

## (1) Problems on Road Network in Siem Reap City

### 1) Existing Problems

#### (a) Traffic Congestion on NR6

International donors, such as WB, ADB, and the Government of Japan (GOJ) have funded to NR6 rehabilitation projects. All through NR6 from Phnom Penh to Siem Reap had already rehabilitated.

A row of big hotels and restaurants stand along or nearby NR6. In addition, the biggest market in Siem Reap city, Phsar Leu Market, is also located along NR6. One of the major factors which cause such a lopsided development is the lack of arterial roads other than NR6 which run through Siem Reap city to the east-west direction.

The current alignment, width and road surface condition of other streets that run east-west direction are not applicable to the arterial road usage.

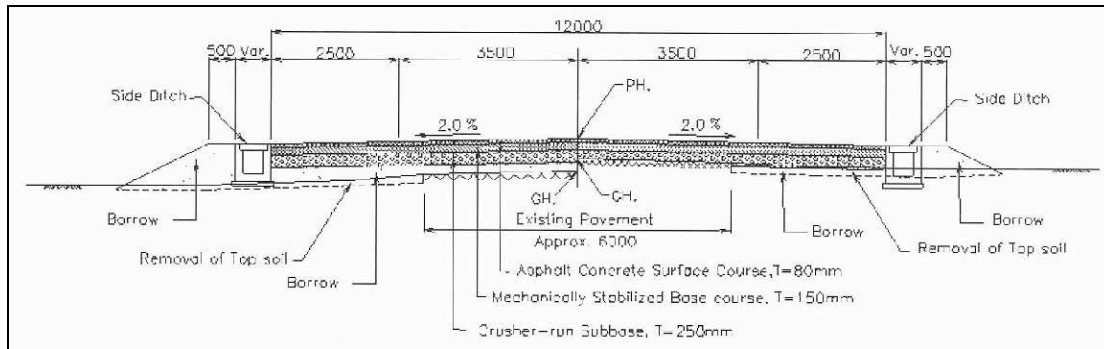
As a result, the mix traffic of tourists and residents is concentrated to the NR6 especially in the evening peak hour. However, the capacity of the NR6 is not enough to satisfy the evening peak traffic especially in the central city section. There are two major bottleneck points in this section, those are,

- ✓ French Bridge (crossing Siem Reap River), and
- ✓ The intersection with Sivatha St

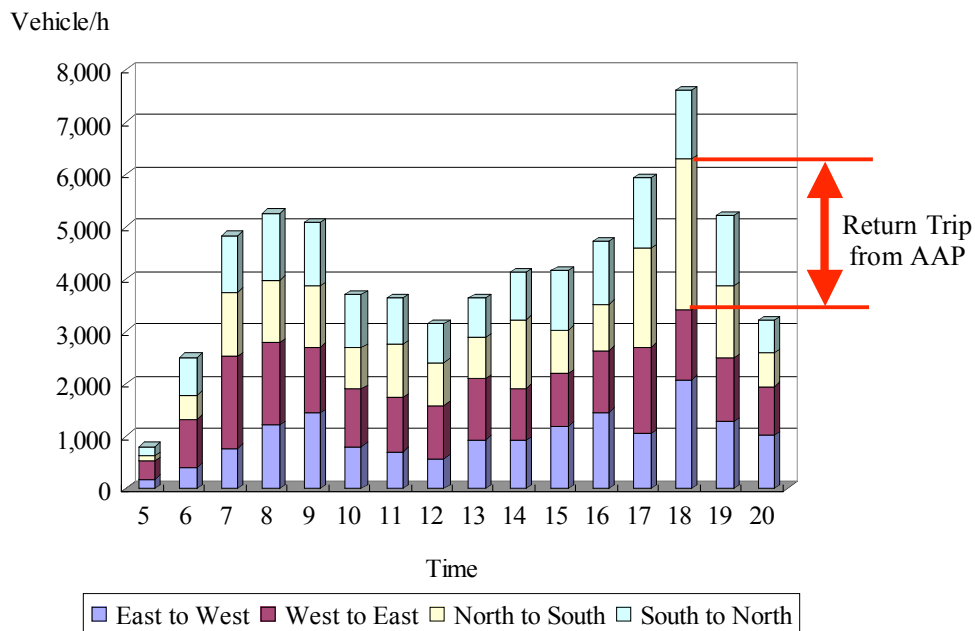
The bottleneck on French Bridge is due to the shortage of traffic capacity. Despite the NR6 in Siem Reap are designed to 7.0m for carriageway with 2.5m shoulder on each side (See Figure III.6.9), the bridge has only 5.0m for carriageway. Therefore, vehicles slow down or even wait at the end of bridge if medium or large vehicle reaches to this bridge. In addition, the bridge is controlled as one-way traffic to the east-west direction in the peak hours. Traffic to the west-east direction is detoured to the south when the bridge is controlled as one-way.



In the meantime, the traffic congestion at the intersection with Sivatha St. is caused by the over traffic concentration of tourists coming back from AAP after the sunset. The Figure III.6.10 shows the distribution of traffic volume at the intersection of the NR6 and Sivatha St. About the 11% of 16 hours traffic is concentrated at the evening peak hour, and the 38% of evening peak hour traffic is from north (AAP direction).



**Figure III.6.9 Typical Cross Section of the NR 6 in Siem Reap**



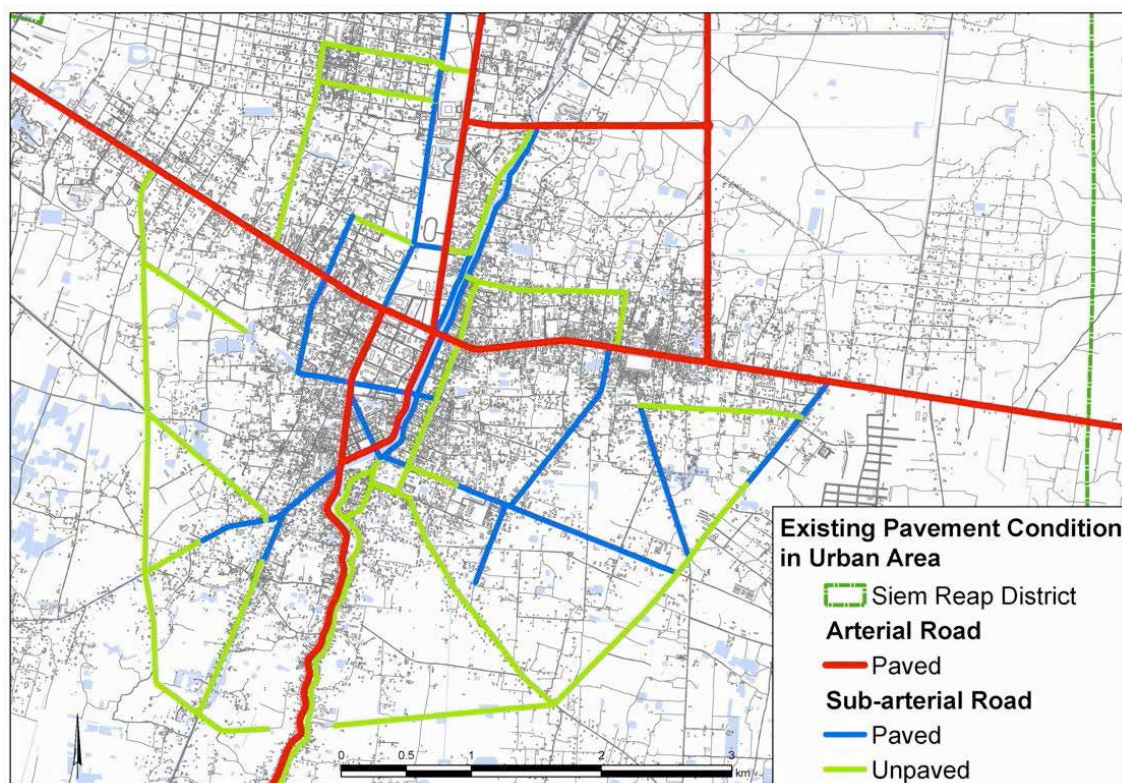
**Figure III.6.10 Time Distribution of Traffic Volume at the Intersection of NR6 and Sivatha Avenue (December 12, 2004)**

**(b) Unpaved Sub-Arterial Roads in Urbanizing Area**

In the urbanizing area, there are many unpaved sub-arterial roads. Figure III.6.11 shows the paving condition of existing major roads in the urbanizing area. Though sub-arterial roads in central urban area are mostly paved, those in peri-urban and urbanizing area especially in north area are still laterite, earth or heavily damaged macadam. Laterite and earth roads are muddy and slippery in rain season, and dusty in dry season. Therefore, pedestrians, cyclists and motorcyclists have to pay full precaution against turnover in rain season. In the meantime motorcyclists use mask for preventing road dusts in the dry season. Equally, pedestrians and cyclists bury their mouth and nose when vehicles pass beside them. In addition, heavily damaged macadam roads are difficult to pass all through the year because of bare crush stones.

**(c) Disordered Small Path Network in Residential Area**

Road network in residential area is poor and disordered. Most roads in residential area are laterite or earth, and width of these roads is getting narrower than the original because of the roadside fence built within the right of way. Moreover, some roads are



**Figure III.6.11 Existing Pavement Condition in Urbanizing Area**

closed and impassable by new house construction. Therefore, many houses are in the hard condition for emergency vehicle to reach in smooth.

## 2) Future Problems

### (a) Increasing Through Traffic of Siem Reap

Rehabilitation project for Siem Reap and Poipet section has started with the fund of ADB. The access between Thailand and eastern Cambodia via NR6 will become much smooth after the completion of this project. The existing traffic on NR6 in Siem Reap is mostly from/to or within Siem Reap. However, after the completion of NR6 rehabilitation projects, trucks and vehicles which run between Phnom Penh and Poipet are considered to divert from NR5. In addition, the traffic volume on NR6 itself as the bypass route of Asian Highway A1 will increase in the future.

### (b) Lack of Frame Road Network in Future Urbanization Area

In Siem Reap, urbanization area is expanding year by year. However, there is not frame road network in suburban area now. People will occupy the land and build their house and construct private roads as the same way with the existing residential area if government doesn't reserve the land for road.

### (c) Constant Traffic Congestion in Urbanizing Area

Considering to the traffic demand forecast and above issues, the traffic situation in urbanizing area will become much serious in the future if there are any appropriate measures are not implemented in coming years.

## (2) Problems on Road Network in AAP and Rural Area

### 1) Existing Problems

#### (a) Mixed Traffic of Automobiles and Bicycles in AAP

Thousands of tourists visit Angkor Heritages every day by various traffic modes just like tour bus, passenger car, Tuk-Tuk, motorcycle and bicycle. In addition, roads in the AAP are shared with local traffic including large trucks. However, the road capacity in this area is limited. The width of carriageway is not enough for large vehicles to meet another, therefore, the road shoulder are seriously damaged in some sections. In addition, it is dangerous for cyclists to share such roads with heavy vehicles.

Angkor Thom has three gates on north, east and south with the width of less than 3.0m. Therefore, there are waiting queue on the both side of gate especially in the evening. Besides that, tour buses sometimes hit the gate because of the shortage of width.



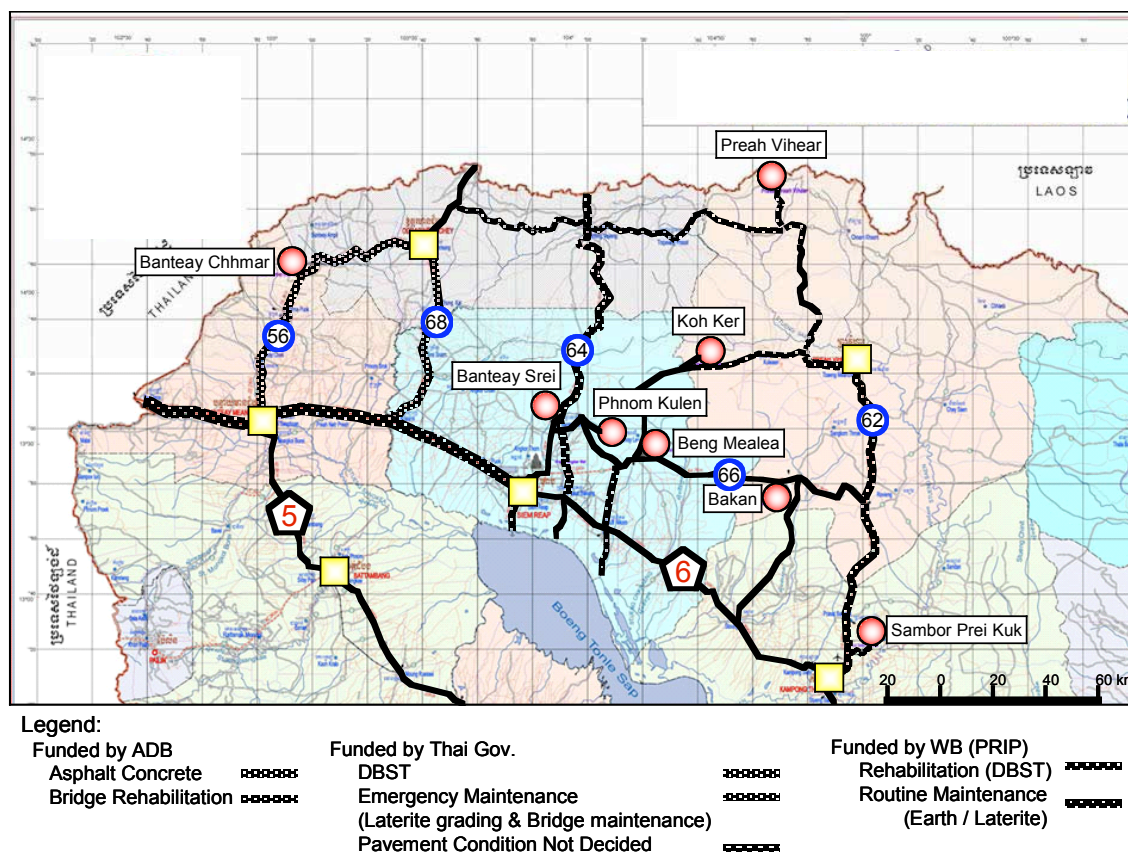
#### (b) Shortage of Parking Space in AAP

Though all tourists visit AAP by vehicles or bicycles, appropriate parking space is not prepared for each heritage so that drivers park their vehicles at vacant space nearby heritages. In the evening, there are long queue of vehicles at the famous sunset place such as Phnom Bakheng and Angkor Wat.



#### (c) Accessibility to Remote Heritage

In recent years, the rural heritages are developed as the security condition in the rural area is getting better. However, the road condition to these rural heritages is worse than that in the Angkor area especially in the rain season (See Figure III.6.2). Besides that, management of some rural heritages and its access roads has been outsourced under the BOT contract. Therefore, tourists have to pay extra charges to visit these heritages. There are some arterial road rehabilitation projects on going or under planning in the northwest region as shown in Figure III.6.12.



Source: JICA Study Team

**Figure III.6.12 Road Rehabilitation/Maintenance Projects in the Northwest Region**

## 2) Future Problems

### (a) Traffic Congestion in AAP

The tourist's population recorded 858,245 in 2005. In this study, annual tourist's population is forecasted to reach one point five (1.5) million in 2008, two (2) million in 2011 and two point eight (2.8) million in 2020 by policy intervention scenario. The traffic volume in AAP will generally increase with the trend of tourist's population i.e. traffic volume in AAP will reach 3.2 times as large as that in 2004. The existing road capacity and parking space in AAP are not enough as mentioned above. As the result, there will be traffic congestion in AAP if any measures of road improvement or traffic control are not executed.

### (b) Negative Impacts to the Angkor Heritages from Heavy Traffic

APSARA Authority warns that the vibration from over loaded large vehicle traffic in AAP may affect the negative impact to the heritages. Besides that, exhaust gas from vehicles that don't have any technical inspection may affect another negative impact to the heritages.

### **(3) Problems on Road Amenity and Safety**

#### **1) Existing Problems**

##### **(a) Insufficient Pedestrian Space in Urban Area**

Attractive sidewalk is one of the most important factors to make tourists ramble among the downtown area. There exist sidewalks in downtown area and some part of major roads. However, there are many obstacles on the sidewalks, for example, parking vehicles including motorbike, street booths, construction materials and so on. Therefore, pedestrians cannot walk smoothly and sometimes forced to walk on carriageway.

##### **(b) Shortage of Road Facility in Urban Area**

Insufficient road drainage system is one of the major problems. Roads without sufficient drainage system are easily flooded by daily squall. And after the squall, the remained rainwater and rubbishes on the roadside causes the stench.

Lack of road lighting makes tourists giving up to ramble among the downtown area in night time. Pokambor Ave. (the river side road) has a potential to be a relaxation place both for tourists and residents. However, existing road lighting is too dark to walk and have a rest.

##### **(c) Disregard of Traffic Rule and Driving Manner**

In Cambodia, there is any concrete scheme to educate the traffic rule and driving manner to drivers. People, even school children, drive motorcycles without any driving license. As the result, there are many reckless drivers, for example, running in the contrary direction.

#### **2) Future Problems**

##### **(a) Degradation of Attractiveness of Urban Area to Tourists**

Discomfort road condition for pedestrians will make tourists hesitate to visit downtown area.

##### **(b) High Risks for Traffic Accident**

Increasing vehicles and worse driving manner will bring high risks for traffic accident.

### **(4) Problems on Road Management**

#### **1) Existing Problems**

##### **(a) Shortage of Budget and Resources**

DPWT and PDRD are not able to carry out activity sufficiently due to the insufficient budget allocation and human resources.

##### **(b) Transparency on Procurement**

Comparing between force account method and contract-out method in road maintenance work, former transparency on expenditure is inferior to the latter. As for the quality assurance, it is pointed out that the monitoring work carried out to the force account achievement, official of MPWT has a tendency to hesitate fulfill their obligation while monitoring because they belong to the same Ministry.

## 2) Future Problems

### (a) Deterioration of Rehabilitated Arterial Road

Many of the rehabilitated roads in Siem Reap province are paved by DBST. The advantage in applying DBST is the cheaper initial cost than that of asphalt concrete. However this method requires the frequent maintenance and the service life is generally five years. Therefore, when the road is improved by DBST, it must be improved to asphalt concrete surface as soon as possible otherwise the maintenance/rehabilitation cost increases due to the acceleration of road deterioration.

### 6.1.4 Issues on Road Sector

Considering to the situation and problems mentioned hereinbefore, following road sector issues should have the priority for the sustainable development of Siem Reap and Angkor Town.

#### (1) Development of Road Network

At present, traffic congestion in the study area is limited. However, existing road network in the existing urban area and future urbanization area are not insufficient for future traffic demand. Developing the road network prior to urbanization is essential in efficient urbanization.

In the meantime, regional road network is quite poor. Some important heritages located in the remote area are still in the hard condition to be reached for tourists. It is effective to focus on the access to these remote heritages in the diversification of heritage tourism.

#### (2) Road Condition for Pedestrians in Urban Area

In the development of urban area, attractiveness of road condition especially for pedestrians is one of the most important factors. Existing sidewalks drainage and lighting facilities are not attractive enough for tourists to make them walk among or from/to downtown area. It is essential to improve these conditions to attract tourists, especially women, children and persons of advanced age, to the downtown area.

#### (3) Traffic Control in the AAP

Tourist's population in 2020 is projected to increase up to two point eight (2.8) times as large as that in 2004. Naturally, the main purpose of those tourists is to visit Angkor Heritages. Therefore, it is mandatory to manage the smooth transportation in the AAP for the increasing tourists. There are two kind of way to avoid the traffic congestion in the AAP;

- Expanding the road capacity sufficient for future traffic demand, and
- Restriction of private car entry and providing the efficient public transportation.

The former one causes the increase in traffic volume and it may affect the negative impact to the heritages. In addition, the gate of Angkor Thom cannot accept any more traffic because of its limited width. Therefore, latter one must be considered for sustainable heritage tourism.

**(4) Efficient Road Maintenance**

Road maintenance is the most important work in sustainable road development, though the budget and resources for it are strictly limited. Therefore, road maintenance work must be implemented as efficiently as possible including maintenance planning, road monitoring, contract management and supervising works.

**(5) Enforcement and Public Awareness of Legislations on Road Traffic**

Some legislations on road traffic, i.e. Road Law, Law on Road Traffic and Sub-decree on the Issue on the Vehicle Number Plate, has been enacted or under preparation/revision. However, these legislations are not enforced efficiently or unknown among people. It is effective to focus on this issue in improving road safety and increasing vehicle related tax revenue.



### 6.1.5 Civil Aviation Sector

#### (1) Current Condition

##### 1) Government Bodies and Institutional Framework

###### (a) State Secretariat of Civil Aviation (SSCA)

The State Secretariat of Civil Aviation (SSCA) was established in 1996 under the Office of Council of Ministers. Formerly, all airport operations belonged to SSCA. Phnom Penh and Siem Reap airports have been conceded to SCA (see later). The SSCA is currently responsible with civil aviation policy and regulatory issues and operation of several local airports.

The SSCA is a pioneer of privatization and deregulation. It has 19 bilateral Air Service Agreements and Memorandums of Understandings (MOU) and six International Civil Aviation Organization (ICAO) conventions. Thus, the authority basically has an "Open Sky Policy" and many air carriers are operating international route to Cambodia. "Open Sky Policy" is widely accepted by Cambodian and foreigners under the situation that there is no national flag carriers. Because Cambodia accepts foreign tourists more than Cambodian international tourists, it is reasonable to open its air to foreign carriers from tourists' origin. Establishment of a new international route is relatively easy with one exception. The exception is the route between Bangkok and Siem Reap by Thai Airways International (TG). The route has been banned for almost ten years.

SSCA is currently preparing a study on another international airport at Soutr Nikom and Chi Kraeng districts in Siem Reap Province. It is not certain that the feasibility of the airport is sufficient. Regardless of the feasibility, the new airport can not be opened until the year of 2020 due to the existing concession contract on the current airport. This Master Plan study does not include the new airport capacity because the opening time of new airport is beyond the time frame of this study.

###### (b) Société Concessionnaire de l'Aéroport (SCA)

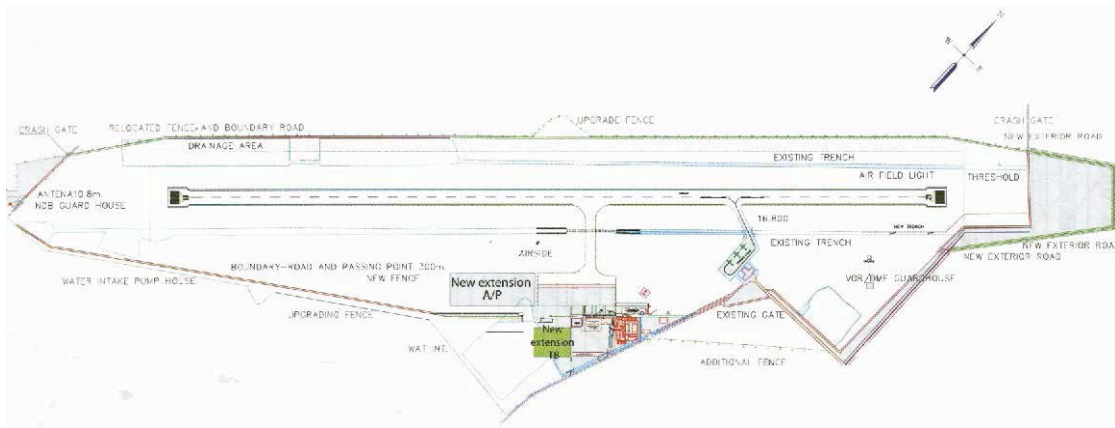
*Société Concessionnaire de l'Aéroport* (SCA) is a joint venture between a Malaysian company and Paris Airport Authority. Following the Phnom Penh International Airport, SSCA conceded the operation of Siem Reap International Airport to SCA in 2000. This concession is based on BOT (Build, Operate and Transfer) basis and lasts 20 years to end in 2020. The key components of the concession are expressed as follows.

- Exclusive right of international airport operation in the Siem Reap area.
- Guaranteed internal rate of return of 13.5%.

CAMS (Cambodian Airport Management System), a subsidiary of SCA, is working as an operation company for the airport.

##### 2) Airport Facilities

A basic specification for the Siem Reap International Airport is shown in Figure III.6.13 and below.



Source: SSCA.

**Figure III.6.13 Facility Layout of Siem Reap Airport**

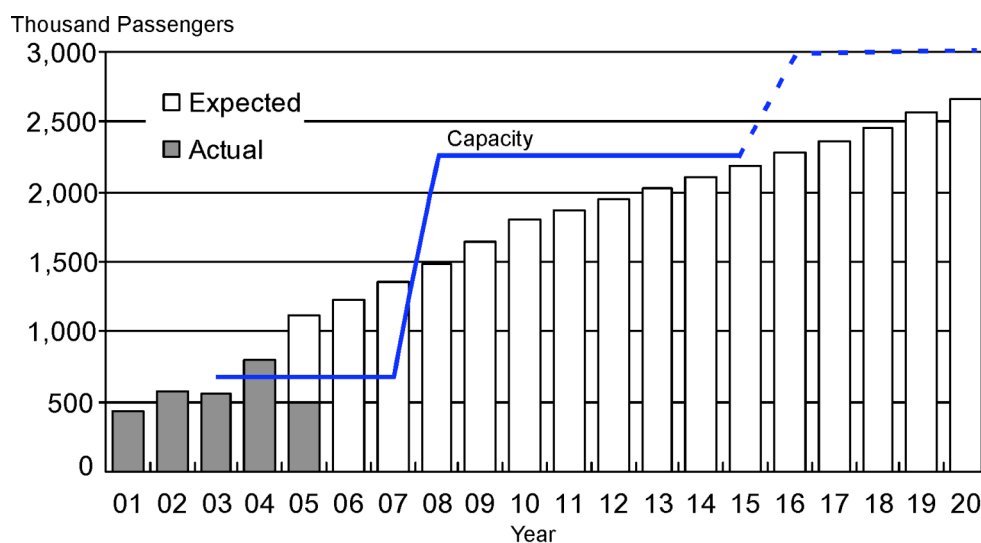
### Airfield

- Runway length: 2,550 m.
- Runway width: 45 m., with shoulders 2.5 m. wide each.
- Orientation: 05 / 23.
- Pavement structure: concrete base.
- Perpendicular taxiways: 1.
- Peak hour capacity: 12 movements (runway).
- Apron capacity:
  - Total area: 160x95 + 98x108.
  - Parking stands: 6 (3 A320s, 1 B757 and 2 ATR72s).
- Navigation aids and visual aids:
  - VOR/DME
  - NDB
  - PAPI
  - Runway and taxiway lighting
  - Approach lighting
  - Apron floodlighting

Currently, the Airport can accommodate aircrafts up to A320 or B737. They are equivalent to category 4C by ICAO standard. Under special authorization, a B757 can call the airport.

### **3) Passenger Traffic**

Almost all passengers to Siem Reap International Airport can be classified to tourists. The numbers of passengers has been growing for ten years as shown in Figure III.6.8.



Source: Actual numbers and capacity: SCA.  
Expected passengers: JICA Study Team.

**Figure III.6.14 Growth of Passengers at Siem Reap Airport**

#### 4) Development Plan

In order to meet the increasing passenger demand, SCA is improving its airport facilities. Most critical factor at this moment is passenger-handling capacities, which is 350 departure passengers per peak hour and 300 arrival passengers per peak hour. Currently, SCA is constructing a new international terminal (Figure III.6.15).



Source: SCA.

**Figure III.6.15 Land Side Layout Plan with New International Terminal under Construction**

In addition, the airport has a plan to construct a taxiway. In the future, the airport will also extend the runway to the south if necessary. Thus, all of growing passengers up to 2020 under the Master Plan scenario can be handled within the current concession scheme. Thus, this study honors the airport development plan by SCA and set the plan as given in this report.