

## **CHAPTER 5 HIGH PRIORITY ROAD PROJECT AND EXPRESSWAY PLAN**

Following the previous sections, selection of priority project is confirmed in **Section 5.1**. Details of the priority project, including lane arrangement, implementation program and terms of reference (TOR) for feasibility study on those projects are discussed in **Section 5.2** in order to proceed to next step without delay.

In **Section 5.3**, effect and necessity of expressway is stipulated in accordance with the context in the previous sections concerning expressway.

Brief of Build-Operate-Transfer (BOT) and Public-Private-Partnership (PPP) scheme are described in **Section 5.4** together with utilization of those schemes for road and expressway development, including features and process of selecting appropriate scheme. Recommendation for BOT and PPP scheme is also provided.

### **5.1 Selection of Priority Project**

In **Section 4.7** to **4.9**, priority projects are selected from those listed in the medium term program as follows.

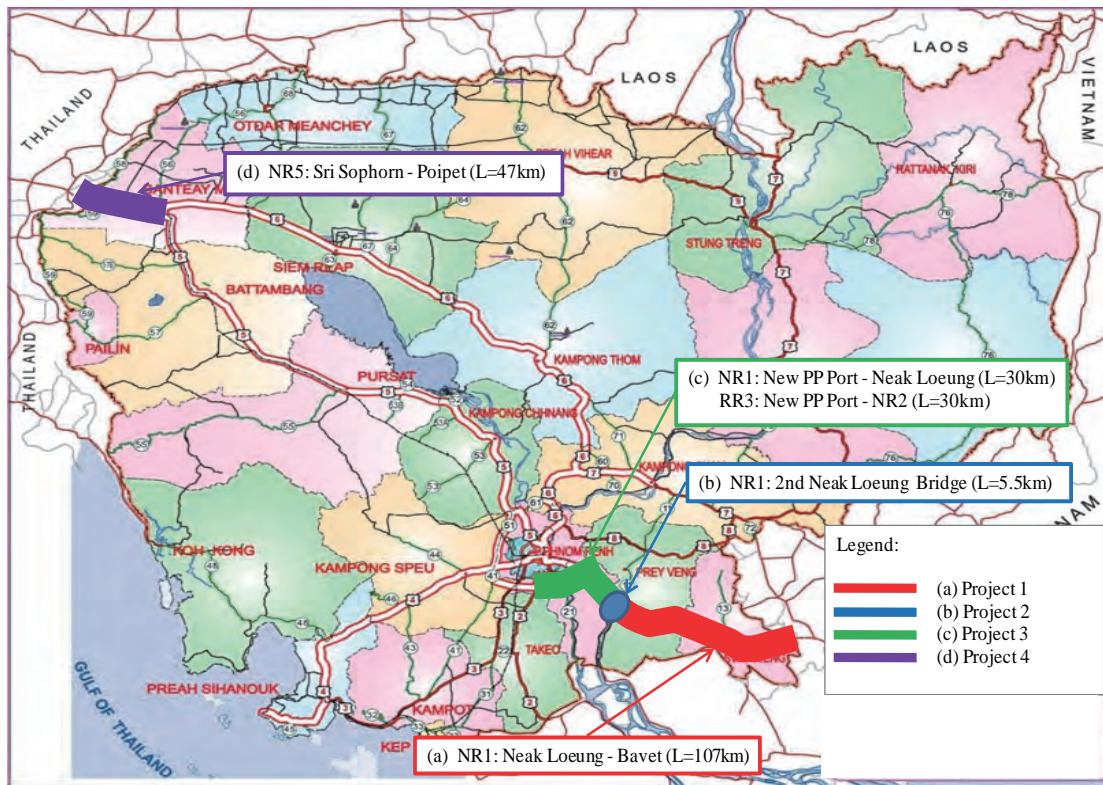
- National Road 1: Neak Loeung to Bavet to widen to 2 lanes x 2 directions with asphalt concrete (AC) pavement
- National Road 1: Another Neak Loeung Bridge to be constructed as second bridge with AC pavement to accommodate at least 2 lanes x 2 directions capacity together with the first bridge
- National Road 1: PK 30 (New Phnom Penh Port) to Neak Loeung to widen and/or construct new road as NR 1 bypass to 2 lanes x 2 directions with AC pavement, including provision of accesses to new Port and new SEZ near new Port
- Phnom Penh Ring Road No. 3: NR 1 (PK 30) to NR 2 to construct 2 lanes x 2 directions road with AC pavement newly, including provision of interchange for smooth movement between NR 1 and ring road No. 3
- National Road 5: Sri Sophorn to Poipet to widen to 2 lanes x 2 directions with AC pavement

Once the above projects are complete, the Southern Economic Corridor / Asian Highway 1 will be 2 lanes x 2 directions road within Cambodia from Poipet (border to Thailand) to Bavet (border to Vietnam).

### **5.2 Priority Road Development Project and Preparation of TOR**

#### **(1) Priority Road Development Project**

With the consideration in the previous section, four priority projects are selected and shown in the figure and table below.



Source: JICA survey team

**Figure 5.2-1 Priority Road Development Project**

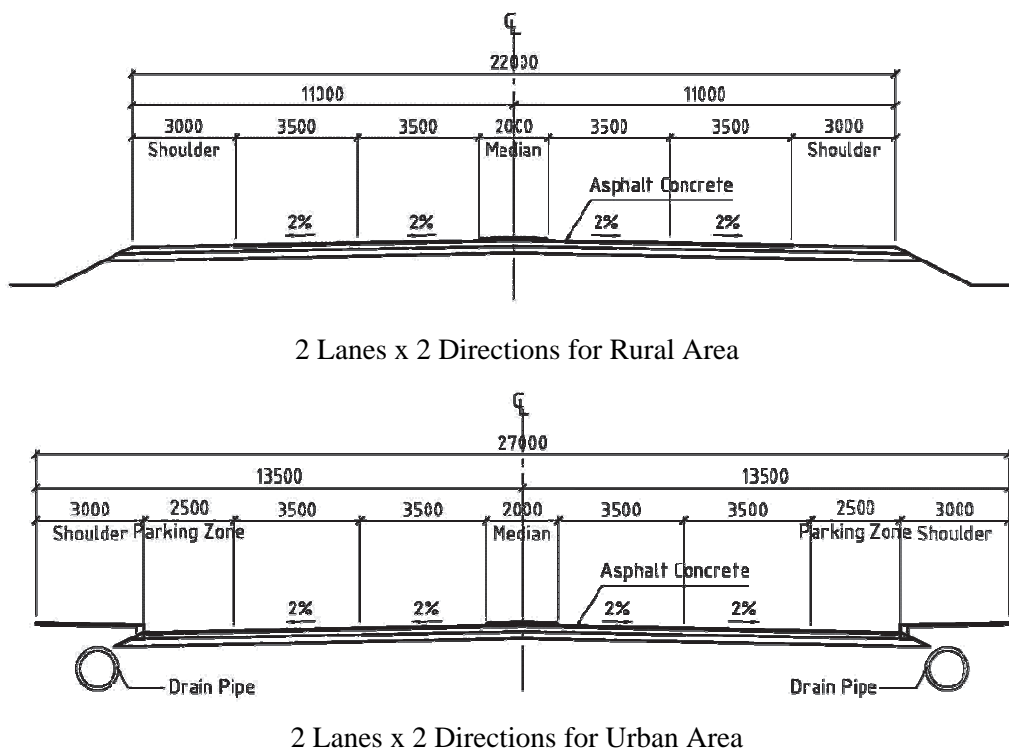
**Table 5.2-1 Priority Road Development Project**

no	Road	Location	Length	Current conditions	Development
(a)	NR 1	Neak Loeung to Bavet	107 km	1 lane x 2 directions	2 lanes x 2 directions
(b)	NR 1	2nd Neak Loeung Bridge	5.5 km	1st bridge to complete in 2015	(3 lanes or 2lanes + bike) x 2 directions or more
(c)	NR 1	New PP Port to Neak Loeung	30 km	(1 lane + bike) x 2 directions	2 lanes x 2 directions
	RR 3	New PP Port to NR 2	30 km	-	2 lanes x 2 directions
(d)	NR 5	Sri Sophorn to Poipet	47 km	(1 lane + bike) x 2 directions	2 lanes x 2 directions

Source: JICA survey team

Based on the site survey along with the Southern Economic Corridor and Asian Highway 1 in whole Cambodia (NR 1 and 5 together with other connection roads), Thailand from the border to Bangkok and Vietnam from the border to Ho Chi Minh, majority of the routes in Thailand and Vietnam is found to be at least 2 lanes x 2 directions with center divider (0.5 m to 2 m wide, but certain stretches with no divider) and street lamps (ref. **Section 2.3**). The survey team also refers the final report of the Preparatory Survey for National Road No. 5 (north section) Rehabilitation Project submitted last year and two typical sections are found from the report, applying 2 lanes x 2 directions for rural area as well as for urban area.

Taking those into consideration, the survey team recommends at this stage the slightly modified cross sections from NR 5 rehabilitation shall be the sections applying to priority projects in general, which is shown in the figure below.

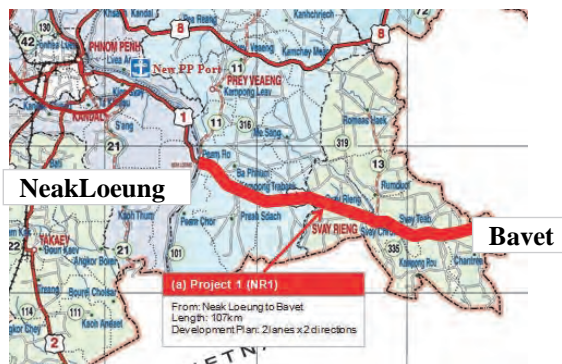


Source: JICA survey team based on the Preparatory Survey for National Road No. 5 Rehabilitation Project by IICA

**Figure 5.2-2 Typical Section of Priority Project**

(a) Project 1 (NR 1 Neak Loeung to Bavet)

Location map of Project 1 is shown in the figure at right and typical section to widen is as per the figure above.



Source: JICA survey team

**Figure 5.2-3 Location Map of Project 1**

It is to note that congestions near SEZs in Bavet (ref. to **section 2.6**) needs to be addressed for possible solutions during feasibility study. It is also the fact that the project funded by ADB (Project No. 43319-033: Greater Mekong Subregion Southern Economic Corridor Towns Development Project) takes care this congestion as “civil works to widen the 10 km section (in Bavet) of road from 10 m to 22 m with expansion from 2 to 4 lanes with upgraded paved surface together with lighted median and drainage ditches both side”.

When carrying out the feasibility study to the Project 1, discussions shall be arranged with the team from ADB project (No. 43319-033) and the contents of the Project 1 shall be well coordinated with ADB project to avoid overlapping or gap between the projects.

Consideration shall also be made to provide facilities at border like transshipments etc. during the feasibility study.

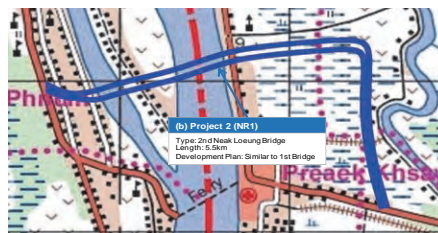
(b) Project 2 (NR 1 2nd Neak Loeung Bridge and Connection Road)

Location map of Project 2 is shown in the figure below, widening embankment section, separating to two bounds (both one way direction), paralleling 2nd bridge to the 1st bridge

and then combining to embankment section again.

When feasibility study for second Neak Loeung Bridge is conducted, the bridge shall be considered to incorporate more capacity for future traffic, including expressway. Thus, the bridge may be wider than the first bridge or double decked type.

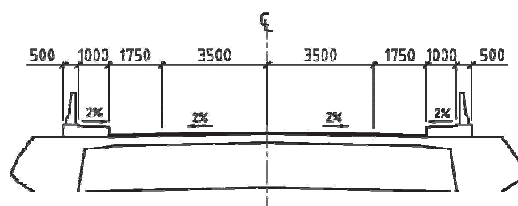
For Project 2 (Second Neak Loeung Bridge), process to widen to 3 lanes or (2 lanes + bike) x 2 directions are a little complicated as stated below.



Source: JICA survey team

**Figure 5.2-4 Location Map of Project 2**

- (i) First Neak Loeung Bridge to open in 2015 with section (1 lane + bike) x 2 directions in the figure below.



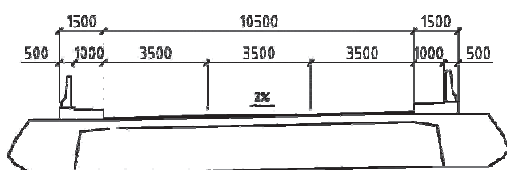
Source: Preparatory study for Neak Loeung Bridge in 2010, JICA

**Figure 5.2-5 Section of First Neak Loeung Bridge**

- (ii) Second Neak Loeung Bridge and connection road after separation to east bound and west bound toward the bridge to construct in order to accommodate designed capacity. Combined part of connection road to widen to be as per the **Figure 5.2-2** or wider.

It is to note that second Neak Loeung Bridge is unable to draw at this stage and may be wider than the first bridge or double deck bridge as stated the above.

- (iii) After completion of second Neak Loeung Bridge, the first bridge to modify lane arrangement as per the figure below to accommodate one way direction



First Neak Loeung Bridge  
(lane arrangement modified)

*Second bridge to be wider or double deck bridge to accommodate more traffic, possibly for future expressway*

Second Neak Loeung Bridge

Source: JICA survey team

**Figure 5.2-6 Section of Priority Project 2dge**

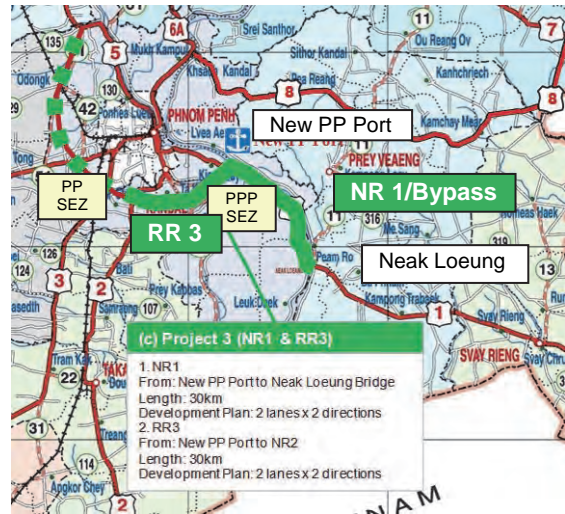


(c) Project 3 (NR 1 New Phnom Penh Port to Neak Loeung & Ring Road No. 3 New Phnom Penh Port to NR 2)

The survey team recommends that development of National Road 1 (NR 1)/Bypass of NR 1 from new Phnom Penh Port to Neak Loeung and Phnom Penh Ring Road No. 3 from new Phnom Penh Port to National Road 2 shall be combined, as these roads are continuous for smooth traffic flow, location map of which is shown at right.

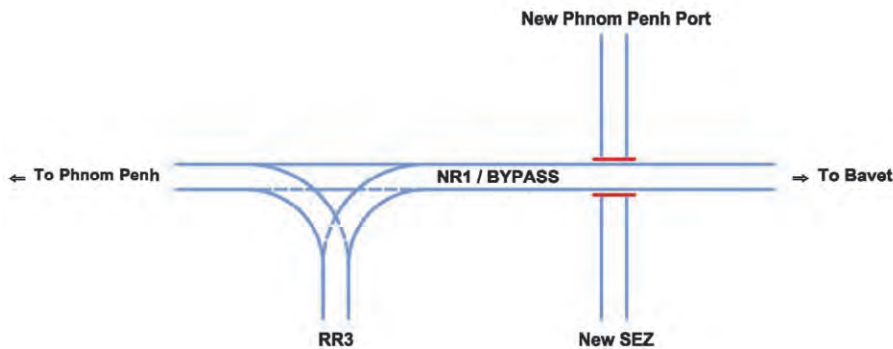
When the first Neak Loeung Bridge is open in 2015 and new SEZ near new Phnom Penh Port becomes operational, traffic demand in NR 1 and ring road No. 3 is anticipated to increase hugely.

Hence, the junction between NR 1/Bypass and new PP Port & new SEZ and between NR 1/Bypass and ring road No. 3 may need some additional structure for smooth traffic like flyover, shown below.



Source: JICA survey team

**Figure 5.2-7 Location Map of Project 3**



Source: JICA survey team

**Figure 5.2-8 Additional Structure (Flyover etc.) at Junctions**

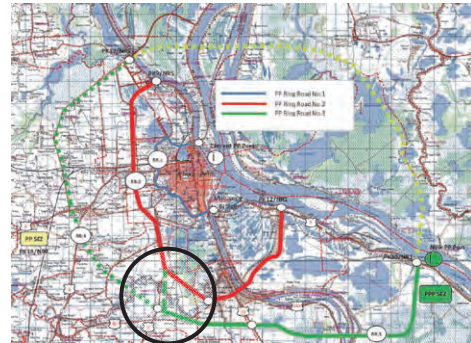
The survey team recommends that two route options near new PP Port may be considered, 1) widening of present NR 1 and 2) new road to construct as Bypass of NR 1 in front of new SEZ.

It is to note that the following matters has been considered, when the part of ring road No. 3 (NR 1 to NR 2) is selected as the priority project.

- Route selection of ring road No. 3 between NR 2 to NR 5 is not simple or easy.
- Social environmental issues shall be checked and properly addressed, and resettlement plan shall be prepared for several route options after holding stake holders meetings.
- Discussions with Phnom Penh Municipality shall be arranged in regard to route of ring road No. 3, as ring road is one of important roads for development of whole city planning.
- Business view point shall be taken into account for route selection of ring road.
- Main junctions with NR 2, 3, 4 and 5 shall have smooth in & out facilities (e.g. flyover or interchange kind of structure to introduce).
- One of main reasons to construct ring road No. 3 is to make linkage from NR 5 to new Phnom Penh Port for transport of agricultural products and from Phnom Penh SEZ to new

Port and vice versa without passing through Phnom Penh city. In this sense, the remaining part of ring road No. 3 (NR 2 to NR 5) shall be complete together with the priority project discussed the above for full functioning of ring road No. 3.

Hence, the survey team recommends that separate study for remaining part of the ring road No. 3 shall be carried out in due course and due time. If and only if the remaining part of ring road No. 3 (NR 2 to NR 5) is not progressed as expected, Project 3 (ring road No. 3 from NR 1 to NR 2) shall take care to make connection to the ring road No. 2 along with NR 2 temporarily, as shown in the figure at right.



Source: JICA survey team

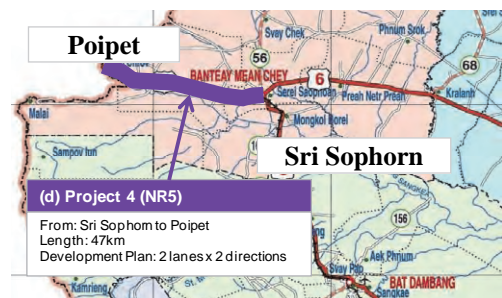
**Figure 5.2-9 PP Ring Road No. 3**

(d) Project 4 (NR 4 Sri Sophorn to Poipet)

Location map of Project 4 is shown at right.

Sri Sophorn bypass proposed in the final report for the Preparatory Survey for National Road No. 5 (north section) Rehabilitation Project needs to take care during the feasibility study of Project 4.

Consideration shall also be made to provide facilities at border like transshipments etc. during feasibility study.



Source: JICA survey team

**Figure 5.2-10 Location Map of Project 4**

(2) Implementation Program

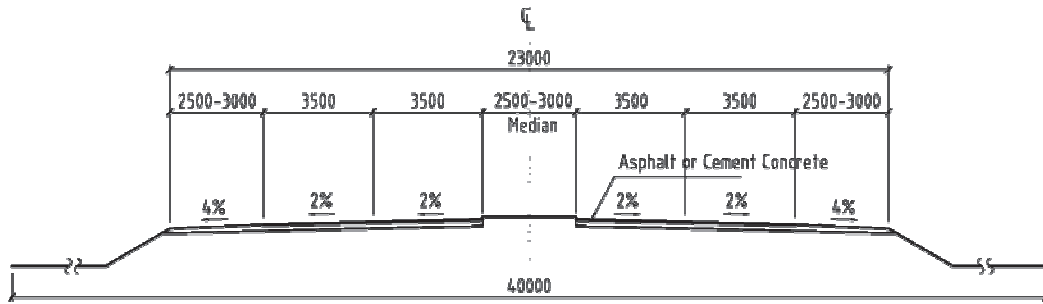
Implementation program for the priority road development projects is shown below, activity of which is classified into feasibility study, loan agreement / design / tender of contractor and construction.

Items				2013		2014		2015		2016		2017		2018		2019		2020	
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
(a)	NR 1	Neak Loeung to Bavet	107 km	feasibility study				loan agreement / design / tender								construction			
(b)	NR 1	2nd Neak Loeung Bridge	5.5 km	feasibility study				loan agreement / design / tender								construction			
(c)	NR 1 RR3	New PP Port to Neak Loeung New PP Port to NR 2	30 km 30 km	feasibility study				loan agreement / design / tender								construction			
(d)	NR 5	Sri Sophorn to Poipet (can be integrated with the Middle Section Project)	47 km	feasibility study				loan agreement / design / tender								construction			

Source: JICA survey team

**Figure 5.2-11 Implementation Program of Priority Project**

When the above program is maintained, the Southern Economic Corridor / Asian Highway 1 (AH 1) would have 2 lanes x both directions road in 2020 throughout Cambodia, providing that National Road 5 from Prek Kdam to Sri Sophorn is widened as scheduled. Hence, road from Bangkok in Thailand to Ho Chi Minh in Vietnam is connected in the standard section with slight modification of center median of Asian Highway Class I (shown in the figure below).



Source: MPWT information

**Figure 5.2-12 Typical Section of Asian Highway Class I**

(3) Standard Composition of Term of Reference for Feasibility Study

In order to have common understanding, standard composition of terms of reference for feasibility study of the above priority road development project is stated hereafter and basic and special points for consideration is provided in each project in (4) below.

Standard Composition of terms of reference

1. General

- (1) Background of Study
- (2) Objective of Study
- (3) Output of Study
- (4) Study Area
- (5) Related Authority

2. Basic and Special Points for Consideration

3. Scope and Methodology of Study

(1) Preparatory works

- a. Collection of related reports and analysis of those reports
- b. Compilation of inception report and explanation to stake holders

(2) First Stage of Study

- a. Confirmation of scope of study
- b. Collection of regulation and standard on transport sector
- c. Site condition survey on road (pavement) and bridges & structures, including utilities under and above ground
- d. Traffic survey, including travel speed survey
- e. Future traffic demand
- f. Review of progress in regard to cross border transport agreement
- g. Hydraulics and hydrology analysis
- h. Aerial photo survey
- i. Analysis of bypasses routes & major junctions and comparison of ideas

- j. Initial study of road section and geometry
- k. Geotechnical investigation
- l. Preliminary survey for environmental and social consideration
- m. Compilation of interim report, explanation to and discussion with stake holders
- n. First JICA advisory committee of environmental and social consideration
- (3) Second Stage of Study
  - a. Topographic survey for bypasses and major junctions
  - b. Geotechnical investigation on bypasses and major junctions
  - c. Preliminary design of roads, structures (bridges and culverts) and bypasses & junctions
  - d. Construction plan
  - e. Survey for environmental and social consideration
  - f. Plan of implementation organization
  - g. Plan of maintenance organization
  - h. Plan of traffic safety measures
  - i. Estimation of project cost and proposed loan amount
  - j. Value engineering study
  - k. Implementation plan
  - l. Economic evaluation and analysis
- (4) Draft Final Report
  - a. Compilation of draft final report and explanation to stake holders
  - b. Second JICA advisory committee of environmental and social consideration
- (5) Final Report
  - a. Discussion and finalization of draft final report
  - b. Compilation and submission of final report
- 4. Schedule of Study
- 5. Role of Cambodia Side

(4) Basic and Special Points for Consideration in Each Project

- (a) Project 1 (NR 1 Neak Loeung to Bavet)
  - (i) Road width (number of lanes) to be verified in accordance with traffic demand, survey result of environment and social consideration and local conditions, including congestions near SEZs in Bavet area.
  - (ii) The project funded by ADB (Project No. 43319-033: Greater Mekong Subregion Southern Economic Corridor Towns Development Project) to commence to improve traffic flow (ease of congestions) in the area of Bavet as “civil works to widen the 10 km section of road from 10 m to 22 m with expansion from 2 to 4 lanes with upgraded paved surface together with lighted median and drainage ditches both side”. During the feasibility study to the Project 1, discussion to be arranged with the team from ADB project (No. 43319-033) and coordination to be conducted for contents of the Project.



- (iii) Parking areas for SEZs in Bavet to be provided as soon as possible together with education of traffic rules to observe
  - (iv) Special arrangement to be made near the border for facility of transshipment etc.
  - (v) Bypass to be studied at town of Svay Rieng
  - (vi) Existing bridges to be checked and reviewed, particularly bridge length more than hundred meter in accordance with latest design standard adopted in Cambodia and to consider whether those to be widen or another bridge to be constructed
  - (vii) UXO clearance to be issued prior to topographic survey and soil investigation
  - (viii) Survey for environmental and social consideration to be carried out in accordance with JICA Guideline for Environmental and Social Consideration (2010) as well as Guideline in Cambodia (Decree on Procedure on Environmental Impact Assessment by MOE)
- (b) Project 2 (NR 1 2nd Neak Loeung Bridge and Connection Road)
- (i) Road width (number of lanes) to be verified in accordance with traffic demand, survey result of environment and social consideration and local conditions, including those for future expressway
  - (ii) Embankment to widen and then to separate toward bridge
  - (iii) Lane arrangement in the first bridge to modify after second bridge complete, as the first bridge to be one way direction
  - (iv) Utilizing design and construction records in the first Neak Loeung Bridge
  - (v) Review and arrange (if necessary) of structure positions in river not to disturb river flow
  - (vi) UXO clearance to be issued prior to topographic survey and soil investigation
  - (vii) Survey for environmental and social consideration to be carried out in accordance with JICA Guideline for Environmental and Social Consideration (2010) as well as Guideline in Cambodia (Decree on Procedure on Environmental Impact Assessment by MOE)
- (c) Project 3 (NR 1 New Phnom Penh Port to Neak Loeung & Ring Road No. 3 New Phnom Penh Port to NR 2)
- (i) Road width (number of lanes) to be verified in accordance with traffic demand, survey result of environment and social consideration and local conditions
  - (ii) Road in NR 1 to widen and/or bypass of part of NR 1 to newly construct in front of new SEZ and ring road No. 3 to construct newly to accommodate traffic demand
  - (iii) Special arrangement at junction of NR 1 and accesses of new Phnom Penh Port & new SEZ to consider like fly over kind of structure
  - (iv) Interchange at junction of NR 1 and ring road No. 3 to consider some structure like fly over for smooth traffic flow
  - (v) Existing bridges to be checked and reviewed in accordance with latest design standard adopted in Cambodia and to consider whether those to be widen or another bridge to be constructed
  - (vi) Utilizing design and construction records in Takhmau Bridge over Bassak River being constructed for ring road No. 2
  - (vii) UXO clearance to be issued prior to topographic survey and soil investigation
  - (viii) Survey for environmental and social consideration to be carried out in accordance with

JICA Guideline for Environmental and Social Consideration (2010) as well as Guideline in Cambodia (Decree on Procedure on Environmental Impact Assessment by MOE)

- (d) Project 4 (NR 4 Sri Sophorn to Poipet)
  - (i) Road width (number of lanes) to be verified in accordance with traffic demand, survey result of environment and social consideration and local conditions, including congestions near special economic zones in Poipet area
  - (ii) Parking areas for SEZ in Poipet to be provided
  - (iii) Special arrangement to be made near the border for facility of transshipment etc.
  - (iv) Arrangement at junction of Sri Sophorn Bypass and NR 5
  - (v) Existing bridges to be checked and reviewed, particularly bridge length more than hundred meter in accordance with latest design standard adopted in Cambodia and to consider whether it to be widen or another bridge to be constructed
  - (vi) UXO clearance to be issued prior to topographic survey and soil investigation
  - (vii) Survey for environmental and social consideration to be carried out in accordance with JICA Guideline for Environmental and Social Consideration (2010) as well as Guideline in Cambodia (Decree on Procedure on Environmental Impact Assessment by MOE)

### **5.3 Proposed Expressway Plan**

#### **(1) Background of Expressway Plan**

Following the previous sections, the survey team proposes the future plan of the development of road network, as construction of the High Standard Highway (Expressway). Expressway is not only to promote economic growth continually and to agree to the Rectangular Strategy directly and indirectly but also to connect to the correction of difference among ASEAN countries by the construction of high standard roads based on the policy of “Asian Highway”.

Therefore, the considerations to expressway during long-term road network planning are summarized as follows.

[Appearance of economic effect]

Economic performance, reflecting the scale of benefits may deliver in relation to its cost of implementation

[Synergy effect with the plan of surrounding area]

Synergy with other schemes such as regional development plan and private investment

[Estimation of traffic demand]

If the expressway network is implementing functionally, level of usage will be high.

One of elements in the long-term road network plan is the expressway. In the existing master plan, as the degree of understanding to the plan with the expressway is low, and there is no description when (how long later) Cambodia will implement to utilize the expressway.

#### **(2) Effect of Construction of Expressway**

Socio-economic effects gained by the introduction of expressway are classified into two major categories, “direct effect” and “indirect effect”. Direct effect is the effect what the users of expressway receive. Indirect effect is the effect that arose by the construction of expressway, namely, effect to the area along the roads and the effect of land development.

Cambodia seems to be developed nationwide from now, and the survey team considers that Cambodia shall put more emphasis on the effect of regional development (indirect effect) than that of direct effect. If the appropriate strategy and investment are accompanied with the

expressway, the effect of regional development will be urged equal development of the provinces then the regions will be expected to be more active with more effect.

Those effects are summarized below.

**Table 5.3-1 Effects of Expressway**

Direct effect	<ul style="list-style-type: none"> <li>- Savings in travel time</li> <li>- Savings in vehicle operating cost</li> <li>- Improve comfortableness driving</li> <li>- Relaxation of traffic congestion on existing roads</li> <li>- Securing time of travelling</li> <li>- Improvement of environment</li> <li>- Promotion of mobility by operating long-distance bus</li> <li>- Decrease of cargo damage and savings in packing cost</li> </ul>
Indirect effect (the effect of regional development) (Industrial promotion)	<ul style="list-style-type: none"> <li>- Promotion of regional development</li> <li>- Relieve of the crowding at cities</li> <li>- Promotion of industries</li> <li>- Promotion of tourism development</li> <li>- Promotion of agriculture, fishery and commerce (increase of production and import/export)</li> <li>- Improvement in living conditions</li> <li>- Region wide medical care</li> <li>- Improve the countermeasure to the disaster</li> <li>- Expansion of the opportunity of employment</li> </ul>

Source: JCA survey team

(3) Proposed Plan of Expressway

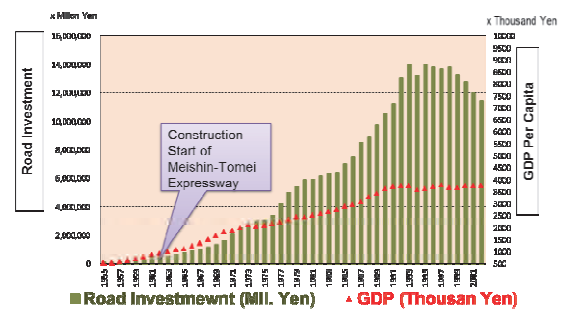
As stated before, Cambodia is now at the starting point of economic growth, graduating from the stage of recovery from aftermath of the civil war. It is time for the Royal Government of Cambodia (RGC) to start planning of expressway network.

It should be noted that development of expressway network is a large national project which requires huge investment and strong political determination. Thus, formulation of expressway network plan is highly political matter and needs diligent planning process with long period. Therefore, discussion on expressway network in Cambodia needs to be started as soon as possible in order that services provided by the expressway network can be started in the next 10 years when rapid economic growth is expected in Cambodia.

Construction of expressway network needs to be started at an optimum stage of economic growth. If it is too early, traffic demand is not large enough. Also, the characteristics of the industry (mainly Primary Industry) do not require fast and stable transport which is the most important advantage of expressway.

Usually expressway network is constructed in early stage of economic growth when the government's fund is not sufficient. Thus, the government needs to borrow loans from donors, such as JICA, ADB and World Bank. This loan can be amortized (paid back) in later years when the economy will grow and the government revenue will be large enough.

Many Asian countries started construction of expressway in early stage of economic growth, when GDP per capita was USD 1000 or less. The governments of these countries well understood that expressway network is essential



Source: JICA survey team

**Figure 5.3-1 GDP per Capita to Road Investment in Japan**

for economic growth. For example, relation of GDP per capita and road investment including timing of first expressway construction in Japan is shown in **Figure 5.3-1**. This figure tells two points that 1) GDP per capita was USD 1000, when the first expressway was started to construct in 1960s in Japan and 2) road investment initiated increment of GDP per capita in Japan.

Whereas Thailand developed expressway plan in year 1992 (GDP per capita USD 1945) and targeted to have expressway of 4,150 km in year 2016. Vietnam approved expressway plan in year 2008 (GDP per capita USD 1052) and target to have 2,639 km of expressway in 2020. It is to note that expressway from Ho Chi Minh to Vung Tau will be open by 2020 and from Ho Chi Minh to Moc Bai (border town and next to Bavet in Cambodia) be open by 2030 as shown in the figure at right. There is also recent news that the plan of area development along Ho Chi Minh to Moc Bai has been submitted to the Provincial Peoples Committee for review.



Source: JICA survey team

**Figure 5.3-2 Expressway Plan near Ho Chi Minh**

GDP per capita of Cambodia is USD 853 (year 2011) and expected USD 1900 in year 2020. This means that construction of expressway network is an urgent issue for economic growth in the very near future. The very rapid economic growth of Cambodia in the recent years seems to indicate that the “take-off” of economic growth is approaching.

Also, establishment of “ASEAN Community” scheduled in 2015 will accelerate the regional cooperation. Sandwiched between Thailand and Vietnam which will have substantial expressway by year 2020, Cambodia will be pressured to construct expressway.

In view of considerable time period (about 10 years) needed for obtaining the national consensus, discussion on construction of expressway needs to be started now. Otherwise, opening of expressway network will be behind the economic growth and hamper it. Hence, JICA survey team recommends to formulate master plan for expressway in Cambodia at the soonest. It is also important that organization for construction, operation and maintenance of expressway shall be established as soon as after the master plan.

Although the present information is not enough to show concrete future expressway network plan at this stage, an expected expressway network based on the “Asian Highway” is shown in the table and figure below.

**Table 5.3-2 Summary of Proposed Expressway**

ID	Origin	Destination	Route	Length (km)
(a)	Phnom Penh	Poipet	Running along National Road 5	400 km
(b)	Phnom Penh	Bavet	Running between National Road 1	160 km
(c)	Phnom Penh	Sihanoukville	Running along National Road 4	210 km
(d)	Phnom Penh	Sri Sophorn	Running along National Road 6	400 km

Source: JICA survey team

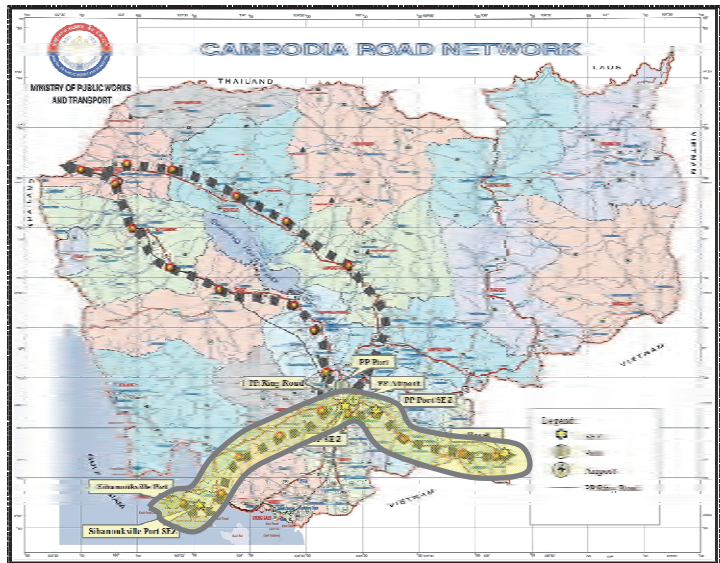
There are three points to note in regard to expressway plan as follows.

- (a) Origin of expressway shows “Phnom Penh” in the table below, however it is subject to further discussion among stakeholders, as road networks within Phnom Penh Municipality is to determine by referring whole picture of Phnom Penh city development plan. It is maybe possible to say the ring road No. 3 would be the starting point for each expressway
- (b) In accordance with traffic demand and evaluation of development projects stipulated in the

previous sections, it is most likely that the expressway (b) would be first one to construct, as the expressway (c) has been already planned.

- (c) During study of master plan for expressway, intelligent transport systems (ITS) shall be reviewed at the time and incorporated into the plan, if possible.

Possible implementation program for expressway is shown below with the same fashion of **Figure 5.2-11** (priority project). If this can be followed, first section of expressway will be commenced for construction in 2020 and be ready for use in 2020s.



Source: JICA survey team

**Figure 5.3-3 Map of Proposed Expressway**

Items	2013			2014			2015			2016			2017			2018			2019			2020		
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
(e) Expressway																								
	feasibility study																							
	master plan																							
	loan agreement / design / tender																							
																						construction		

Source: JICA survey team

**Figure 5.3-4 Implementation Program of Expressway**

#### 5.4 Build-Operate-Transfer (BOT) and Public-Private-Partnership (PPP) Scheme

There are many ways to construct and maintain roads in terms of fund preparation, such as financed by public budget (purely public works), PPP scheme which is financially shared by public and private sector (there are numerous variations as percentage of shares of both sectors), BOT (or Build-Own-Operate (BOO) or Build-Transfer (BT)) which is also number of variations, and financed by private sector.

In developing countries, public sector tends to utilize BOT kind of scheme for developing infrastructures like roads and bridges, as there are insufficient budgets for them to construct and maintain those facilities. However, BOT scheme was often failed and so far not persuasive in developing countries. Particularly it is true for road development, because transportation infrastructure is characterized high market risk.

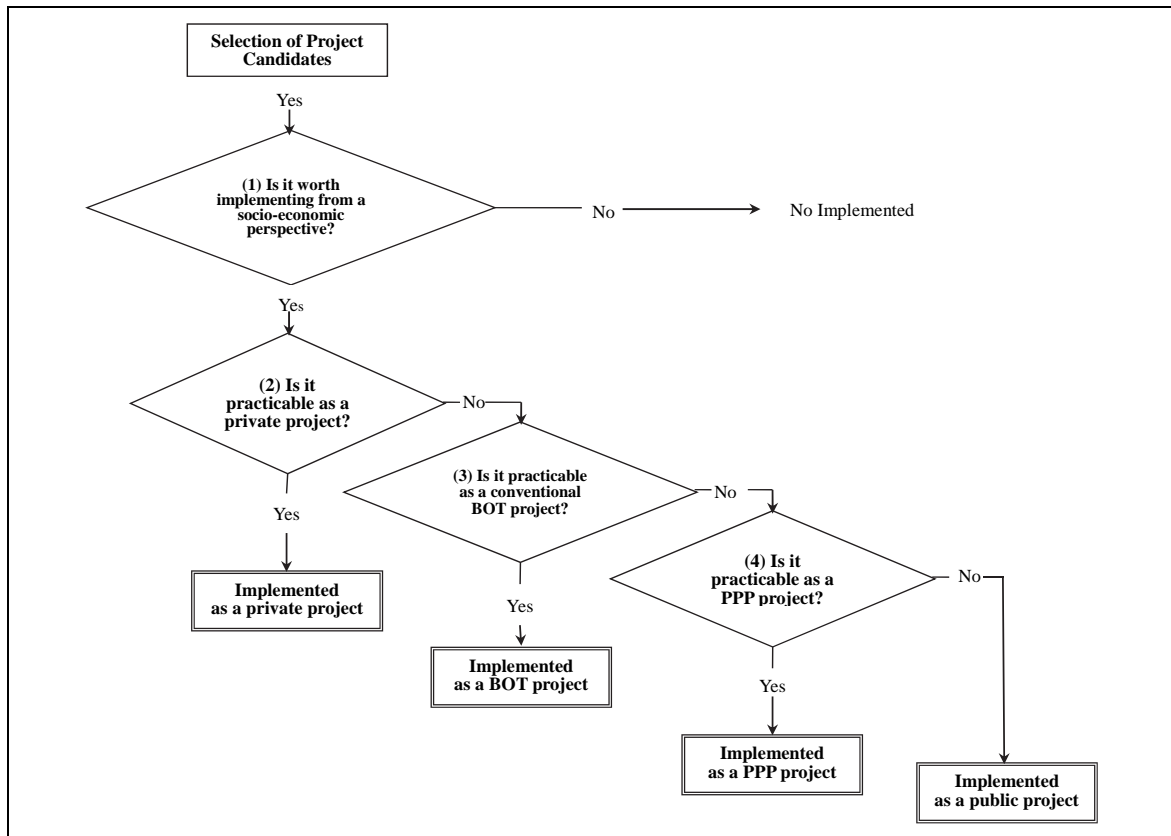
Demand for transportation fluctuates widely with socio-economic changes in the country and the level of services provided by the transportation facility. This makes private sectors extremely cautious toward participation in a BOT project.

Several projects have failed right after they were started, partly because real demand fell short of initial projections.

It is collect to say that concept of BOT scheme could be one part of PPP scheme when share of public sector makes nearly zero.

In this sense, process of selecting most appropriate scheme for road projects is shown below in view of purely private sector to carry out, BOT or PPP scheme to adopt, or public sector to do. This process flow is drawn, based on Guideline for BOT Road Project Development Under Public-Private Partnership compiled by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Japan.





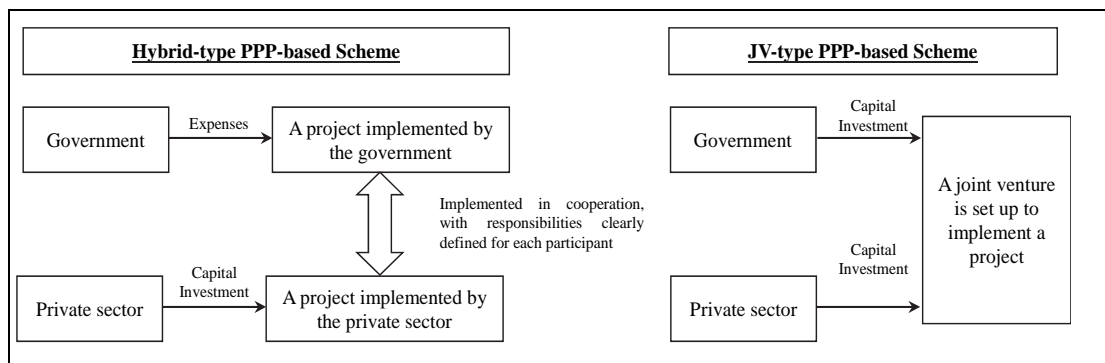
Source JICA survey team based on MLIT Guideline for BOT/PPP

**Figure 5.4-1 Process of Selecting Scheme for Road Project**

For success of BOT or PPP scheme for road project, appropriate toll setting is key factor. Tolls must be set to a level that ensures the profitability of a project, since a BOT project is a financially independent project in which the private enterprise assumes the demand risk. Particularly in developing nations, the toll set by a private enterprise frequently exceeds the level calculated from a socio-economic perspective, leading to the failure of the project.

To avoid this problem, tolls shall be set to the level calculated from socio-economic conditions. If there is a discrepancy between this level and the level required by the private-sector participant, some form of compensation shall be formulated and implemented under public-private partnership. A toll level is appropriate if it is acceptable to the citizens from a socio-economic viewpoint.

There are a few proposals by the Guideline of MLIT Japan to lead success of road project, namely 1) Hybrid type PPP based scheme and 2) JV type PPP based scheme. Those are shown below.



Source MLIT Guideline for BOT/PPP

**Figure 5.4-2 Hybrid Type and JV Type PPP Scheme**

Other scheme to be considered is concession. The following explanation on concession and BOT is taken from the world bank web site.

A concession gives an operator the long term right to use all utility assets conferred on the operator, including responsibility for all operation and investment. Asset ownership remains with the authority. Assets revert to the authority at the end of the concession period, including assets purchased by the operator. In a concession the operator typically obtains its revenues directly from the consumer and so it has a direct relationship with the consumer. A concession covers an entire infrastructure system (so may include the operator taking over existing assets as well as building and operating new assets).

A BOT Project (build operate transfer project) is typically used to develop a discrete asset rather than a whole network and is generally entirely new or greenfield in nature (although refurbishment may be involved). In a BOT Project the project company or operator generally obtains its revenues through a fee charged to the utility/ government rather than tariffs charged to consumers. A number of projects are called concessions, such as toll road projects, which are new build and have a number of similarities to BOTs.

The survey team did check present cases of BOT/PPP kind of scheme implementing in Cambodia and there are three cases as follows.

- (1) National Road 4: concession contract with private company (AZI Co. Ltd.) for maintenance and repair and toll collection since 2001 for 35 years. Toll charge is shown in the table below.

**Table 5.4-1 Toll Charge in National Road 4**

Class	Type Of Tickets	Price (USD)	Price (Riel)
1	Agriculture	\$6.27	25,080
2	Bus	\$2.75	11,000
3	Dump Truck	\$3.93	15,720
4	Family Cars	\$0.69	2,760
5	Family Cars (Riels)	\$0.44	1,760
6	Heavy Vehicle 20ft	\$7.21	28,840
7	Heavy Vehicle 40ft	\$9.41	37,640
8	Light Truck (1T - 2T)	\$1.65	6,600
9	Light Truck (2T - 3T)	\$2.20	8,800
10	Light Truck (3T - 6T)	\$2.75	11,000
11	Mini Bus	\$1.49	5,960
12	Tanker Truck	\$6.27	25,080
13	Taxi	\$0.69	2,760

*Source AZI Co. Ltd.*

- (2) Koh Kong Bridge in National Road 48: BOT contract with private company (LYP Group Ltd.) Toll charge is shown in table below.

**Table 5.4-2 Toll Charge at Koh Kong Bridge**

Class	Type Of Tickets	Price (USD)	Price (Riel)
1	Family car or 4 wheel (Sedan)	\$1.43	5,700
2	2. Pickup	\$1.50	6,000
3	3. 6 wheels vehicle	\$3.18	12,700
4	4. Large bus	\$4.25	17,000
5	5. 10 wheels vehicle	\$4.50	18,000
6	6. >10 wheels	\$8.50	34,000

*Source LYP Group Ltd.*

- (3) Prek Pnov Bridge in Phnom Penh: BOT contract with private company (LYP Group Ltd.) Toll charge is same as the table above.

The survey team has collected the data for BOT / PPP scheme on road development project in Vietnam as well. There are several cases of BOT scheme and actually those are more like concession because most cases are to improve or widen existing road with maintenance in certain period of time with right to collect fee from road users. But pure BOT is only one case, progressing to construction stage, although there are a few more cases just formulated formation only.

Based on the above description, the survey team recommends the followings in regard to BOT or PPP scheme in Cambodia.

- (a) To formulate legal frames for concession, BOT/BOO/BT and PPP scheme
- (b) To enhance to understand concept of all schemes (concession, BOT/BOO/BT, PPP) in officer of public sector as well as possible operator
- (c) To establish whole plan for development in regard to road networks
- (d) With the whole picture of road development, to make judgment on selecting appropriate scheme (following the process suggested in **Figure 5.4-1**) for road development
- (e) Otherwise high viability sections be taken by BOT or PPP operators and remaining be low profitable or sections with deficit

## CHAPTER 6 RECOMMENDATIONS

Following the stipulation in the previous sections, the survey team hereby compiles the recommendations within and slightly beyond the terms of reference of the data collection survey.

- (1) Feasibility study for four priority projects described in table below shall be carried out in due course, in order to have 2 lanes x 2 directions roads through the north west of Cambodia to the south east of Cambodia along the Southern Economic Corridor.

These four priority projects shall be implemented and complete before 2020.

**Table 6-1 Priority Road Development Project**

no	Road	Location	Length	Current conditions	Development
(a)	NR 1	Neak Loeung to Bavet	107 km	1 lane x 2 directions	2 lanes x 2 directions
(b)	NR 1	2nd Neak Loeung Bridge	5.5 km	1st bridge to complete in 2015	(3 lanes or 2lanes +bike) x 2 directions or more
(c)	NR 1	New PP Port to Neak Loeung	30 km	(1 lane + bike) x 2 directions	2 lanes x 2 directions
	RR 3	New PP Port to NR 2	30 km	-	2 lanes x 2 directions
(d)	NR 5	Sri Sophorn to Poipet	47 km	(1 lane + bike) x 2 directions	2 lanes x 2 directions

*Source: JCA survey team*

- (2) Feasibility study and construction for Phnom Penh Ring Road No. 3 from NR 2 through NR 3 and 4 to NR 5 shall be carried out in the simultaneous timing with the above.
- (3) Nation-wide road network development master plan in Cambodia shall be formulated by updating the master plan in 2006 and 2009, because those are out of date already.
- (4) Study for expressway master plan in Cambodia shall be commenced, so that expressway may be open for public use in 2020s.
- (5) Legal frame for BOT / PPP scheme shall be formulated as soon as possible. Then, together with the new master plan for road network development and expressway master plan, BOT / PPP based projects may be effectively formed, commenced and implemented with success.
- (6) Budget for transport infrastructure development shall be increased (see Section 2.1.7) and budget source shall be secured.
- (7) For industrial park, power supply and water / sewer treatment facilities shall be improved to promote hi-tech factories and more system oriented factories. Electric supply is key for industrial part and back-up system shall be facilitated in case power supply is off.
- (8) Progress of cross border transport agreement (CBTA) has been too slow in order to achieve ASEAN community in 2015. Custom process in particular shall be internationalized by promoting more transparent system and introducing more transport passes through borders.
- (9) National specification and design standard for roads, bridges and other structures / facilities shall be formulated and relevant authorities including MPWT shall request to various donors to apply those to loan projects. When this process (national specification and design standard, and application to all projects) is introduced, maintenance of roads and bridges will be tremendously effective and standardized.
- (10) The conditions of contract for loan projects shall also be formulated and standardized.
- (11) Road inventory data shall be updated regularly to plan for short term development, to select the priority rehabilitation project under national budget, and to maintain the national asset, by

referring and utilizing the Straight Line Diagram delivered under the data collection survey.

- (12) The strengthening of private contractors shall be worked on as an urgent issue. MPWT shall organize the program for training course. The method of contract out is one of good example for this. However, MPWT capacity of structure and function takes time to grow to sustain and manage the construction supervision. MPWT shall develop the common guideline and regulation for medium and large size of road and bridge project under donor project and national budget.