong River. NR1, which connects Phnom Penh and Ho Chi Minh City of Vietnam, is one of the busiest routes in Cambodia; also the route is part of the Asian Highway Number 1 (AH-1). Since the Mekong River at Neak Loeung has been a bottleneck of NR1, construction of the project Bridge over the Mekong River is considered to entail significant benefits to the country. The purpose of this chapter is to evaluate the economic and financial feasibility of the project.

As described in Section 5.6 “Construction and Project Implementation Planning”, implementation plan assumes that the basic design starts in 2007, the construction takes nearly four years and is completed in 2012. The analysis is made by discounted cash flows over 25 years of the project life of the bridge.

(1) Basic Assumption

1) “With Project” and “Without Project”

“With Project” covers the situation where the proposed bridge is implemented, and “Without Project” covers the situation where no such investment takes place. The quantified economic benefits, which would be realized from the implementation of the project, are defined as savings in vehicle travel costs (vehicle operating costs and vehicle time costs) derived from the difference between “With Project” and “Without Project”.

2) Implementation schedule

According to the implementation plan, it is assumed that the engineering design work of the project bridge will start in the second quarter of 2007 and finish in early 2008. The construction supervision is expected to start in the fourth quarter of 2008 and be completed in the third quarter of 2012. Therefore actual opening of the bridge to the traffic is expected in September 2012.

3) Project life

The evaluation period is assumed to be 25 years after the completion of the bridge in 2012.

4) Prices

The base year for prices is September 2005 and exchange rates are set as follows:

US$ 1.0 = Yen 108.03 = 4067 Riel (average rates of the six months between March 2005 and August 2005)

(2) Traffic Demand Forecast at Neak Loeung

Based on the traffic survey conducted by the study team, the traffic demand to cross the Mekong River at Neak Loeung is forecast as described in Chapter 3 "Traffic Demand Analysis". Table 9.1.1 shows the summary of the estimated daily traffic volume in future.

Table 9.1.1 Daily Traffic Demand Forecast

Unit: Vehicle/PCU

Traffic Type	2005		2010		2015		2020	
	With	Without	With	Without	With	Without	With	Without
Motorbike	-	1,816.1	-	2,333.2	3,529.4	3,199.3	4,732.3	4,185.8
Sedan	-	571.2	-	734.1	1,238.6	1,151.9	1,776.9	1,639.9
Pickup	-	304.8	-	391.7	660.9	614.7	948.1	875.0
Short Body Bus	-	192.6	-	242.4	682.5	336.3	840.1	458.7
Long Body Bus	-	82.5	-	103.9	292.4	144.1	359.9	196.5
Short Body Truck	-	198.1	-	287.0	414.7	388.2	544.5	509.2
Long Body Truck	-	104.4	-	151.3	218.6	204.6	287.0	268.4
Semi/Full Trailer	-	39.6	-	57.4	83.0	77.7	109.0	101.9
Total	-	3,309.3	-	4,301.0	7,120.1	6,116.7	9,597.8	8,235.3
Total (PCU)	-	2,657.3	-	3,628.6	6,859.2	5,619.0	9,157.1	7,639.7

Source: JICA Study Team

(3) Ferry Capacity

As described in Chapter 3 "Traffic Demand Analysis", the full capacity of the current three ferries in PCU per day for both directions is estimated at 5,580 PCU. Based on the service level of the waiting time and the queuing theory, the maximum future traffic is estimated at 5,340 PCU with 3 hours waiting time, which is estimated equivalent to the additionally required travel time via the detour route (through NR11, Kizuna Bridge/Kompong Cham, NR7 and NR6A to Phnom Penh). Investigation was also done for the capacity of the existing pier, and it is concluded that four-ferry operation is not practicable. This indicates that when the future traffic volume reaches to 5,340 PCU, the traffic over this level will alter their ferry route to the detour route. This assumption is based on the roadside OD interview survey result, which showed 80% of the ferry traffic goes to Phnom Penh as their destination.

9.1.2 Project Benefits

(1) Estimation of the benefits

The benefits that could be expected by the implementation of the project are quantified separately before and after the traffic demand reaches the ferry waiting time (about 3 hours) equivalent to the travel time additionally required to detour the route via Neak Loeung and go to Kampong Cham and Kizuna Bridge.

Savings are derived from the comparison between costs (with case) of road users who would pass over the project bridge and costs (without case) of either those who have crossed the river by the Neak Loeung Ferry or those who would take the alternative route via Kampong Cham and Kizuna Bridge because of the lack of the ferry capacity. Those savings composed of:

- Vehicle operating costs
- Travelers time costs (Savings of passenger travel time and savings in the opportunity cost of capital caused by the delayed freight by trucks)

(2) Savings

The quantified economic benefits derived from savings in vehicle operating costs and vehicle time costs are defined as the difference of these costs when comparing the "With Project" and "Without Project". Table 9.1.2 shows the difference between ferry and bridge in travel distance and time to cross the Mekong River at Neak Loueng.

Table 9.1.2 Difference in Distance & Time at Mekong River Crossing

	By Ferry	By Bridge	Difference
Distance covered (meter)	3,200	5,430	2,230
Travel time (minutes)	50.8	6.5	-44.3

Note: Travel distance by ferry is not included
Travel time by ferry includes those on ferry and waiting time in 2012 (36 minutes)
Travel time by bridge is calculated with the assumed vehicle speed at 50km/hour

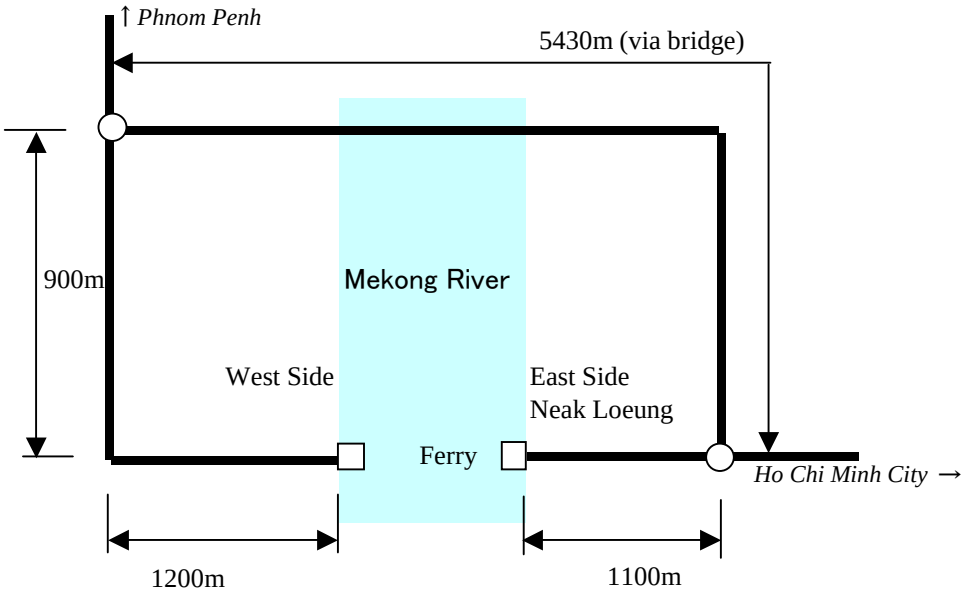


Table 9.1.3 shows the travel distance and time of the alternative routes between Neak Loeung (East Intersection) and Phnom Penh.

Table 9.1.3 Travel Distance & Time of Alternative Routes between Neak Loeung and Phnom Penh

	By Bridge	By Detour	By Ferry
Distance covered (km)	61.6	226.4	60.0
Travel time (hour)	1.2	4.5	1.5

Source: JICA Study Team
Note: Distance by Detour is from Neak Loueng to Phnom Penh via NR11, NR7, Kizuna Bridge and NR6A
Travel Time by ferry does not include the waiting time

9.1.3 Project Costs

(1) Project Costs

The project costs in terms of financial prices are based on the preliminary engineering design and estimated as detailed in Chapter 5. Table 9.1.4 shows the summary of the overall financial project costs.

Table 9.1.4 Summary of the Financial Project Costs

Unit: US$ million

Cost Items	Local	Foreign	Financial Cost
Land Acquisition & Compensation Cost	0.67	0.00	0.67
Demining and UXO Cearance Costs	0.18	0.00	0.18
Engineering Cost	0.40	4.06	4.46
Construction Cost	17.10	44.97	62.06
Contingency	1.75	4.90	6.65
Total Project Cost	20.09	53.93	74.02

Source: JICA Study Team

(2) Estimation of Economic Project Costs

For the economic analysis, financial costs were converted to economic costs by deducting the tax portions and applying a standard conversion factor to the portion of non-trade goods.

The conversion factor is applied in the following manner:

In the economic analysis, all the costs are classified into items of trade goods, non-trade goods and transfer items. It is assumed that trade goods are equivalent to the foreign currency portion, and aggregation of non-trade goods stands for the local currency portion. Transfer item means the portion of taxes. In this study the following conversion factors are applied.

- For fuel price (gasoline and diesel): custom duty, additional tax and VAT are deducted and for lubricant price custom duty, specific tax and VAT are deducted.
- For the vehicle price: tax amount, custom duty, specific tax, VAT, are deducted and for the tire costs custom duty and VAT are deducted.
- For tax, conversion factor of 0.00 is applied.
- For land acquisition and compensation, a standard conversion factor is applied.

It should be noted that some of the prices that are not available were taken from the report for The Feasibility Study on the Implementation of National Road No.1 (Phnom Penh ～ Neak Loeung), March 2003 and CPI is applied to estimate the cost in 2005 prices.

Standard Conversion Factor (SCF):

The standard conversion factor is an index, which converts domestic prices to border prices by adjusting the distortion of prices in the domestic market. SCF is estimated as follows:

$$SCF = \frac{M + X}{(M + Tm) + (X - Tx + Sx)}$$

where:

M	:	Total value of import (CIF)
X	:	Total value of export (FOB)
Tm	:	Total value of import duty
Tx	:	Total value of export duty
Sx		Total value of export subsidy

According to the statistical data regarding foreign trade and governmental revenues in Cambodia, SCF is estimated at 0.855 as shown in Table 9.1.5.

Table 9.1.5 Calculation of Standard Conversion Factor

Unit: US$ million

		1998	1999	2000	2001	2002
1	Total Import (CIF)	1,276.2	1,611.7	2,094.8	2,224.7	2,500.4
2	Total Export (FOB)	815.5	1,016.0	1,395.6	1,524.7	1,766.8
3	Import Customs	565.7	715.7	740.6	710.7	728.7
4	Export Customs	0.8	6.1	5.6	6.1	7.1
5	1+2	2,091.6	2,627.7	3,490.5	3,749.4	4,267.2
6	5+3-4	2,656.5	3,337.3	4,225.5	4,454.0	4,988.8
7	SCF (5/6)	0.787	0.787	0.826	0.842	0.855

Source; Statistic YearBook 2003, Cambodia Economic Watch by Economic Institute of Cambodia

It is assumed that for the economic project costs, the portion for price contingency is excluded. As a result, the project costs in terms of economic prices for the proposed bridge are estimated as shown in Table 9.1.6.

Table 9.1.6 Estimated Project Cost

Unit: US$ million

Cost Items	Local	Foreign	Financial Cost	Economic Cost
(1) Land Acquisition & Compensation Cost	0.67	0.00	0.67	0.58
Tax	0.06	0.00	0.06	0.00
(2) Demining and UXO Clearance Costs	0.18	0.00	0.18	0.15
Tax	0.02	0.00	0.02	0.00
(3) Engineering Cost	0.43	4.47	4.90	4.20
Detailed Design	0.01	1.54	1.55	1.55
Construction Supervision	0.35	2.15	2.50	2.45
Tax	0.04	0.37	0.40	0.00
Contingency	0.04	0.41	0.44	0.20
(4) Construction Cost	18.81	49.46	68.27	59.59
Temporary Works Cost	0.31	1.61	1.92	1.87
Roads Construction Cost	6.66	1.65	8.31	7.34
Bridge Construction Cost	7.67	29.09	36.76	35.65
River Protection Works Cost	0.19	0.02	0.21	0.18
Other Works Cost	0.00	2.08	2.08	2.08
Common Temporary Works Cost	0.45	0.37	0.82	0.75
Site Expenses	0.27	2.69	2.96	2.92
Overhead	0.00	3.37	3.37	3.37
Tax	1.55	4.09	5.64	0.00
Contingency	1.71	4.50	6.21	5.42
Total Project Cost	20.09	53.93	74.02	64.51

Source: JICA Study Team

(3) Operation and Maintenance Cost

1) Operating & Maintenance Costs of Ferry

Annual operating costs of the Neak Loeung Ferry are provided by the Ministry of Public Works and Transport as US$ 892,000. Its economic price is calculated as US$ 615,900 by deducting tax payment from the cost of fuel and lubricant and applying SCF for the rest.

2) Operation & Maintenance Costs of Bridge

The operation and maintenance costs for the proposed bridge in terms of financial prices

are given in the process of cost estimates in Chapter 6 "Proposed Operation and Maintenance System for the Project". Table 9.1.7 shows the summary of the maintenance, operation and management costs for the bridge.

Table 9.1.7 Annual Maintenance Costs for the Bridge

Unit: $1000/year

Annual Maintenance Cost				
Type	Routine	Periodic	Total	Economic Price
Approach Road	7.1	55.7	62.8	53.72
Bridge	26	102	128	109.49
sub-total	33.1	157.7	190.8	163.20
Annual Operation and Management Cost				
Item	Quantity	Unit Cost	Annual	Economic Price
Staff	30	0.80	24.00	20.53
Office	1	6.50	0.33	0.28
Vehicle	10	20.00	20.00	17.11
Other expenses		33.24	33.24	28.44
sub-total		60.54	77.57	66.35
Total			**268.37**	**229.55**

Source: JICA Study Team

Note: Residual Periods of Office and Vehicle are assumed as 20 and 10 years

(4) Vehicle Operating Cost and Time Cost

Vehicle operating costs are calculated and detailed figures are presented in Appendix and summarized in Table 9.1.8 (in economic prices).

Table 9.1.8 Vehicle Operating Cost by Vehicle Types

Unit: US$

Vehicle Type	VOC (per 000km)	Travel Time Cost (per hour)
Motorbike	16.3	0.38
Sedan	119.1	3.07
Pickup / Light Truck	117.9	2.32
Bus	172.9	2.07
Truck	163.1	0.35
Semi/Full Trailer	213.3	0.19

Source; JICA Study Team

The time cost estimation in this study is based on The Distribution of Employees and Average Monthly Wages 10 Years & Over in 2001 from the Cambodian Statistical Year Book 2003 by the Cambodian Labor Forces Surveys. Based on The Feasibility Study on the Improvement of National Road No.1 (Phnom Penh ～Neak Loeung) report, March 2003, wage income brackets are distributed to the users of different types of vehicle.

Table 9.1.9 Adjustment Factors to Derive Time Travel Cost

(1)Adjustment factors by trip purpose						
Purpose	to work	to school	to shopping	to business	to others	to home
Composition	0.157	0.011	0.065	0.439	0.160	0.168
(2)Adjustment factors for employment and age						
Ratio of actual employment					0.726	
Ratio over 10 years age among vehicle occupants					0.95	

Source; Traffic interview survey at Neak Loeung

Among six trip purposes used for the traffic survey, only business and work purposes are chosen as relevant to the time cost estimation, and consequently the adjustment factor of 0.596 is applied for the trip purpose. Also from the traffic interview survey, 95% of the travelers were identified as over 10 years of age (Table 9.1.9).

Applying these adjustment factors, vehicle occupancy and the Consumer Price Index, the time cost of each vehicle is estimated as shown in Table 9.1.10.

Table 9.1.10 Time Costs by Types of Vehicle

		Motorbike	Sedan	Pick-up / Light Truck	Bus	Truck	Semi/Full Trailer
Average Monthly Income	US$/person	59.85	246.10	62.34	42.67	29.04	29.04
Monthly Working Hours	hr/month	150	150	150	150	150	150
Average Hourly Income	US$/hour	0.40	1.64	0.42	0.28	0.19	0.19
Adjustment factors							
Trip purpose		0.596	0.596	0.596	0.596	0.596	0.596
Ratio of actual employment		0.726	0.726	0.726	0.726	0.726	0.726
Ratio over 10 years age among vehicle occupants		0.95	0.95	0.95	0.95	0.95	0.95
Average hourly income after adjustmer	US$/hour	0.16	0.67	0.17	0.12	0.08	0.08
Vehicle Occupancy	person	2.15	4.29	12.76	16.63	4.08	2.25
Time Value by Vehicle in 2002	US$/hr	0.35	2.89	2.18	1.94	0.32	0.18
Time Value by Vehicle in 2005	US$/hr	0.38	3.07	2.32	2.07	0.35	0.19

** Trip purpose ratio includes only the purpose to work & to business*
Source: Cambodian Statistical Year Book 2003

9.1.4 Cost Benefit Analysis

For the Economic Analysis of the project, costs and benefits of the project are identified as shown in the Table 9.1.11. By this method, Revenue from Ferry and Bridge toll are excluded for the cost-benefit analysis of the project.

Based on the economic costs and benefits as identified in Table 9.1.11, their annual flows were estimated as shown in Table 9.1.12 and the economic evaluation results are summarized in Table 9.1.13. All three indicators of the economic evaluation ensure economic feasibility of the project investment: 23% EIRR, 3.43 B/C Ratio and sufficient positive NPV.

Table 9.1.11 Costs and Benefits Items of the Project for Economic Analysis

for Supplyer		for User		Net Cash Flow for the cases
Cash-Out	Cash-In	Cash-Out	Cash-In	
Case: [Without] Project				
Ferry Operation & Maintenance (future replacement costs are annualized)	*Revenue by Ferry Tariff*	*Payment for Ferry Tariff* VOC Travel Time Cost		・Ferry Operation & Maintenance ・VOC ・Travel Time Cost
Case: [With] Project				
Investment (Bridge) Operation & Manitenance of the bridge	*(Revenue from the bridge, if toll is applied)*	*(Payment for the bridge, if toll is applied)* VOC Travel Time Cost		・Investment (Bridge) ・O & M of the bridge ・VOC ・Travel Time Cost
[With - Without] Project				
				Cash-In items **・Ferry O & M** **・User's savings in VOC & TTC (for Ferry - for Bridge)** Cash-Out items **・Investment (Bridge)** **・Bridge O & M**

Source: JICA Study Team

Table 9.1.12 Cost Saving by Bridge Development

Unit; 000US$ (Economic Price)

Year	Cash - Out			Cash - In						Net Cash Flow
	Bridge		Total	User's Cost Savings				Ferry	Total	
	Investment	O&M		VOC	Time Cost	Freight Time	Total	O&M		
2007	2,045	0	2,045	0	0	0	0	0	0	-2,045
2008	2,057	0	2,057	0	0	0	0	0	0	-2,057
2009	16,919	0	16,919	0	0	0	0	0	0	-16,919
2010	16,035	0	16,035	0	0	0	0	0	0	-16,035
2011	16,105	0	16,105	0	0	0	0	0	0	-16,105
2012	11,356	77	11,433	-264	1,760	149	1,645	308	1,953	-9,480
2013	0	230	230	-288	2,461	205	2,378	924	3,302	3,073
2014	0	230	230	-312	3,774	310	3,773	924	4,696	4,467
2015	0	230	230	1,279	7,317	598	9,194	924	10,118	9,889
2016	0	230	230	3,883	11,863	958	16,705	924	17,629	17,399
2017	0	230	230	6,587	13,032	1,050	20,670	924	21,594	21,364
2018	0	230	230	9,395	14,245	1,146	24,786	924	25,710	25,481
2019	0	230	230	12,310	15,503	1,245	29,059	924	29,983	29,753
2020	0	230	230	15,336	16,808	1,349	33,492	924	34,416	34,187
2021	0	230	230	18,475	18,160	1,415	38,050	924	38,974	38,744
2022	0	230	230	21,732	19,562	1,481	42,775	924	43,698	43,469
2023	0	230	230	25,109	21,015	1,547	47,671	924	48,595	48,365
2024	0	230	230	28,611	22,520	1,614	52,744	924	53,668	53,439
2025	0	230	230	32,241	24,079	1,680	58,000	924	58,924	58,694
2026	0	230	230	36,004	25,693	1,746	63,444	924	64,368	64,138
2027	0	230	230	39,904	27,365	1,812	69,081	924	70,005	69,776
2028	0	230	230	43,944	29,096	1,878	74,918	924	75,842	75,613
2029	0	230	230	48,129	30,887	1,945	80,961	924	81,885	81,655
2030	0	230	230	52,463	32,741	2,011	87,215	924	88,139	87,909
2031	0	230	230	56,951	34,659	2,077	93,687	924	94,611	94,382
2032	0	230	230	61,598	36,643	2,143	100,384	924	101,308	101,078
2033	0	230	230	66,359	38,358	4,845	109,563	924	110,487	110,257
2034	0	230	230	71,386	40,152	7,683	119,221	924	120,145	119,915
2035	0	230	230	76,692	42,028	10,660	129,380	924	130,304	130,075
2036	0	230	230	82,292	43,990	13,782	140,065	924	140,988	140,759
2037	-399	230	-170	88,201	46,043	17,054	151,298	924	152,222	152,392
Total	64,117	5,815	69,933	898,021	619,755	82,383	1,600,159	23,405	1,623,564	1,553,632
NPV	40,579	951	41,529	68,621	63,568	6,035	138,225	3,827	142,052	100,522
B/C	discount rate	12%								3.43
EIRR										23.0%

Source; JICA Study Team

Table 9.1.13 Summary of Cost Benefit Analysis

Indicator	Result
EIRR	23.0%
B/C (at discount rate of 12%)	3.43
NPV (US$000, at discount rate of 12%)	100,522

Source; JICA Study Team

9.1.5 Sensitive Analysis

The study road forms part of the Asian Highway Route AH-1 and 2nd East-West Economic Corridor, connecting Thailand – Phnom Penh – Ho Chi Minh.
A sensitivity analysis against the base case was undertaken to assess the project feasibility under the following worse case scenarios:

- Increase in construction costs by 10%
- Increase in construction costs by 20%
- Decrease in traffic demand by 10 %

- Decrease in traffic demand by 20 %
- Increase in construction costs by 10% & Decrease in traffic demand by 10 %
- Increase in construction costs by 10% & Decrease in traffic demand by 20 %
- Increase in construction costs by 20% & Decrease in traffic demand by 10 %
- Increase in construction costs by 20% & Decrease in traffic demand by 20 %

The results of the sensitivity analysis in the above eight cases are shown in Table 9.1.14. The results show that the project maintains its economic feasibility even if the cost increases by 20% and the traffic demand decreases by 20%.

Table 9.1.14 Summary of Economic IRRs by Varying Traffic Demand

		Project Cost		
		Base Case	10% Increase	20% Increase
Traffic Demand	Base Case	23.0%	22.0%	21.1%
	10% Decrease	20.5%	19.6%	18.9%
	20% Decrease	18.4%	17.6%	16.8%

Source: JICA Study Team

The sensitivity analysis against the variation of the economic benefit is also positive as shown in Table 9.1.15.

Table 9.1.15 Summary of Economic IRRs by Varying Economic Benefit

		Project Cost		
		Base Case	10% Increase	20% Increase
Economic Benefit	Base Case	23.0%	22.0%	21.1%
	10% Decrease	20.8%	19.9%	19.1%
	20% Decrease	18.4%	17.6%	16.9%
	30% Decrease	15.7%	14.9%	14.3%

Srouce: JICA Study Team

Accordingly, if the benefit (similar to the traffic demand) is lowered by 30% from the base case the Economic IRR will reduce to 15.7%, and further if the construction cost is raised by 20% the Economic IRR will grow worse to 14.3%.

9.1.6 Unquantifiable Costs and Benefits

In addition to the quantified benefits analyzed in this study, there are various impacts to the region that will be brought about from the proposed bridge. For the evaluation of these unquantifiable benefits, the relevant concepts that should not be missed are:

1) General impacts from the large-scale transport projects[1]

- Improving connectivity and economic distance to markets, information, education and health service – road network and accessibility in rural areas, which are key determination for provincial income and resource mobilization ability and thus improve the living conditions of the poor.
- Creating effective demand, off-farm jobs and income opportunities, for construction of large-scale infrastructure projects. The employment of local farmers for such unskilled works contributes to jobs and income generation in the surrounding rural areas, particularly during off-farm seasons.
- Reducing transaction costs and facilitating trade flows within and across borders.
- Lowering the costs of inputs used in the production of almost all goods and services. Opening up new opportunities for entrepreneurs, or making existing business more profitable.
- Improving environmental conditions, which link to improved livelihoods, better health and reduced vulnerability of the poor.

Figure 9.1.1 indicates such linkages schematically.

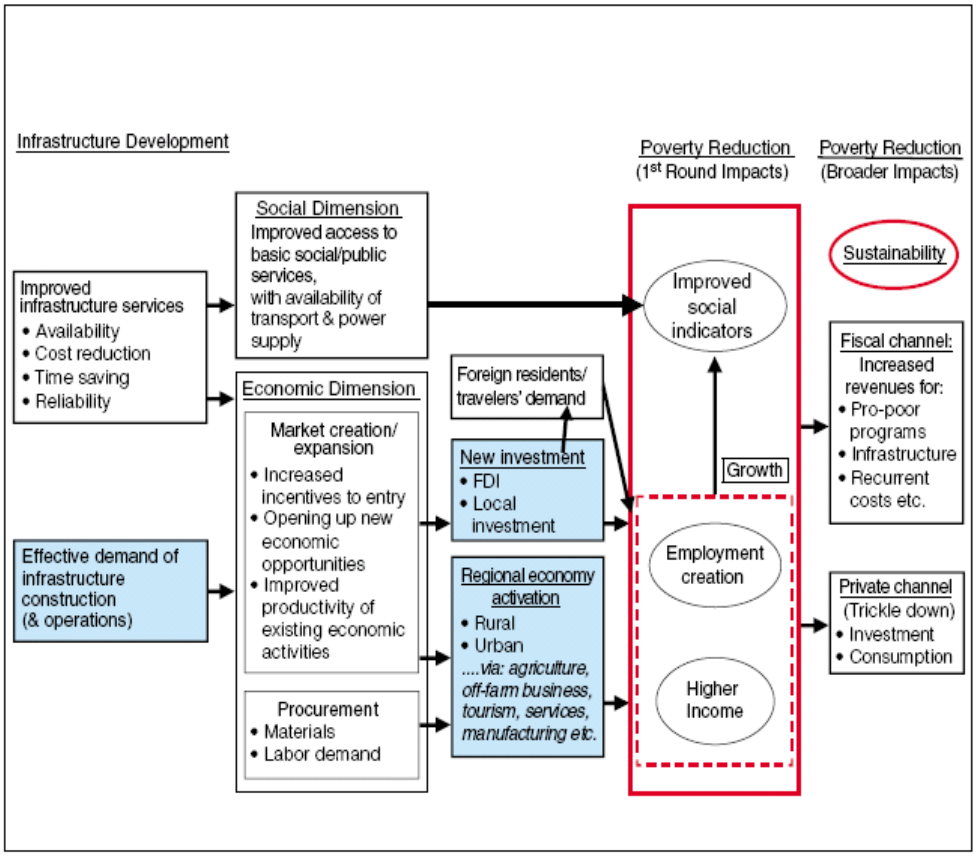


Figure 9.1.1 Linkages among Large-Scale Infrastructure, Growth, and Poverty Reduction

Source: Linking Economic Growth and Poverty Reduction − Large-Scale Infrastructure in the Context of Vietnam's CPRGS— November 2003 GRIPS Development Forum

[1] *Referred to the Linking Economic Growth and Poverty Reduction − Large-Scale Infrastructure in the Context of Vietnam's CPRGS— November 2003 GRIPS Development Forum*

For example, the impact of construction of My Thuan Bridge at the Mekong Delta, Vietnam, which also connected the trunk road bottlenecked by the Mekong River, were reported as follows:

- Travel time between Ho Chi Minh City (HCMC) and Can Tho was reduced from 4.5-5.0 hours to 3.5 hours (time to cross the Tien River from 32 to 5-6 minutes).
- Significant increase in freight and passenger movement, doubling of traffic volume at the bridge between 1999 to 2001.
- New investment of 80 firms (20 FDI) and 13,000 new employees.

The report also points to the activation effect to the regional economy, enhancement of new economic opportunities and productivity of the existing economic activities, even without additional investment. For example, better access to markets and information could generate jobs and income in rural households through improved agricultural productivity, diversification of agricultural products, and promotion of off-farm industry in rural areas, etc.

2) Impacts from the bridge projects

a) Impact study on Honshu-Shikoku Bridges of Japan pointed out the following impacts:

- Improvement of basic traffic condition; saving of travel time, accessibility without limitation, punctuality.
- Increase in traffic volume (passenger and cargo)
- Improvement of livelihood; better access to medical service, more option for commuting and leisure.
- Enhancement of the production in farming and fishery, increase in tourist and logistics by the increase in traffic volume and enhanced market.
- Increased potential for investment; increased number of firms by 1.3 times and increased number of retailed super-store by 3.2 times
- Increase of production by 1% of GRDP, increased employment 120,000 workers, annual time and cost savings by vehicle US$2.3 billion

Source; URL of Honshu-Shikoku Bridge Expressway Company Limited (HSBE)

b) The result of Impact Study on Infrastructure Project by Infrastructure Development Institute (IDI) and Ministry of Land Infrastructure and Transport of Japan in March 2002, which studied the impact of the construction of Meghna Bridge and Meghna-Gumti Bridge in Bangladesh, shows benefits of the bridge project as follows:

- Even the people at the bridge site area, located at Dhaka- Chitagong Highway that connects the capitol of Bangladesh and the major port for Dhaka, enjoyed an increase in income, including farmers, fishermen and other industries. While some of the transport sector got increase of income, some other sectors got decrease in income; however, study analysis also shows the reduction of expenses in case of the income decrease and consequently net income was not changed.
- More than 60% of the project related people answered they had good medical treatment access after the project, although only 1% answered “good” before the project. The percentage of doctors also answered they could get medicinal supplies without problem increased from 5% before the project to 70% after the project.
- Decrease in amount of poverty by 8%, from 59.9% to 51.9%.

3) Asian Highway Concept

"Recognizing the economic and social benefits, which could result from the linking of the countries of Asia -- and eventually the continents of Europe and Asia -- by an international highway, the Governments supported the establishment of the Asian Highway."
"Landlocked areas, which are often left in isolation, are the other beneficiaries of the Asian Highway project. The project also pays particular attention to the inhabitants, traders and travelers whose lives revolve around the Asian Highway network."

Through ESCAP, countries have also defined what linkages should receive priority under the Asian Highway network, taking into account:

- capital-to-capital links for international transport.
- connections to main industrial and agricultural centers as well as growth triangles and zones (links to important origin and destination points).
- connections to major sea and river ports (integration of land and water transport networks).
- Connections to major container terminals and depots (integration of road and rail networks).

4) Unquantifiable benefit from the proposed bridge

In this study traffic increase by the regional area development associated with the bridge project is already counted in the traffic demand forecast. Additional benefits that could be considered are as follows:

- Shorter access time and distance between east bank region of Mekong River and Phnom Penh, and also Phnom Penh and HCMC that will bring about effects to facilitate the further movement of passengers and cargo resulting in the additional investment to the area and regional development.
- Tourism development of Phnom Penh through Neak Loeung from HCMC. Certain number of current tourists to Cambodia from HCMC, most of which go directly to Siem Reap by plane, might change their itinerary to Siem Reap via Phnom Penh by bus as the consequence of better road access.
- Lobster at Neak Loeung has already established good reputation for the residents of Phnom Penh and enjoys better price than other towns along Mekong River such as Kompong Cham. Better access to Neak Loeung and good scenery of or from the proposed bridge will stimulate increased number of Phnom Penh residents for the restaurant at Neak Loeung and relaxing time at the bridge site.
- Reduced accident rates associated with the current ferry service. The government of Cambodia expects increase in amount of seaborne traffic between PP and HCMC in the future. Neak Loeung Ferry also expects increase in traffic demand. This might cause more accidents between up and down traffic and crossing traffic.
- The possible area where the existing Neak Loeung ferry would be relocated will receive benefit from the new ferry service
- Neak Loeung area will get benefit of reduction in pollution as the result of direct and indirect ferry operation.
- As mentioned in chapter 3, Regional Development through the creation of the flood-free land. The province and the town could utilize the created flood-free land for the regional development, creating distribution center of logistics, petroleum terminal for Phnom Penh, fishery process factories, etc.

9.2 Financial Evaluation of the Project

9.2.1 General

The purpose of financial analysis is to examine the financial viability of the investment to the "Construction of the Second Mekong Bridge Project" from the viewpoint of the implementation body. The analysis is performed based on the revenue, in cases set in the toll policy considered in Chapter 6 "Construction Cost, Operation and Maintenance Costs.

As the first step in this study, Financial Internal Rate of Return (FIRR) is calculated in order to evaluate the return on total investment. In this case, FIRR indicates the project viability regardless of the fund raising conditions. Then as the second step alternative cases of the fund procurement are examined. The alternatives include different level of interests and fund raising schemes to compare the scale of financial burden to the implementation body.

(1) Basic Assumption

1) Implementation Schedule

According to the implementation plan, it is assumed that the engineering design work of the project bridge will start in the second quarter of 2007 and finish in early 2008. The construction supervision is expected to start in the fourth quarter of 2008 and the project be completed in the third quarter of 2012. Therefore actual opening of the bridge to traffic is expected in September 2012.

2) Project life

The project life is assumed to be 30 years, after the completion of the bridge construction.

3) Prices

The base year for prices is September 2005 and exchange rates are set up as follows:

US$ 1.0 = Yen 108.03 = 4067 Riel (average rates of the six months between March 2005 and August 2005)

(2) Revenue Estimation

1) Toll rate

As described in Section 6.3 "Application of Toll System to the Project" the base case is set to the toll level to cover the operation and maintenance costs required for the proposed bridge. In this financial analysis, the following additional cases are examined to determine the financial viability of the project. It should be noted in the revenue calculation that from the traffic survey and practical consideration, collection rate[2] of toll is set at 80%. The cases examined are:

Base Case: The toll level to cover the operation and maintenance costs of the project, proposed bridge and its approach roads.

Case 1: Base Case plus additional charge to cover $0.5 million equivalent to the annual surplus of the current ferry operation, which is considered a source of the road development fund.

Case 2: The toll level at 80% of the user's benefit by the project.

[2] To exclude the traffic, which are exempted from paying toll, such as emergency vehicles and some public purpose vehicles. The collection rate was derived from in the traffic survey by the study team in May 2004

Case 3: The toll level at 100% of the user's benefit by the project.

Case 4: Current Ferry Tariff Level.

Toll cases are summarized in Table 9.2.1.

Toll levels for Case 2 and Case 3 are calculated as follows:

Table 9.2.1 Toll Rates for Cases

Toll Case / Category of vehicle	Base Case: Level to operate and maintain the project		Case 1: Level to cover $0.5 mil. surplus + Base Case		Case 2: Level at 80% of user's benefit		Case 3: Level at 100% of user's benefit		Case 4: Level at current ferry rate	
	Riel	USD	Riel	USD	Riel	USD	Riel	USD	Riel	USD
Motorbike	100	0.02	200	0.05	200	0.05	250	0.06	500	0.12
Sedan	400	0.10	1,400	0.34	2,600	0.64	3,200	0.79	5,800	1.43
Pickup	400	0.10	1,400	0.34	2,600	0.64	3,200	0.79	5,800	1.43
Short Body Bus	600	0.15	2,100	0.52	3,700	0.91	4,600	1.13	8,500	2.09
Long Body Bus	1,700	0.42	6,000	1.48	11,000	2.70	13,700	3.37	25,000	6.15
Short Body Truck	1,700	0.42	6,000	1.48	11,000	2.70	13,700	3.37	25,000	6.15
Long Body Truck	1,700	0.42	6,000	1.48	11,000	2.70	13,700	3.37	25,000	6.15
Semi/Full Trailer	3,400	0.84	11,800	2.90	21,000	5.16	27,000	6.64	49,000	12.05
Ratio to Ferry Tarrif	7%		24%		45%		55%		100%	

Note: Excahnge rate 1$=Riel 4067, Toll level for Case3 is set at 44% of Case1, Toll level for Case4 is set at 55% of Case1

Source: JICA Study Team

By applying the estimated financial prices VOC, the total benefit at financial price in 2012 is calculated as US$ 1,538,000. Annual toll revenue at the current ferry tariff level is as much as US$ 2,805,000 in 2012. Therefore, the toll levels at 80% (Case 2) or 100% (Case 3) of the bridge user's benefit are only confined to 44% (1,538 X 0.8 / 2,805 = 0.44) or 55% of the current ferry tariff level, respectively.

9.2.2 Cash Flow Analysis

(1) Estimated FIRR (ROI)

Based on the estimated revenues and project costs, FIRR regardless of fund raising condition is calculated for each toll rate case set in Table 9.2.1 above. Table 9.2.2 shows the summary of the resulting FIRR, and detailed cash flows of the project are shown in Table 9.2.3.

Table 9.2.2 Estimated FIRRs of Alternative Toll Cases

Case		FIRR
Base Case	Level to cover maintenance cost of the proposed project	Unsolved
Case 1	Level to cover $0.5 million surplus + Base Case	Unsolved
Case 2	Level at 80% of user's benefit	Unsolved
Case 3	Level at 100% of user's benefit	2.9%
Case 4	Level at current ferry rate	6.6%

Source: Study Team

As discussed in Section 6.3 "Application of Toll System to the Project", it is desirable that the toll level should fall between the Case1 and Case2. However, the result shows that the

project is financially not feasible in these two cases.

Even at the toll level equivalent to the current ferry tariff, the project will not be able to attract private sector for the investment, considering the fund raising cost of 16% p.a. in Cambodia and the risk in foreign exchange rates.

Table 9.2.3 Cashflow for Estimating the Financial IRR (ROI)

Unit; 000US$

Year	Revenue					Bridge Cost			Land Acquisition	Compensation	Demining & UXO Clearance	Total Cost	Net Cash Flow				
	Base	Case1	Case2	Case3	Case4	Investment	O&M	Total					Base	Case1	Case2	Case3	Case4
2007						1,686.7		1,686.7	358.5	180.7	140.8	2,366.7	-2,367	-2,367	-2,367	-2,367	-2,367
2008						2,433.4		2,433.4	89.6	45.2	35.2	2,603.4	-2,603	-2,603	-2,603	-2,603	-2,603
2009						19,355.5		19,355.5				19,355.5	-19,355	-19,355	-19,355	-19,355	-19,355
2010						18,423.8		18,423.8				18,423.8	-18,424	-18,424	-18,424	-18,424	-18,424
2011						18,504.6		18,504.6				18,504.6	-18,505	-18,505	-18,505	-18,505	-18,505
2012	68.8	231.2	411.4	512.4	935.0	12,765.2	80.5	12,845.7				12,845.7	-12,777	-12,614	-12,434	-12,333	-11,911
2013	222.9	748.5	1,331.6	1,658.5	3,026.4		246.5	246.5				246.5	-24	502	1,085	1,412	2,780
2014	239.9	805.4	1,432.5	1,784.2	3,255.8		251.7	251.7				251.7	-12	554	1,181	1,532	3,004
2015	258.2	866.0	1,539.8	1,917.7	3,499.4		257.0	257.0				257.0	1	609	1,283	1,661	3,242
2016	280.5	940.8	1,672.6	2,083.2	3,801.4		262.4	262.4				262.4	18	678	1,410	1,821	3,539
2017	303.7	1,018.3	1,810.4	2,254.8	4,114.6		267.9	267.9				267.9	36	750	1,543	1,987	3,847
2018	327.7	1,098.7	1,953.2	2,432.7	4,439.2		273.5	273.5				273.5	54	825	1,680	2,159	4,166
2019	352.6	1,182.1	2,101.3	2,617.0	4,775.6		279.3	279.3				279.3	73	903	1,822	2,338	4,496
2020	378.4	1,268.4	2,254.7	2,808.1	5,124.2		285.1	285.1				285.1	93	983	1,970	2,523	4,839
2021	404.6	1,356.2	2,411.0	3,002.7	5,479.4		291.1	291.1				291.1	113	1,065	2,120	2,712	5,188
2022	431.6	1,447.1	2,572.8	3,204.3	5,847.3		297.2	297.2				297.2	134	1,150	2,276	2,907	5,550
2023	459.7	1,541.3	2,740.4	3,413.1	6,228.2		303.5	303.5				303.5	156	1,238	2,437	3,110	5,925
2024	488.7	1,638.7	2,913.9	3,629.2	6,622.6		309.8	309.8				309.8	179	1,329	2,604	3,319	6,313
2025	518.7	1,739.6	3,093.5	3,852.8	7,030.7		316.3	316.3				316.3	202	1,423	2,777	3,536	6,714
2026	549.8	1,844.0	3,279.3	4,084.3	7,453.1		323.0	323.0				323.0	227	1,521	2,956	3,761	7,130
2027	582.0	1,952.0	3,471.6	4,323.8	7,890.1		329.8	329.8				329.8	252	1,622	3,142	3,994	7,560
2028	615.2	2,063.7	3,670.5	4,571.5	8,342.1		336.7	336.7				336.7	279	1,727	3,334	4,235	8,005
2029	649.6	2,179.3	3,876.3	4,827.7	8,809.7		343.8	343.8				343.8	306	1,836	3,533	4,484	8,466
2030	685.2	2,298.8	4,089.0	5,092.7	9,293.3		351.0	351.0				351.0	334	1,948	3,738	4,742	8,942
2031	722.0	2,422.4	4,309.0	5,366.7	9,793.2		358.4	358.4				358.4	364	2,064	3,951	5,008	9,435
2032	760.0	2,550.1	4,536.4	5,649.9	10,310.1		365.9	365.9				365.9	394	2,184	4,171	5,284	9,944
2033	800.7	2,686.5	4,779.0	5,952.1	10,861.5		373.6	373.6				373.6	427	2,313	4,405	5,579	10,488
2034	842.7	2,827.5	5,029.8	6,264.4	11,431.4		381.4	381.4				381.4	461	2,446	4,648	5,883	11,050
2035	886.1	2,973.2	5,289.1	6,587.3	12,020.6		389.4	389.4				389.4	497	2,584	4,900	6,198	11,631
2036	931.0	3,123.8	5,556.9	6,920.9	12,629.4		397.6	397.6				397.6	533	2,726	5,159	6,523	12,232
2037	977.4	3,279.4	5,833.7	7,265.7	13,258.5		405.9	405.9				405.9	571	2,873	5,428	6,860	12,853
2038	1,025.3	3,440.1	6,119.7	7,621.8	13,908.5		414.5	414.5				414.5	611	3,026	5,705	7,207	13,494
2039	1,074.8	3,606.2	6,415.2	7,989.8	14,579.9		423.2	423.2				423.2	652	3,183	5,992	7,567	14,157
2040	1,125.9	3,777.7	6,720.3	8,369.8	15,273.4		432.1	432.1				432.1	694	3,346	6,288	7,938	14,841
2041	1,178.7	3,954.9	7,035.4	8,762.3	15,989.5		441.1	441.1				441.1	738	3,514	6,594	8,321	15,548
2042	1,233.2	4,137.8	7,360.8	9,167.5	16,729.1		450.4	450.4				450.4	783	3,687	6,910	8,717	16,279
Total	19,376	64,999	115,611	143,989	262,753	73,169	10,239	83,409	448	226	176	84,259	-64,883	-19,259	31,353	59,730	178,495
NPV	3,003	10,073	17,913	22,310	40,711					NPV		47,865	-46,161	-42,149	-37,701	-35,206	-24,764
										B/C			0.06	0.21	0.37	0.47	0.85
										FIRR			#DIV/0!	#DIV/0!	#NUM!	2.9%	6.6%

Source: Study Team

(2) Cash Flow Analysis

Alternative case analysis was executed to evaluate the possible cash flows that reflect the fund procurement method and repayment conditions. The purpose of cash flow analysis is to show, if the necessary investment cost is funded by loan, how much subsidy the government of Cambodia needs to prepare to compensate annual deficit of the project under the different alternative toll rates. Other basic conditions of the alternative analysis are:

- Interest during construction is assumed to be covered by the subsidy.
- Subsidy (annual short-term loan required to cover the shortage of balance) is calculated to show the necessary funds that the implementation body (government) needs to prepare to compensate the annual deficit. The analysis result exhibits the first year of annual surplus and also the first year of the accumulated surplus.

The cash flow analysis was conducted under different conditions, such as alternative toll levels, loan/equity ratios and repayment conditions. The loan/equity ratio was assumed to be 100/0 or 85/15. The latter is more realistic in the practice of ODA lending agencies and the 15% equity nearly corresponds to the required cost for the estimated "Land Acquisition and Compensation", "Site Clearance" and "Tax" portion (13.1%) of the project cost as shown in Table 9.2.4.

Table 9.2.4 Estimated Project Costs

Unit: US$ million

Cost Items		Local	Foreign	Total Cost
(1) Land Acquisition & Compensation Cost		0.67	0.00	0.67
	Tax	0.06	0.00	0.06
(2) Demining and UXO Clearance Cost		0.18	0.00	0.18
	Tax	0.02	0.00	0.02
(3) Engineering Cost		0.43	4.47	4.90
	Detailed Design	0.01	1.54	1.55
	Construction Supervision	0.35	2.15	2.50
	Tax	0.04	0.37	0.40
	Contingency	0.04	0.41	0.45
(4) Construction Cost		18.81	49.46	68.27
	Temporary Works Cost	0.31	1.61	1.92
	Roads Construction Cost	6.66	1.65	8.31
	Bridge Construction Cost	7.67	29.09	36.76
	River Protection Works Cost	0.19	0.02	0.21
	Other Works Cost	0.00	2.08	2.08
	Common Temporary Works Cost	0.45	0.37	0.82
	Site Expences	0.27	2.69	2.96
	Overhead	0	3.37	3.37
	Tax	1.55	4.09	5.64
	Contingency	1.71	4.50	6.21
Total Project Cost		20.09	53.93	74.02

Source: JICA Study Team

Alternative loan conditions are assumed to be as follows:

- Repayment Period : 30 years
- Grace Period : 10 years
- Alternative Interest Rates : 1% and 5% per annum

Based on the different conditions of the toll level, loan/equity ratio and the loan conditions, the cash flow analysis were undertaken and the results are summarized in Table 9.2.5; detailed cash flows of the selected cases are shown in Tables 9.2.6 through 9.2.10. The remaining details are presented in Appendix 9.

The result shows:

1) As the toll rate becomes higher, the cash flow shows better results in this order: Case 4, Case 3, Case 2, Case1 and Base Case.
2) When the interest rate is 1%, Case 4 (4-a, 4-b) does not require subsidy and make annual surplus from the 1st year of operation. All other cases require subsidy and even in the next best condition, Case 3-b, actual first year of annual surplus appears only in the 15th year.
3) When the interest rate is 5%, all the cases require subsidy. The least subsidy appears in Case 4-d with the maximum annual subsidy of $ 500,000 and the first year of annual surplus is in the 13th year.

Table 9.2.5 Summary of Result of Alternative Cases

	Toll Level		Loan Condition				Results		
			Interest Rate	Repayment Period (year)	Grace Period (year)	Loan/Equity Ratio	Max Annual Subsidy (Year)	First Year of Annual Surplus	First Year of Accumulated Surplus
Base Case	Level to cover maintenance and operation cost of the project	a	1%	30	10	100/0	$mil 4.25 (12th)	31st	do not show in the project life
		b		30	10	85/15	$mil 3.59 (12th)	31st	
		c	5%	30	10	100/0	$mil 7.40 (12th)	n.a.	do not show in the project life
		d		30	10	85/15	$mil 6.27 (12th)	n.a.	
Case 1	Level to cover $0.5 mil. surplus + Base Case	a	1%	30	10	100/0	$mil 3.17 (12th)	29th	do not show in the project life
		b		30	10	85/15	$mil 2.51 (12th)	28th (5th)*3	
		c	5%	30	10	100/0	$mil 6.32 (12th)	29th	do not show in the project life
		d		30	10	85/15	$mil 5.18 (12th)	29th	
Case 2	Level at 80% of user's benefit	a	1%	30	10	100/0	$mil 1.97 (12th)	21st (2nd)*4	28th (4th)*8
		b		30	10	85/15	$mil 1.31 (12th)	19th (2nd)*5	22nd (3rd)*9
		c	5%	30	10	100/0	$mil 5.12 (12th)	26th	do not show in the project life
		d		30	10	85/15	$mil 3.98 (12th)	24th	
Case 3	Level at 100% of user's benefit	a	1%	30	10	100/0	$mil 1.30 (12th)	18th (2nd)*6	3rd
		b		30	10	85/15	$mil 0.64 (12th)	15th (2nd)*7	2nd
		c	5%	30	10	100/0	$mil 4.44 (12th)	23rd	do not show in the project life
		d		30	10	85/15	$mil 3.31 (12th)	21st	
Case 4	Level at Current Ferry Tariff	a	1%	30	10	100/0	n.a.	1st	2nd
		b		30	10	85/15	n.a.	1st	2nd
		c	5%	30	10	100/0	$mil 1.63 (12th)	15th (7th) *1	22nd
		d		30	10	85/15	$mil 0.50 (12th)	13th (5th) *2	18th

Note: Repayment period includes grace period, Loan amount ratio is the percentage of loan amount to total investment amount

*Note: Annual surplus initially shows between 7th and 8th year (*1), 5th and 9th (*2), 5th and 8th (*3), 2nd and 9th (*4), 2nd and 9th (*5), 2nd and 9th (*6), 2nd and 10th (*7).*
*Accumulated surplus initially shows between 4th and 11th (+8), 3rd and 14th (*9). Refer detail to the Table AP9.2.1 in Appendix.*

Source: JICA Study Team

Table 9.2.6 Alternative Case Cash Flow (Base Case-b)

Base Case-b: Toll Level to cover maintenance & operation cost of the project Loan/Equity: 85/15 Interest Rate: 1%

Year	Equity	Loan	Revenue	Initial Inflow	Investment Cost	O&M Cost	Loan Repayment	Loan Interest	Initial Outflow	Initial Balance	Outstanding Loan amount	Required Subsidy	Accumulated Surplus	Annual Loan Repayment
2007	0.36	2.01		2.37	2.37	0.00	0.00		2.37	0.00	2.01	0.00	0.00	0.000
2008	0.39	2.21		2.60	2.60	0.00	0.00	0.02	2.62	-0.02	4.22	0.02	-0.02	0.000
2009	2.90	16.45		19.36	19.36	0.00	0.00	0.04	19.40	-0.04	20.68	0.04	-0.06	0.000
2010	2.76	15.66		18.42	18.42	0.00	0.00	0.21	18.63	-0.21	36.34	0.21	-0.27	0.000
2011	2.78	15.73		18.50	18.50	0.00	0.00	0.36	18.87	-0.36	52.07	0.36	-0.63	0.000
2012	1.91	10.85	0.07	12.83	12.77	0.08	0.00	0.53	13.37	-0.54	62.92	0.54	-1.17	0.000
2013			0.22	0.22		0.25	0.00	0.64	0.89	-0.66	62.92	0.66	-1.83	0.000
2014			0.24	0.24		0.25	0.00	0.64	0.89	-0.65	62.92	0.65	-2.48	0.000
2015			0.26	0.26		0.26	0.00	0.64	0.90	-0.64	62.92	0.64	-3.12	0.000
2016			0.28	0.28		0.26	0.00	0.64	0.90	-0.62	62.92	0.62	-3.74	0.000
2017			0.30	0.30		0.27	0.00	0.64	0.91	-0.60	62.92	0.60	-4.35	0.000
2018			0.33	0.33		0.27	0.10	0.64	1.01	-0.68	62.82	0.68	-5.03	0.096
2019			0.35	0.35		0.28	0.20	0.64	1.12	-0.77	62.62	0.77	-5.80	0.205
2020			0.38	0.38		0.29	1.03	0.64	1.95	-1.57	61.59	1.57	-7.37	1.028
2021			0.40	0.40		0.29	1.81	0.64	2.74	-2.33	59.78	2.33	-9.70	1.811
2022			0.43	0.43		0.30	2.60	0.63	3.52	-3.09	57.18	3.09	-12.79	2.597
2023			0.46	0.46		0.30	3.14	0.61	4.05	-3.59	54.04	3.59	-16.38	3.140
2024			0.49	0.49		0.31	3.14	0.58	4.03	-3.54	50.90	3.54	-19.93	3.140
2025			0.52	0.52		0.32	3.14	0.55	4.01	-3.49	47.76	3.49	-23.42	3.140
2026			0.55	0.55		0.32	3.14	0.52	3.98	-3.43	44.62	3.43	-26.85	3.140
2027			0.58	0.58		0.33	3.14	0.49	3.96	-3.38	41.48	3.38	-30.22	3.140
2028			0.62	0.62		0.34	3.14	0.46	3.93	-3.32	38.34	3.32	-33.54	3.140
2029			0.65	0.65		0.34	3.14	0.43	3.91	-3.26	35.20	3.26	-36.80	3.140
2030			0.69	0.69		0.35	3.14	0.39	3.88	-3.20	32.06	3.20	-40.00	3.140
2031			0.72	0.72		0.36	3.14	0.36	3.86	-3.14	28.92	3.14	-43.14	3.140
2032			0.76	0.76		0.37	3.14	0.33	3.84	-3.08	25.78	3.08	-46.21	3.140
2033			0.80	0.80		0.37	3.14	0.30	3.81	-3.01	22.65	3.01	-49.23	3.140
2034			0.84	0.84		0.38	3.14	0.27	3.79	-2.95	19.51	2.95	-52.17	3.140
2035			0.89	0.89		0.39	3.14	0.24	3.77	-2.88	16.37	2.88	-55.05	3.140
2036			0.93	0.93		0.40	3.14	0.21	3.74	-2.81	13.23	2.81	-57.86	3.140
2037			0.98	0.98		0.41	3.14	0.17	3.72	-2.74	10.09	2.74	-60.60	3.140
2038			1.03	1.03		0.41	3.04	0.14	3.60	-2.58	7.04	2.58	-63.18	3.044
2039			1.07	1.07		0.42	2.93	0.11	3.47	-2.39	4.11	2.39	-65.57	2.935
2040			1.13	1.13		0.43	2.11	0.08	2.62	-1.50	2.00	1.50	-67.07	2.112
2041			1.18	1.18		0.44	1.33	0.05	1.82	-0.64	0.67	0.64	-67.72	1.329
2042			1.23	1.23		0.45	0.54	0.03	1.02	0.21	0.13	0.00	-67.51	0.543
Total	11.1	62.9	19.4		74.0	10.2	62.8	13.9	158.5			67.7		62.9

Source: Study Team

Table 9.2.7 Alternative Case Cash Flow (Case 1-b)

Case1-b: Base + Level to cover $0.5 million Surplus Loan/Equity: 85/15 Interest Rate: 1%

Year	Equity	Loan	Revenue	Initial Inflow	Investment Cost	O&M Cost	Loan Repayment	Loan Interest	Initial Outflow	Initial Balance	Outstanding Loan amount	Required Subsidy	Accumulated Surplus	Annual Loan Repayment
2007	0.36	2.01		2.37	2.37	0.00	0.00		2.25	0.00	2.01	0.00	0.00	0.000
2008	0.39	2.21		2.60	2.60	0.00	0.00	0.02	2.59	-0.02	4.22	0.02	-0.02	0.000
2009	2.90	16.45		19.36	19.36	0.00	0.00	0.04	19.40	-0.04	20.68	0.04	-0.06	0.000
2010	2.76	15.66		18.42	18.42	0.00	0.00	0.21	18.63	-0.21	36.34	0.21	-0.27	0.000
2011	2.78	15.73		18.50	18.50	0.00	0.00	0.36	18.87	-0.36	52.07	0.36	-0.63	0.000
2012	1.91	10.85	0.23	13.00	12.77	0.08	0.00	0.53	13.37	-0.37	62.92	0.37	-1.01	0.000
2013			0.75	0.75		0.25	0.00	0.64	0.89	-0.14	62.92	0.14	-1.14	0.000
2014			0.81	0.81		0.25	0.00	0.64	0.89	-0.09	62.92	0.09	-1.23	0.000
2015			0.87	0.87		0.26	0.00	0.64	0.90	-0.03	62.92	0.03	-1.26	0.000
2016			0.94	0.94		0.26	0.00	0.64	0.90	0.04	62.92	0.00	-1.22	0.000
2017			1.02	1.02		0.27	0.00	0.64	0.91	0.11	62.92	0.00	-1.11	0.000
2018			1.10	1.10		0.27	0.10	0.64	1.01	0.09	62.82	0.00	-1.02	0.096
2019			1.18	1.18		0.28	0.20	0.64	1.12	0.06	62.62	0.00	-0.96	0.205
2020			1.27	1.27		0.29	1.03	0.64	1.95	-0.68	61.59	0.68	-1.64	1.028
2021			1.36	1.36		0.29	1.81	0.64	2.74	-1.38	59.78	1.38	-3.03	1.811
2022			1.45	1.45		0.30	2.60	0.63	3.52	-2.07	57.18	2.07	-5.10	2.597
2023			1.54	1.54		0.30	3.14	0.61	4.05	-2.51	54.04	2.51	-7.61	3.140
2024			1.64	1.64		0.31	3.14	0.58	4.03	-2.39	50.90	2.39	-10.00	3.140
2025			1.74	1.74		0.32	3.14	0.55	4.01	-2.27	47.76	2.27	-12.27	3.140
2026			1.84	1.84		0.32	3.14	0.52	3.98	-2.14	44.62	2.14	-14.41	3.140
2027			1.95	1.95		0.33	3.14	0.49	3.96	-2.01	41.48	2.01	-16.41	3.140
2028			2.06	2.06		0.34	3.14	0.46	3.93	-1.87	38.34	1.87	-18.28	3.140
2029			2.18	2.18		0.34	3.14	0.43	3.91	-1.73	35.20	1.73	-20.01	3.140
2030			2.30	2.30		0.35	3.14	0.39	3.88	-1.59	32.06	1.59	-21.60	3.140
2031			2.42	2.42		0.36	3.14	0.36	3.86	-1.44	28.92	1.44	-23.03	3.140
2032			2.55	2.55		0.37	3.14	0.33	3.84	-1.29	25.78	1.29	-24.32	3.140
2033			2.69	2.69		0.37	3.14	0.30	3.81	-1.13	22.65	1.13	-25.45	3.140
2034			2.83	2.83		0.38	3.14	0.27	3.79	-0.96	19.51	0.96	-26.41	3.140
2035			2.97	2.97		0.39	3.14	0.24	3.77	-0.79	16.37	0.79	-27.20	3.140
2036			3.12	3.12		0.40	3.14	0.21	3.74	-0.62	13.23	0.62	-27.82	3.140
2037			3.28	3.28		0.41	3.14	0.17	3.72	-0.44	10.09	0.44	-28.26	3.140
2038			3.44	3.44		0.41	3.04	0.14	3.60	-0.16	7.04	0.16	-28.42	3.044
2039			3.61	3.61		0.42	2.93	0.11	3.47	0.14	4.11	0.00	-28.28	2.935
2040			3.78	3.78		0.43	2.11	0.08	2.62	1.15	2.00	0.00	-27.13	2.112
2041			3.95	3.95		0.44	1.33	0.05	1.82	2.13	0.67	0.00	-25.00	1.329
2042			4.14	4.14		0.45	0.54	0.03	1.02	3.11	0.13	0.00	-21.88	0.543
Total	11.1	62.9	65.0		74.0	10.2	62.8	13.9	158.5			28.72		62.9

Source: Study Team

Table 9.2.8 Alternative Case Cash Flow (Case 2-b)

Case2-b: Level at 80% of User's Benefit Loan/Equity: 85/15 Interest Rate: 1%

Year	Equity	Loan	Revenue	Initial Inflow	Investment Cost	O&M Cost	Loan Repayment	Loan Interest	Initial Outflow	Initial Balance	Outstanding Loan amount	Required Subsidy	Accumulated Surplus	Annual Loan Repayment
2007	0.36	2.01		2.37	2.37	0.00	0.00		2.25	0.00	2.01	0.00	0.00	0.000
2008	0.39	2.21		2.60	2.60	0.00	0.00	0.02	2.59	-0.02	4.22	0.02	-0.02	0.000
2009	2.90	16.45		19.36	19.36	0.00	0.00	0.04	19.40	-0.04	20.68	0.04	-0.06	0.000
2010	2.76	15.66		18.42	18.42	0.00	0.00	0.21	18.63	-0.21	36.34	0.21	-0.27	0.000
2011	2.78	15.73		18.50	18.50	0.00	0.00	0.36	18.87	-0.36	52.07	0.36	-0.63	0.000
2012	1.91	10.85	0.41	13.18	12.77	0.08	0.00	0.53	13.37	-0.19	62.92	0.19	-0.83	0.000
2013			1.33	1.33		0.25	0.00	0.64	0.89	0.45	62.92	0.00	-0.38	0.000
2014			1.43	1.43		0.25	0.00	0.64	0.89	0.54	62.92	0.00	0.16	0.000
2015			1.54	1.54		0.26	0.00	0.64	0.90	0.64	62.92	0.00	0.80	0.000
2016			1.67	1.67		0.26	0.00	0.64	0.90	0.77	62.92	0.00	1.58	0.000
2017			1.81	1.81		0.27	0.00	0.64	0.91	0.90	62.92	0.00	2.48	0.000
2018			1.95	1.95		0.27	0.10	0.64	1.01	0.94	62.82	0.00	3.42	0.096
2019			2.10	2.10		0.28	0.20	0.64	1.12	0.98	62.62	0.00	4.40	0.205
2020			2.25	2.25		0.29	1.03	0.64	1.95	0.30	61.59	0.00	4.70	1.028
2021			2.41	2.41		0.29	1.81	0.64	2.74	-0.33	59.78	0.33	4.38	1.811
2022			2.57	2.57		0.30	2.60	0.63	3.52	-0.95	57.18	0.95	3.43	2.597
2023			2.74	2.74		0.30	3.14	0.61	4.05	-1.31	54.04	1.31	2.12	3.140
2024			2.91	2.91		0.31	3.14	0.58	4.03	-1.12	50.90	1.12	1.00	3.140
2025			3.09	3.09		0.32	3.14	0.55	4.01	-0.91	47.76	0.91	0.09	3.140
2026			3.28	3.28		0.32	3.14	0.52	3.98	-0.70	44.62	0.70	-0.61	3.140
2027			3.47	3.47		0.33	3.14	0.49	3.96	-0.49	41.48	0.49	-1.10	3.140
2028			3.67	3.67		0.34	3.14	0.46	3.93	-0.26	38.34	0.26	-1.36	3.140
2029			3.88	3.88		0.34	3.14	0.43	3.91	-0.03	35.20	0.03	-1.40	3.140
2030			4.09	4.09		0.35	3.14	0.39	3.88	0.20	32.06	0.00	-1.19	3.140
2031			4.31	4.31		0.36	3.14	0.36	3.86	0.45	28.92	0.00	-0.74	3.140
2032			4.54	4.54		0.37	3.14	0.33	3.84	0.70	25.78	0.00	-0.04	3.140
2033			4.78	4.78		0.37	3.14	0.30	3.81	0.97	22.65	0.00	0.92	3.140
2034			5.03	5.03		0.38	3.14	0.27	3.79	1.24	19.51	0.00	2.17	3.140
2035			5.29	5.29		0.39	3.14	0.24	3.77	1.52	16.37	0.00	3.69	3.140
2036			5.56	5.56		0.40	3.14	0.21	3.74	1.81	13.23	0.00	5.50	3.140
2037			5.83	5.83		0.41	3.14	0.17	3.72	2.11	10.09	0.00	7.62	3.140
2038			6.12	6.12		0.41	3.04	0.14	3.60	2.52	7.04	0.00	10.14	3.044
2039			6.42	6.42		0.42	2.93	0.11	3.47	2.95	4.11	0.00	13.08	2.935
2040			6.72	6.72		0.43	2.11	0.08	2.62	4.10	2.00	0.00	17.18	2.112
2041			7.04	7.04		0.44	1.33	0.05	1.82	5.21	0.67	0.00	22.39	1.329
2042			7.36	7.36		0.45	0.54	0.03	1.02	6.34	0.13	0.00	28.73	0.543
Total	11.1	62.9	115.6		74.0	10.2	62.8	13.9	158.5			6.92		62.9

Source: Study Team

Table 9.2.9 Alternative Case Cash Flow (Case 3-b)

Case3-b: Level at 100% of User's Benefit Loan/Equity: 85/15 Interest Rate: 1%

Year	Equity	Loan	Revenue	Initial Inflow	Investment Cost	O&M Cost	Loan Repayment	Loan Interest	Initial Outflow	Initial Balance	Outstanding Loan amount	Required Subsidy	Accumulated Surplus	Annual Loan Repayment
2007	0.36	2.01		2.37	2.37	0.00	0.00		2.25	0.00	2.01	0.00	0.00	0.000
2008	0.39	2.21		2.60	2.60	0.00	0.00	0.02	2.59	-0.02	4.22	0.02	-0.02	0.000
2009	2.90	16.45		19.36	19.36	0.00	0.00	0.04	19.40	-0.04	20.68	0.04	-0.06	0.000
2010	2.76	15.66		18.42	18.42	0.00	0.00	0.21	18.63	-0.21	36.34	0.21	-0.27	0.000
2011	2.78	15.73		18.50	18.50	0.00	0.00	0.36	18.87	-0.36	52.07	0.36	-0.63	0.000
2012	1.91	10.85	0.51	13.28	12.77	0.08	0.00	0.53	13.37	-0.09	62.92	0.09	-0.72	0.000
2013			1.66	1.66		0.25	0.00	0.64	0.89	0.77	62.92	0.00	0.05	0.000
2014			1.78	1.78		0.25	0.00	0.64	0.89	0.89	62.92	0.00	0.94	0.000
2015			1.92	1.92		0.26	0.00	0.64	0.90	1.02	62.92	0.00	1.96	0.000
2016			2.08	2.08		0.26	0.00	0.64	0.90	1.18	62.92	0.00	3.14	0.000
2017			2.25	2.25		0.27	0.00	0.64	0.91	1.35	62.92	0.00	4.49	0.000
2018			2.43	2.43		0.27	0.10	0.64	1.01	1.42	62.82	0.00	5.91	0.096
2019			2.62	2.62		0.28	0.20	0.64	1.12	1.49	62.62	0.00	7.41	0.205
2020			2.81	2.81		0.29	1.03	0.64	1.95	0.86	61.59	0.00	8.26	1.028
2021			3.00	3.00		0.29	1.81	0.64	2.74	0.26	59.78	0.00	8.53	1.811
2022			3.20	3.20		0.30	2.60	0.63	3.52	-0.32	57.18	0.32	8.21	2.597
2023			3.41	3.41		0.30	3.14	0.61	4.05	-0.64	54.04	0.64	7.58	3.140
2024			3.63	3.63		0.31	3.14	0.58	4.03	-0.40	50.90	0.40	7.17	3.140
2025			3.85	3.85		0.32	3.14	0.55	4.01	-0.15	47.76	0.15	7.02	3.140
2026			4.08	4.08		0.32	3.14	0.52	3.98	0.10	44.62	0.00	7.12	3.140
2027			4.32	4.32		0.33	3.14	0.49	3.96	0.37	41.48	0.00	7.49	3.140
2028			4.57	4.57		0.34	3.14	0.46	3.93	0.64	38.34	0.00	8.13	3.140
2029			4.83	4.83		0.34	3.14	0.43	3.91	0.92	35.20	0.00	9.05	3.140
2030			5.09	5.09		0.35	3.14	0.39	3.88	1.21	32.06	0.00	10.25	3.140
2031			5.37	5.37		0.36	3.14	0.36	3.86	1.51	28.92	0.00	11.76	3.140
2032			5.65	5.65		0.37	3.14	0.33	3.84	1.81	25.78	0.00	13.57	3.140
2033			5.95	5.95		0.37	3.14	0.30	3.81	2.14	22.65	0.00	15.71	3.140
2034			6.26	6.26		0.38	3.14	0.27	3.79	2.48	19.51	0.00	18.19	3.140
2035			6.59	6.59		0.39	3.14	0.24	3.77	2.82	16.37	0.00	21.01	3.140
2036			6.92	6.92		0.40	3.14	0.21	3.74	3.18	13.23	0.00	24.19	3.140
2037			7.27	7.27		0.41	3.14	0.17	3.72	3.55	10.09	0.00	27.74	3.140
2038			7.62	7.62		0.41	3.04	0.14	3.60	4.02	7.04	0.00	31.76	3.044
2039			7.99	7.99		0.42	2.93	0.11	3.47	4.52	4.11	0.00	36.28	2.935
2040			8.37	8.37		0.43	2.11	0.08	2.62	5.75	2.00	0.00	42.02	2.112
2041			8.76	8.76		0.44	1.33	0.05	1.82	6.94	0.67	0.00	48.96	1.329
2042			9.17	9.17		0.45	0.54	0.03	1.02	8.14	0.13	0.00	57.11	0.543
Total	11.1	62.9	144.0		74.0	10.2	62.8	13.9	158.5			2.24		62.9

Source: Study Team

Table 9.2.10 Alternative Case Cash Flow (Case 4-b)

Case4-b: Current Ferry Level Loan/Equity: 85/15 Interest Rate: 1%

Year	Equity	Loan	Revenue	Initial Inflow	Investment Cost	O&M Cost	Loan Repayment	Loan Interest	Initial Outflow	Initial Balance	Outstanding Loan amount	Required Subsidy	Accumulated Surplus	Annual Loan Repayment
2007	0.36	2.01		2.37	2.37		0.00		2.25	0.00	2.01	0.00	0.00	0.000
2008	0.39	2.21		2.60	2.60		0.00	0.02	2.59	-0.02	4.22	0.02	-0.02	0.000
2009	2.90	16.45		19.36	19.36		0.00	0.04	19.40	-0.04	20.68	0.04	-0.06	0.000
2010	2.76	15.66		18.42	18.42		0.00	0.21	18.63	-0.21	36.34	0.21	-0.27	0.000
2011	2.78	15.73		18.50	18.50		0.00	0.36	18.87	-0.36	52.07	0.36	-0.63	0.000
2012	1.91	10.85	0.94	13.70	12.77	0.08	0.00	0.53	13.37	0.33	62.92	0.00	-0.30	0.000
2013			3.03	3.03		0.25	0.00	0.64	0.89	2.14	62.92	0.00	1.84	0.000
2014			3.26	3.26		0.25	0.00	0.64	0.89	2.36	62.92	0.00	4.20	0.000
2015			3.50	3.50		0.26	0.00	0.64	0.90	2.60	62.92	0.00	6.81	0.000
2016			3.80	3.80		0.26	0.00	0.64	0.90	2.90	62.92	0.00	9.71	0.000
2017			4.11	4.11		0.27	0.00	0.64	0.91	3.21	62.92	0.00	12.91	0.000
2018			4.44	4.44		0.27	0.10	0.64	1.01	3.43	62.82	0.00	16.34	0.096
2019			4.78	4.78		0.28	0.20	0.64	1.12	3.65	62.62	0.00	19.99	0.205
2020			5.12	5.12		0.29	1.03	0.64	1.95	3.17	61.59	0.00	23.17	1.028
2021			5.48	5.48		0.29	1.81	0.64	2.74	2.74	59.78	0.00	25.91	1.811
2022			5.85	5.85		0.30	2.60	0.63	3.52	2.33	57.18	0.00	28.24	2.597
2023			6.23	6.23		0.30	3.14	0.61	4.05	2.18	54.04	0.00	30.41	3.140
2024			6.62	6.62		0.31	3.14	0.58	4.03	2.59	50.90	0.00	33.00	3.140
2025			7.03	7.03		0.32	3.14	0.55	4.01	3.02	47.76	0.00	36.03	3.140
2026			7.45	7.45		0.32	3.14	0.52	3.98	3.47	44.62	0.00	39.50	3.140
2027			7.89	7.89		0.33	3.14	0.49	3.96	3.93	41.48	0.00	43.43	3.140
2028			8.34	8.34		0.34	3.14	0.46	3.93	4.41	38.34	0.00	47.84	3.140
2029			8.81	8.81		0.34	3.14	0.43	3.91	4.90	35.20	0.00	52.74	3.140
2030			9.29	9.29		0.35	3.14	0.39	3.88	5.41	32.06	0.00	58.15	3.140
2031			9.79	9.79		0.36	3.14	0.36	3.86	5.93	28.92	0.00	64.08	3.140
2032			10.31	10.31		0.37	3.14	0.33	3.84	6.47	25.78	0.00	70.56	3.140
2033			10.86	10.86		0.37	3.14	0.30	3.81	7.05	22.65	0.00	77.61	3.140
2034			11.43	11.43		0.38	3.14	0.27	3.79	7.64	19.51	0.00	85.25	3.140
2035			12.02	12.02		0.39	3.14	0.24	3.77	8.25	16.37	0.00	93.50	3.140
2036			12.63	12.63		0.40	3.14	0.21	3.74	8.89	13.23	0.00	102.39	3.140
2037			13.26	13.26		0.41	3.14	0.17	3.72	9.54	10.09	0.00	111.93	3.140
2038			13.91	13.91		0.41	3.04	0.14	3.60	10.31	7.04	0.00	122.24	3.044
2039			14.58	14.58		0.42	2.93	0.11	3.47	11.11	4.11	0.00	133.35	2.935
2040			15.27	15.27		0.43	2.11	0.08	2.62	12.65	2.00	0.00	146.00	2.112
2041			15.99	15.99		0.44	1.33	0.05	1.82	14.17	0.67	0.00	160.17	1.329
2042			16.73	16.73		0.45	0.54	0.03	1.02	15.71	0.13	0.00	175.87	0.543
Total	11.1	62.9	262.8		74.0	10.2	62.8	13.9	158.5			0.63		62.9

Source: Study Team

4) Both Loan/Equity Ratio of 85/15 and 100/0 require subsidy except for Case 4 (4-a & 4-b) of the interest rate at 1%. Although the cash flow of Case 4 under the Loan/Equity ratio of 85/15 is better and the amount of subsidy is smaller than the case under the Loan/Equity ratio of 100/0, the implementing body has to be prepared for equity portion amounting to 15% of the total project cost.

5) The amount of subsidy:
The minimum subsidy amount is nil in Case 4-a and 4-b, while the maximum single year subsidy of the Base Case-c amounts to $7.40 million in the 12th year and the maximum cumulative subsidy reaches $154.97 million by the year 2042.

6) First year of annual surplus:
As to Cases 1-b, 2-a, 2-b, 3-a, 3-b, 4-c and 4-d, the annual surplus appears before the loan repayment starts, but when the repayment of the principal begins, subsidies are required again.

7) First year of accumulated surplus:

Similar to item 6) above, the accumulated surplus of Case 2-a and 2-b initially appear before the loan repayment starts; however, once the repayment starts, the accumulated deficit appears again.

8) In Cases 3-a and 3-b, although the subsidy is required in several years between the 10th (11th) year and the 16th (14th) year for Case 3-a (Case 3-b), the first year of accumulated surplus appears in relatively early stages, i.e. the 3rd year (Case 3-a) and the 2nd year (Case 3-b), which are considered acceptable for the implementing body, only if they can afford to manage the annual deficit in the early few years.

Further investigation shows the minimum toll levels required for the project to be financially positive in the annual account (no subsidy is required) as presented in Table 9.2.11.

Table 9.2.11 Toll Rate Level for Nil Subsidy

	Interest Rate	Loan/Equity Ratio	Minimum Toll Rate Required (Percentage to Current Ferry Level)
a	1%	100/0	75%
b	1%	85/15	64%
c	5%	100/0	n.a.
d	5%	85/15	n.a.

Source: Study Team

As mentioned earlier, the toll rates for Case 2 (the toll level at 80% of user's benefit), and Case 3 (the toll level at 100% of user's benefit) correspond to 44% and 55% of the current ferry level respectively. Since these cases are less than 64% of the current ferry tariff, they require subsidies.

9.3 Overall Evaluation of the Project

(1) Economic Evaluation

Major quantifiable economic benefits derived from the proposed project are mainly comprised of savings in vehicle operating cost and travelers time cost. The project EIRR for the base case results in 23.0%. The sensitivity analysis, which reduces the traffic demand by 20% and increases the project cost by 20%, results in 16.8% of EIRR that assures the economic feasibility of the project.

The result of EIRRs by varying economic benefit shows that even in the case of 30% decrease in economic benefit and 20% increase in the project cost, the EIRR is more than 14%.

In addition to these quantitative benefits, unquantifiable benefits also suggest the importance of improving the infrastructure network, especially a trunk road such as NR-1 that connects capital cities of the countries in the region.

From these results it is considered that high priority should be given to the implementation of the project to promote economic and social development of the country and the GMS region as well.

(2) Financial Evaluation

Despite the economic evaluation of the project, the analysis of Financial IRR (ROI) shows that FIRR is positive but small and thus cannot attract the private sector for the project investment. The positive FIRR, however, is only realized when the toll rate is set at or more than 100% of bridge user's benefit (6.60% in case the toll rate is equivalent to the current ferry tariff and 2.93% in case the toll rate is set at 100% of user's benefit).

When the project cost is funded by loan at 1% interest rate, the financial cash flow analysis reveals that the toll rate needs to be set to the level of 75% (in case loan/equity ratio is 100/0) or 64% (in case loan/equity ratio is 85/15) of the current ferry tariff in order to continuously maintain the positive balance of the annual account.

In case the toll rate is set within the bridge user's benefit (55% of the current ferry tariff level), the project requires subsidy to compensate annual deficit during the first few years, but the cumulative surplus emerges thereafter for the remaining project life. This is only possible when the loan interest is as low as 1% and the repayment period is as long as 30 years with the grace period of 10 years. If the loan interest is 5%, the annual deficit continues by the 22nd year (in case the loan/equity ratio is 100/0) or by the 20th year (in case the loan/equity ratio is 85/15).

Consequently, if the implementing body is to raise the required fund by loan, the toll rate will have to be set to cover the maximum benefit of the project users, and the loan condition should be as low as possible, preferably less than 1% and the repayment schedule be as soft as possible, such as 30 years repayment with 10 years grace period.

CHAPTER 10

CONCLUSIONS AND RECOMMENDATIONS

10. CONCLUSIONS AND RECOMMENDATIONS

Based on the thorough examination of the project on both master plan stage and feasibility study stage, the Study results in the following conclusions and recommendations:

10.1 Conclusions

(1) Selection of Optimum Crossing Route and Method:

- Applying the Analytic Hierarchy Process for the selection of an optimum alternative to cross the river, the "Ferry Improvement + Bridge" option on Route A is estimated as the optimum method to cross the Mekong River at Neak Loeung.
- "Ferry Improvement + Bridge (Route A)" option was agreed among all the stakeholders, and which could be regarded as the final consensus on the optimum solution to cross the river, through public comments and response process between MPWT and the stakeholders.
- "Ferry Improvement + Bridge (Route A)" option, however, should not be identified as one project that consists of the "Ferry Improvement" and the "Bridge" components. The "Ferry Improvement" should be considered as prerequisite for the "Bridge" development.

(2) Economic and Financial Analysis:

- The EIRR of the project is 23.0% and the sensitivity analysis results in 16.8 %, when the traffic demand decreases by 20% and the project cost increases by 20%. It is, therefore, concluded that a high priority should be given to implementation of the project to promote economic and social development in Cambodia and GMS region as well.
- The results of financial analysis show low FIRR of 6.6% (at the toll level equivalent to the current ferry tariff) or 2.9% (at the toll level to cover 100% of the bride user benefit). Therefore, the project will not be attractive for private sector to invest without significant financial support by the government.
- In order to operate as a financially sound toll bridge, the toll rate will have to reach the full level of the bridge user benefit, which is about 55% of the current ferry tariff. Further, conditions of the fund procurement should be as soft as possible, that is, less than 1% interest rate and 30 years repayment period with 10 years grace period.
- If the consensus is made among concerned stakeholders, it is desirable to adopt the toll level equivalent to the current ferry tariff, so that the project will not require any subsidy but it attains the first year annual surplus and the first year accumulated surplus in the first and the second year from the bridge opening, respectively

10.2 Recommendations

(1) Traffic Demand and Timing of Bridge Opening

- It is recommended that the bridge should be open to traffic in the Year 2012 before the existing ferry capacity (4,548 PUC/day) is saturated.
- Given the margin of error in the traffic demand forecast, it is advised to monitor the actual traffic volume for the next few years by the proponents. It is also suggested that, based on the results of traffic demand monitoring during this period, further consideration be given to appropriate timing of preparation for the construction. This is in accordance with the recommendations by the JICA Appraisal Committee on the Environmental and Social Considerations with respect to the importance of the traffic demand forecast for the project implementation.

- The traffic demand monitoring should be executed using an indirect method such as the data on monthly revenue from the ferry operation and a direct method such as counting traffic volume on board during the fixed one week period in May, so that the counting result can be compared with the traffic survey conducted in May 2004 by the current Study Team. In addition, the queuing survey should be carried out in parallel with the traffic counts for evaluating the congestion level at the ferry terminal.

(2) Proper Maintenance and Improvement of the Neak Loeung Ferry

- The ferry improvement is not regarded as part of the 2nd Mekong Bridge construction project but it is prerequisite for the bridge project. Therefore, the government should extend the full support to the proper maintenance and improvement of the existing ferry service at Neak Loeung before the bridge is open to traffic.
- In order to meet the estimated traffic demand until 2012, at least three (3) existing ferryboats, "TA PHROM", "VISHNU" and "PEACE-2" should be operated and properly maintained at Neak Loeung.
- If the project bridge is not constructed by 2012 or not allowed to lower the ferry service, for instance much longer queuing time over 36 minutes, the ferrying capacity can be enhanced for example by replacing one (1) ferryboat of 24 PCU with a new ferry boat of 30 PCU.
- Acquisition of new ferry boats to replace the existing ferry boats shall be seriously planned, since the existing ferryboats are so old that degradation of the boats will accelerate year by year.
- In order to enhance the ferrying service over the existing and prospective routes to cross the Mekong River or to meet the increasing traffic demand in future, further recommendations are made as follows:

  1) To plan a whole repair and maintenance schedule for the existing ferry boats.
  2) To reserve a budget for maintenance and repair.
  3) To carry out repair and maintenance of ferry boats on schedule.
  4) To reinforce the workshop for improvement of quality in repair and maintenance including training and education of staff.
  5) To contrive a long term deployment plan including acquisition plan of ferry boats crossing rivers in Cambodia.
  6) To expand the activity of the work at the Neak Loeung Dockyard.

(3) Environmental Impact Assessment and Resettlement Action Plan

- As the result of IEE and EIA, sensitive natural and social environmental elements were identified and impacts of the project against these elements as well as a wide range of secondary, interactive and cumulative impacts were assessed to prepare effective countermeasures to alleviate the negative impacts as discussed and recommended in Chapter 7 of Main Text. Special attention should be paid on vulnerability groups such as economically vulnerable PAPs, female-headed households, vendors, women, children, physically-handicapped persons, and other economically and socially vulnerable households by providing proper recommended mitigation measures.
- Environmental Management Plan should be prepared to pursue the conservation of natural and social environment.
- The number of PAPs to be affected by the land acquisition of the Project at the stage of "Simple Survey" is 260 house owners and landowners with 270 cases of assets, although the figure will be updated at the stage of DMS.

- Since the socio-economic survey, which was conducted in the feasibility stage, is not an official census, the full-scale RAP should be formulated based on the DMS together with the full-scale census.
- The full-scale RAP should include proper mechanizms for information disclosure, grievance resolution, and monitoring activities to guarantee the appropriate planning and implementation of the resettlement and compensation activities.
- Referring to the EIA study explored in this Study, EIA report should be prepared and submitted by MPWT and need to be approved by MOE at appropriate timing for implementation of the Project.

(4) Development of Newly Created Flood-free Land:

- Through studying national and regional development plans and strategies, generation and utilization of the flood-free land is proposed as a key strategy for the development of "Neak Loeung Regional Center" and its preliminary zoning and the land use plan are consequently proposed.
- Although the newly created flood-free land development is not incorporated into the Bridge project, the land development should be promoted by government initiative and private sector funds and by entrepreneurship.

(5) Design Conditions and Criteria for the Project:

- Through applying AASHTO and comparing with the design standards adopted in the past projects in Cambodia, the Highway Design Standard adopted in this Project recommends to accommodate 2-lanes on the carriage way and two motorbike lanes with design speed of 80 km/h.
- Horizontal and vertical clearance of the project bridge is proposed in minimum 180 m and 37.5 m respectively, considering external conditions and development policies and plans, and which allows a 5,000 DWT container ship for one-way traffic and 500 DWT coasters for two-way traffic.
- Taking into account the safety navigation of local ships and therefore minimization of the number of piers in the river, construction costs and features of alternative bridge types, Pre-stressed concrete Cable Stay Bridge were selected eventually with center span length of 320 m.

(6) Project Costs and Implementation Plan:

- Total project cost is estimated at US$ 74 million, including the construction cost, land acquisition and compensation costs, de-mining and UXO clearance costs, using the price level in September 2005. The total construction period, including the mobilization period, is estimated at 45 months, and the overall project implementation period is to be about 6 years.
- Since the financial viability (FIRR) of the project is as low as 6.6% even at the toll level equivalent to the current ferry tariff, the government should take the initiative for the project investment. If the government can successfully procure the funds for the project implementation, the private sector will be able to participate in the operation and maintenance business of the project toll bridge.
- However, before the private sector is invited to participate in project operation and maintenance, the government will have to prepare the legal and institutional environment to attract private sector.
- Since the subject project is a large-scale bridge project, the government should fully utilize this opportunity to train government staff and enhance their technology and management quality.

(7) Public Consultations:

- Following the JICA guidelines for environmental and social considerations, eight stakeholder meetings (SHM 1-1～3-3) were held to discuss the Study results and achieve consensus among stakeholders. The last stakeholder meeting (SHM 3-3) was held at the end of January 2006.
- To have the project implemented smoothly, the government should maintain transparency, accountability of the decision-making process and information disclosure to concerned stakeholders through the procedure of public consultation.