

Section 3. Infrastructure Development

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Introduction

Infrastructure development involves a wide range of sectors including the living environment, transport and communications, disaster prevention and national land conservation, agriculture, forestry and fisheries, and energy production and supply. Discussing infrastructure per se is not always useful in some sectors such as agriculture, forestry and fisheries. Rather, discussing it as part of the overall policy for the sector in question is more appropriate at times.

Based on this recognition, this paper deals mainly with transport and communications infrastructure, or more specifically, roads, railways, ports, airports, telecommunications, and electric power supply. The paper also touches on infrastructure for disaster prevention and national land conservation, covering afforestation, flood control and shore protection, as well as parks and public housing. These types of infrastructure are discussed here only in general terms since the Cambodian government has not articulated its stance toward them, even though they constitute important components of the overall infrastructure.

Another important category of infrastructure, water supply and sewerage systems, is discussed in section 9. Environment in Part Two, Chapter 2, which considers the state of affairs in Cambodia.

Infrastructure is generally developed and managed by the public sector. In recent years, however, the number of cases in which the private sector develops and manages infrastructure has been increasing. Because such initiatives by the private sector are considered important for Cambodia, this report covers infrastructure development projects conducted on a BOT basis or under similar schemes.

1. The state of Cambodia's infrastructure

1-1 History of infrastructure development in Cambodia

The history of infrastructure in what is now Cambodia dates back to the Angkor era. The Angkor Empire

boasted a nationwide road network known as the Roads of the King.

Modern infrastructure development began under French rule. The port of Phnom Penh was built, and Phnom Penh and Saigon (now Ho Chi Minh City) were linked by a liner service. In the 1920s, construction work began for a railway linking Phnom Penh and the Thailand-Cambodia border via Battambang. A waterway linking the port of Phnom Penh and the central railroad station was constructed though it has already been reclaimed. The basic structure of Phnom Penh city was formed during this era.

Infrastructure development continued after independence, and by the time civil war erupted in 1970, Cambodia's infrastructure had already developed to virtually the same level that it is today. In the transport sector, the current trunk road network was already in place. A road that directly connected Phnom Penh with Kompong Som (now Sihanoukville) was already completed with the assistance of the United State. During the 1960s, a rail line called the "new line" that linked the two cities was opened. The port of Kompong Som port (now the port of Sihanoukville), a large-scale seaport, was constructed and started its operation. Pochentong Airport was constructed in the outskirts of the capital, and Phnom Penh was linked with Paris and Tokyo by Air France.

In the telecommunications sector, local telephone line networks were in place not in only Phnom Penh but also other major cities, and these local networks were linked to one another via long-distance telephone lines, which were open-wire lines.

In Phnom Penh, the sewerage system and pumping stations were in place and power lines were laid underground.

During the 1960s, there were plans to construct large-scale dams in Stung Treng along the Mekong River and its main tributaries for the purpose of irrigation and flood control. However, these plans were abandoned due to the civil war, except for the Prek Thnot Dam.

Despite limitations, before the civil war that broke out in 1970 Cambodia's infrastructure was comparable to that of neighboring countries, although it tended to be

Table 3-1 Expenditures on Infrastructure Development in the National Budget

(Unit: billion riels/percent)

	1994	1995	1996	1997	1998	1999	2000 (estimates)
Total expenditures	1002.0	1294.5	1464.1	1273.7	1569.1	1834.2	2301.0
Of which, total capital spending on infrastructure development	339.6	557.7	674.3	457.7	635.2	738.3	1036.0
Percentage of the GDP	5.5%	7.8%	8.2%	5.0%	6.0%	6.4%	8.3%
Foreign funds	256.8	454.2	567.0	341.6	509.5	504.2	700.0

Source: Compiled by the author based on the data from the Cambodian government

concentrated on the capital.

1-2 The state of Cambodia's infrastructure

The infrastructure developed during the 1960s was ravaged during the civil war. The human resources required for the development and management of this infrastructure were also mostly lost during the Pol Pot era. These effects of the civil war are still weighing heavily on Cambodia.

Another negative effect of the civil war is that Cambodia was left behind in terms of technological innovation. While Cambodia was at civil war, the world was experiencing technological innovation in transport and communications fields. By actively adopting such technological innovations, some Asian countries achieved remarkable levels of economic development. However, Cambodia was completely out of this process.

After peace was achieved, however, Cambodia launched an initiative to rehabilitate and reconstruct the country, as described below.

Table 3-1 shows the expenditure on infrastructure development in the national budget between 1994 and 2000. The percentage of spending on infrastructure development in relation to both total expenditures and to the GDP are high, and much of the funding for such expenditures comes from abroad.

The state of Cambodia's infrastructure can be summarized as follows:

- (i) In the transport sector, emergency repair works have almost been completed for arterial and major urban highways, and railroads. The minimum levels of international transport and domestic main transport have been established to meet immediate needs.
- (ii) The Cambodian government recognizes the need for disaster prevention and national land conservation, especially flood control, though it has taken

no measures for this purpose.

- (iii) In the telecommunications sector, the regular telephone line networks have been restored and satellite communications and cellular phones have been introduced in Phnom Penh, meeting the immediate needs of the country.
- (iv) The immediate need for electric power supply in Phnom Penh has been met.

The following sections describe the state of infrastructure development in each sector.

1-2-1 Roads

The state of development of major roads is shown in Table 3-2. It should be noted that most roads other than those listed in the table are unpaved, except in urban areas. For some of these roads transportation is impracticable, especially during the rainy season.

In Cambodia, there are 8,000 large vehicles including trucks and buses, 33,000 small vehicles, including autos and pickup trucks, and 152,000 motorcycles. The number of automobiles has remained at more or less the same level as that prior to the civil war, but the number of motorcycles has increased almost tenfold. Automobile inspection systems are virtually non-existent. Motorcycles with an engine displacement of less than 100 cc do not require a license to drive them.

Transportation services by bus and truck were once run by the state, but these services are now run by the private sector in cities and along some of the trunk roads.

Roads, automobiles, and road transport are under the jurisdiction of the Ministry of Public Works and Transport (MPWT).

1-2-2 Railways

The Royal Railways of Cambodia, or Chemins de Fer

Table 3-2 The State of Road Development

(As of December 2000)

National highway	The origin and destination of the highway and the transit points	Length	Summary
1.	Phnom Penh to the Vietnam - Cambodia border (via ferry crossing on the Mekong)	168 km	- Key international route linking Cambodia with Vietnam - Paved, with one or two lanes - The section between Phnom Penh and the Mekong ferry crossing was restored with ADB assistance. However, after the 2000 flood, this section was intentionally cut off to prevent flooding in Phnom Penh. Later, the cut-off section was connected with a temporary bridge, which has not yet been replaced with a new bridge. - Ferryboats, including new ones, have been donated by Denmark - The section of the Mekong ferry crossing and the Vietnam-Cambodia border, which is being improved to meet international standards with ADB assistance, has suffered from flooding.
2.	Phnom Penh to the Vietnam-Cambodia border (via Takeo)	126 km	- Partly paved, with one or two lanes - The section between Phnom Penh and Takeo has partly been restored with ADB assistance.
3.	Phnom Penh to National Highway 4 (via Kampot)	202 km	- Partly paved, with one lane - Partly restored with the assistance of ADB and the World Bank - Major bridges on the route have not been repaired or replaced.
4.	Phnom Penh to Sihanoukville	230 km	- Key distribution route linking the capital with the seaport - Paved, with two lanes; both the alignment and pavement are in good condition - The highway has been restored with the assistance of the US.
5.	Phnom Penh to the Thailand-Cambodia border (via Battambang and Sisophon)	407 km	- Key international distribution route linking Cambodia and Thailand - Paved, with one or two lanes - The highway has been generally restored with the assistance of ADB, Australia, etc. Yet, some sections have not been restored, including bridges. - The section between Sisophon and Thailand-Cambodia border has undergone emergency repair works with the assistance of Thailand. There is a plan to improve the section on a BOT basis.
6.	Phnom Penh to National Highway 5 (via Sukuun, Siem Reap)	396 km	- Key route connecting the capital and Angkor Wat - Paved, with one or two lanes - The section between Phnom Penh and Sukuun has been improved with Japan's assistance, except sections damaged by floods, which will be restored under a disaster relief program. - The section between Sukuun and Siem Reap is undergoing restoration work with the assistance of ADB and the World Bank. - The section in and near Siem Reap is undergoing improvement work with Japan's assistance. - There is a plan to improve the section between Siem Reap and National Highway 5 on a BOT basis.
7.	National Highway 6 to Laos-Cambodia border (via Kompong Cham, Kratie, Stung Treng)	460 km	- The section between National Highway 6 (Sukuun) and Kompong Cham has already been improved with Japan's assistance. This paved section has two lanes and is in good condition. - The bridge over the Mekong River near Kompong Cham is under construction with Japan's assistance. - The section beyond Kompong Cham is in an extremely bad condition.

Note: Regarding the national highways described as "paved" above, pavement on sections that have not yet been restored is only partly remaining.

Source: Data from Kaneko (1998)

Royaux du Cambodge (CFRC) in French, operates two lines with a total length of 650 kilometers. This is a one-meter gauge line, which is slightly narrower than the one used by the Japan Railways, except for the Shinkansen lines. This so-called meter gauge is common in Southeast Asia. The northern line, constructed between 1929 and 1943, connects Phnom Penh with Poipet on the Thailand-Cambodian border via Battambang. The 48 km section between the Thailand-

Cambodian border and Sisophon has been totally destroyed due to the civil war. The southern line, constructed between 1965 and 1969, links Phnom Penh and Sihanoukville.

Cambodia has conducted a minimum level of emergency repair work for these lines that were ruined by the civil war. However, since the rails remain in a poor state of repair, the maximum operating speed is 20 to 30 kilometers per hour. As signals and communications

systems are inadequate, the service consists of only one train a day on each line. Moreover, the number of railcars has been significantly reduced. The traffic volume is therefore much lower than pre-war levels, and the CFRC has long been in deficit.

The CFRC is a state-owned enterprise under the supervision of the Ministry of Public Works and Transport (MPWT). However, the CFRC is not an autonomous body.

1-2-3 Ports and inland waterways

Cambodia has two large international ports at Phnom Penh and Sihanoukville, two coastal ports at Kampot and Koh Kong, and four river ports at Kompong Cham, Kratie, Prey Veng, as well as Kompong Chhnang in the Tonle Sap. Cambodia has also navigable inland waterways with a total length of 1,800 kilometers. These waterways are used for passenger and freight traffic.

The port of Phnom Penh is a river port at the entry to the capital, 320 kilometers upstream from the mouth of the Mekong River. Its main facilities are a 300-meter pier restored with the assistance of Japan and two pontoons constructed with the assistance of the World Bank. According to 1997 figures, the port handles nearly 700,000 tons of freight. Major import items are oil, oil products and cement. Major export items are lumber and rubber. As the port of Phnom Penh is a river port, the water depth varies from season to season. The difference in water depth between the dry season and the wet season is almost ten meters. During the dry season, freight ships of up to 2,000 tons can enter the port from the mouth of the Mekong River. During the rainy season freight ships of up to 5,000 tons can do so. Maintenance dredging is carried out at the end of the rainy season.

The port of Sihanoukville is located on the Gulf of Siam, 200 kilometers from the capital. Its main facilities are a 250-meter pier with a water depth of ten to eleven meters and a 350-meter quay with a water depth of ten meters, or seven to eight meters as the effective water depth. According to 1997 figures, the port handled about 800,000 tons of freight. Half of the freight is container cargo, which amounts to about 60,000 TEUs. Behind the quay, it has a container yard and other facilities which are constructed with ADB assistance. However, the port is not equipped with container cranes. Instead, ship cranes are used for container

handling. The port is linked with Singapore and Thailand by regular shipping service. The pier is so run-down that it is of limited use. To cope with the increasing number of containers, the Cambodian government is now constructing a new container terminal with the assistance of Japan.

Ports other than the two above are equipped only with small pontoons and simple piers at most. Riverbanks are used for loading and unloading at many of these ports. The port of Koh Kong is used for border trade with Thailand as well as for domestic trade.

The depth of the Mekong River is about two meters as far as Kompong Cham during the dry season, and nearly two meters as far as Kratie upstream during the rainy season. Passenger and cargo boats can go upstream as long as the water depth is two meters or more. Along the river there are businesses producing lumber and rubber. They use cargo boats to bring out these products and bring in fuel and equipment. In addition, there are many ferry services provided for crossing the Mekong River.

The Tonle Sap River and Lake Tonle Sap are used mainly for passenger traffic. A high-speed passenger ship service is provided between Phnom Penh and Siem Reap.

In this way, inland water transport plays a crucial role in Cambodia, where land transport networks are underdeveloped. Yet there are no significant facilities for inland waterways, and maintenance work on waterways has been neglected.

The port of Phnom Penh and the port of Sihanoukville are administered by separate port authorities, which are state-owned enterprises under the supervision of the Minister of Public Works and Transport (MPWT). Each authority directly offers cargo handling services and its business performance is generally good. The Ministry of Public Works and Transport (MPWT) has no department directly dealing with port affairs.

1-2-4 Airports

Cambodia has ten airports, including Pochentong Airport and Siem Reap Airport, the gateway to Angkor Wat, which serve international flights.

Pochentong International Airport has a 3,000-meter runway and is linked with many parts of Asia by direct services. The number of takeoffs and landings is about 17,500 per year. However, the limitation on its facilities

ties makes it impossible for large aircraft to land. Thus, work to improve airport facilities is being carried out on a BOT basis through a joint enterprise between French and Malaysian corporations.

Siem Reap Airport has a 2,500-meter runway, and is used by domestic flights. Airline services connect Siem Reap with Bangkok, adding to domestic services. Airport facilities, including lights, have been improved with the assistance of ADB.

Other airports have attracted less development. Battambang Airport and Sihanoukville Airport have surface-dressed runways, with not in good condition, but the others have only dirt airstrips.

Air traffic control on routes over Cambodia is conducted from Bangkok. Only Pochentong Airport and Siem Reap Airport are controlled individually.

Airport construction was once under the jurisdiction of the civil aviation authority of the Prime Minister's office, but now it is under the jurisdiction of the Ministry of Public Works and Transport (MPWT).

1-2-5 Infrastructure for disaster prevention and national land conservation

More than half of the national land of Cambodia is occupied by the Mekong River basin. The country suffers from frequent flooding during the rainy season. The variation in water depth between the dry season and the wet season is large - some ten meters around Phnom Penh. In the Mekong Delta, the water overflows natural levees during the rainy season and floods up to three to four million hectares of land.

However, this flooding is beneficial to many Cambodians. Large areas of farmland are flooded every year, but this flooded farmland is used to grow rice and also provides good fishing grounds. During the rainy season, rural residents set up makeshift dwellings on dry land, or even on roads, and live in these for the season.

Phnom Penh is protected from flood damage by a double set of dikes; the inner dike and the outer dike. The capital has drainage facilities, including pumping stations. However, inadequate management and an increasing population have overwhelmed these facilities. To cope with the situation, Cambodia is bolstering its urban drainage capacity and flood control with ADB assistance. With the assistance of Japan, the country has just completed a feasibility study for an additional project for flood control.

The floods in 1996 and 2000 destroyed roads and disrupted train services. Kompong Cham was the hardest hit with the entire city being inundated.

The 2000 flood, which occurred during the rainy season, was said to be the worst in the past seven decades, leaving 130 people dead, adversely affecting 1.6 million people, and damaging 100,000 hectares of arable land. The physical infrastructure, including roads and bridges was damaged, although no accurate figures are available. A foreign agency reportedly said that the flood made it difficult to achieve the economic growth target of 5.5% for fiscal 2000.

Cambodia has no fully operational flood control system. Although hydrological observations have been conducted, except for some time during the civil war, extensive river improvement works have not been carried out, with the exception of embankment protection in the cities. It should be noted, however, that construction work for Prek Thnot Dam has been resumed. Construction work on the dam, designed for flood control, irrigation, and hydroelectric power generation, had been suspended during the civil war.

Some experts say that flood damage is on the rise due partly to excessive logging in recent years and inadequate afforestation.

Regarding the national coast, no particular problems have been reported, except for the loss of sand beaches on a very limited scale. This is partly due to the fact that the country's coastal areas are sparsely populated.

1-2-6 Telecommunications

Cambodia has been lagging far behind virtually every country in the world in terms of telecommunications capacity. When the civil war ended, there were only 3,000 telephone lines in Phnom Penh. Only short-wave radio with a limited capacity connected these lines with provincial cities. After the civil war, UNTAC introduced satellite communication systems to carry out its duties. These systems were donated to Cambodia for public use when the new government was established. Today, there are 130,000 telephone subscribers in Cambodia, including those for cellular phones of 100,000. Some 90% of them are in Phnom Penh. The telephone service is offered by the Ministry of Posts and Telecommunications (MPTC) and seven joint ventures between the MPTC and foreign businesses. The regular telephone line network in Phnom Penh has been signifi-

cantly improved with the assistance of Japan, as discussed below.

The satellite communications network system received from UNTAC (Palapa-B4 Satellite) now connects 21 provincial cities. The optic fiber trunk line, a 600 km line between the Thailand-Cambodia border and the Vietnam-Cambodia border via Phnom Penh, connects Phnom Penh to areas along the line as well as the neighboring countries. The optic fiber line was completed in 1999 with the assistance of Germany.

As for international communications, Cambodia is connected to other countries via the Intelsat satellite under a business corporation contract (BCC) with an Australian company. Internet access services were launched in 1997. Currently about 3,000 customers subscribe to this service. There are three Internet cafes in Phnom Penh.

1-2-7 Electric power supply

The electric power generation capacity of Cambodia has been increasing. In 1992, right after peace was achieved, the installed capacity stood at about 90,000 kW, of which 20,000 kW was effective output. As of 2000, the installed capacity totals 15.43 MW, of which 30% is thought to be standby capacity.

Here is the breakdown of the installed capacity. The C2 power plant has a total installed capacity of 50,000 kW. Of the 50,000 kW, 15,000 kW comes from the existing power generating unit whose steam turbines have recently been repaired and, the remaining 35,000 kW comes from another generating unit that a Malaysian independent power producer (IPP) has installed on the same premises. The C3 power plant has a total installed capacity of 16,300 kW. Of the 16,300 kW, 6,300 kW comes from the existing GM diesel generating unit, and the remaining 10,000 kW comes from the additional generating unit installed with the assistance of the World Bank in 1997. The C4 power plant has an installed capacity of 60,000 kW from a combined thermal power generating unit installed by Beacon Hill Associates, a US company; this unit has replaced the existing diesel generating unit provided by the former Soviet Union. The C5 power plant has an installed capacity of 10,000 kW from a diesel generating unit installed with the assistance of Japan. The neighboring C6 power plant has an installed capacity of 18,000 kW from a diesel generating unit installed with ADB assistance.

1-3 Assistance for infrastructure development in Cambodia

This section deals with international aid for infrastructure. For an overview of general international aid, see section 6. Trends in Assistance to Cambodia in Part Two, Chapter 1.

International aid to Cambodia became fully operational after 1993, when peace was achieved.

In the transport sector, the Asian Development Bank has been playing a central role among international agencies. The ADB supported the restoration of trunk roads, railways and the port of Sihanoukville, and the improvement of Siem Reap airport. The ADB also helped the Ministry of Public Works and Transport (MPWT) in building institutional capacity. In addition, ADB conducted a feasibility study for a project for road development between Phnom Penh and Ho Chi Minh City and supported work for the east section of the Mekong River. The World Bank, for its part, supported the restoration of the port of Phnom Penh and trunk roads. Other international agencies helped in the restoration of roads in the provinces.

Japan is the largest bilateral donor. Even before the civil war, Japan extended assistance for the construction of Chruoy Changvar Bridge, popularly known as the "Japan Bridge," that connects Phnom Penh and the opposite bank across the Tonle Sap River. Japan also offered buses and conducted a feasibility study for a port for lumber exports.

After the civil war, Japan launched an extensive range of development assistance. Firstly, Japan restored not only the Japan Bridge destroyed by the civil war but also National Highway 6A that linked the bridge with Kompong Cham. Secondly, Japan provided equipment and materials for the Road Construction Center (RCC) established to reinforce Cambodia's capacity to maintain and manage roads. Japan also sent experts to support the administration of the RCC. Thirdly, Japan carried out a restoration project for the port of Phnom Penh. As part of the project, Japan provided equipment and materials and set up beacons along the Mekong River adding to restoration of the port facilities. Fourthly, Japan provided assistance for improvement work to the sections of National Highway 6 and 7 that connected National Highway 6A (now National Highway 6). In this connection, Japan also extended assistance for the construction of a bridge across the Mekong

River linking these sections. This bridge is expected to be the first bridge across this river from the river mouth. Fifthly, Japan started to offer loan aid for a project to build a container terminal at the port of Sihanoukville after conducting a feasibility study of the project. This loan aid is still in place. Sixthly, Japan has extended assistance for a detailed design study for the restoration of the Siem Reap section of National Highway 6. Seventhly, Japan has conducted a development study to improve urban transport in Phnom Penh. Lastly, Japan has extended other forms of assistance, for example, organizing seminars, and dispatching experts and Japan Overseas Cooperation Volunteers.

Other bilateral donors have also provided assistance in the transport sector. The United States restored National Highway 4. Australia has helped Cambodia to restore road bridges. Denmark extended assistance in building and repairing ferries for use on the Mekong River. Other donors have offered technical assistance as well.

Regarding national land conservation, no particular assistance has been provided apart from the assistance described earlier.

In the telecommunications sector too, many donors and international agencies have been involved. UNDP and ITU provided technical assistance in the drafting of the master plan for a communications-related project between 1995 and 1996. France provided local telephone digital exchangers for 6,000 telephone lines in 1995. Germany assisted Cambodia in setting up a 600 km optic fiber trunk line between the Thailand-Cambodia border and the Vietnam-Cambodia border via Phnom Penh in 1999. Japan launched a project for developing telecommunications networks in Phnom Penh in 1996. The project was completed in 1998. This project set up three telephone exchanges, installed local telephone digital exchangers for 16,800 telephone lines, established an optic local network for a relay transmission network totaling 12 kilometers in length, created a subscriber cable network with a total length of about 260 kilometers, and installed subscriber radio systems in and around Phnom Penh. Through this project, telecommunications facilities and services in the capital have been significantly improved in both quality and quantity. For this project, Japan has also organized seminars and dispatched experts, among other activities.

In the electricity supply sector, rapid progress has been made with the assistance of Japan, the ADB, the

World Bank, and others. As discussed above, the currently installed capacity for Phnom Penh totals 15.43 MW. The World Bank's policy is that in Asia, electric power sources should be developed using private funds and that funds from the World Bank and ODA from donors should be diverted to the development of power grids. Under this policy, the World Bank announced a power sector development plan for Cambodia in 1998, covering the period until 2020. Japan, for its part, has provided diesel power generating units with a total capacity of 10,000 kW under grant aid in 1994. Japan then concentrated on a project for developing the power grid in and around Phnom Penh in coordination with an ADB-assisted project. The third phase of the project, the development of a power grid in the suburbs of the capital, has almost been completed. Thus, Japan has significantly contributed to the improvement in the power supply capacity in and around Phnom Penh. At the moment, Japan is conducting a feasibility study for a thermal power generation project in Sihanoukville in line with the World Bank's power sector development plan. Preliminary results of the study show that among other things, difficulty in securing fuel is an impediment to the project.

As discussed above, the private sector is also participating in infrastructure development in Cambodia. The most striking example is Pochentong Airport, for which expansion work, including its management, is being conducted on a BOT basis. In telecommunications, the private sector plays an important role in providing international communications services and cellular phone services. The private sector also has a significant role in electric power supply in the form of IPPs. In the transport sector, including roads, railways, ports and airports, some foreign businesses are showing interest in Cambodia. The Cambodian government seems willing to invite such businesses. However, details of such moves are not known. Progress in private participation is shown in Table 3-3 and Table 3-4.

2. Infrastructure development – problems and challenges

2-1 Issues on infrastructure development in general

Issues on infrastructure development, especially in the transport sector, are described below:

Table 3-3 Investment Approvals in Infrastructure Development

Year	Roads	Airport	Transport service	Dry ports	Telecommunications
1995	-	1	2 (airlines/bus)	-	1
1996	-	-	-	-	5
1997	-	-	-	-	-
1998	-	-	-	-	-
1999	1	-	-	1	2
2000 (Up to Sept.)	-	-	-	1	-

Note: The table excludes investments in warehouses only, and those in the construction of housing or hotels.

Source: Data from the Council for the Development of Cambodia (CDC)

Table 3-4 Candidate Projects for BOT Arrangements

Sector	Candidate projects	Remarks
Roads	National highways 3, 5A, 11, 21, 31, 33, 51	Including rest stations and service centers, possibly with bus stations, filling stations, repair shops, dry ports, border check-points etc.
Railways	Royal Railways of Cambodia lines (the whole lines or sections)	Investments are welcomed in CFRC lines as part of the Trans-Asia Railway which connects from Singapore to Kunming
Ports	River ports of Phnom Penh, Kompong Cham, and Kratie, plus small-scale moorings and repair shops along rivers	
	The port of Sihanoukville, including warehouses, bulk cargo terminals, etc.	
Airports	Purehabiharu	A group of Buddhist temples, which has considerable potential for tourism development, although access to them is poor.
	Koh Kong, Battambang, Stung Treng, Mondol Kiri, and Ratanak Kiri	
	Sihanoukville	These airport projects are now part of a larger BOT development program by Airston Sdn.Bhd.of Malaysia, but the company will abandon these projects. The development of these airports is expected to be reassigned to new BOT projects.
	Kompong Chhnang	Dragongold Sdn. Bhd. Of Malaysia has won the contract, but the contract is in dispute. The development of the air port is expected to come under a new BOT project.
Water supply	12 areas in the provinces	
Power supply	A few hydroelectric power plants and power grids connected to Thailand and Vietnam	

Note: News reports indicate that the Cambodian government gives top priority to candidate projects listed above under BOT arrangements. According to these reports, projects will not be subject to international bidding. Instead, the successful businesses will be chosen based on their proposals and subsequent negotiations.

Source: Data from CDC

- (i) Transport infrastructure is generally inadequate due to damage resulting from the civil war and lack of maintenance during the civil war.
- (ii) Transport infrastructure is so outdated that it cannot effectively cope with the transport demand of today. During the civil war, the world experienced rapid advancements in transport technology. However, Cambodia's infrastructure cannot cope with these advancements. After peace was achieved, the dilapidated transport infrastructure was restored, but not improved. Such infrastructure is totally inadequate to cope with modern levels of transport up to now, as seen in neighboring countries, and to support full-fledged economic development.
- (iii) Transport networks are inadequate to meet the need for the country's development and the international exchange of people, goods and services.
- (iv) Transport service operators cannot provide services that meet the requirements of users since their management system is inconsistent with a market economy.

- (v) Inadequate telecommunications networks hinder the appropriate operation and management of transport infrastructure.

As discussed above, the private sector is involved in infrastructure development in Cambodia. Pochentong Airport is now being improved on a BOT basis. BOT arrangements with the participation of foreign businesses are also planned for the development and management of roads, railways, and airports. The Cambodian government is considering inviting foreign private capital for the management of international ports in Cambodia. Communications services are provided jointly by the Ministry of Posts and Telecommunications and foreign businesses. Electric power is partly supplied by independent power generators (IPPs). Moreover, some foreign businesses plan to improve the infrastructure as part of their tourism development projects.

There is room for the private sector, especially for foreign private capital to play a part in infrastructure development in Cambodia. This is because the revenue the Cambodian government raises is not sufficient and aid from donors and international agencies is limited. Moreover, such aid may not only require a time-consuming decision-making process, but also create a financial burden on the part of the Cambodian government.

However, the Cambodian government should meet certain conditions if it wants to involve the private sector effectively for the sound development of Cambodia, given the fact that infrastructure development by nature is designed to serve the public and may not be so profitable for the private sector. Firstly, the Cambodian government should select development projects for the private sector in a systematic manner. Secondly, the Cambodian government should create a framework for selecting and supervising participating businesses and for managing the projects in question. Thirdly, the Cambodian government should enter into a contract with participating businesses that ensures transparency based on such a framework. Infrastructure development by a private business such as through a BOT scheme can be effective only on the firm basis mentioned above.

At the same time, coordination is needed between the activities of the private sector and aid through ODA. There are some cases in which a lack of appropriate control by the Cambodian government over the private sector's activities has resulted in a delay in the progress

of projects, high user charges, and skyrocketing land prices.

In sum, the Cambodian government needs to use its resources not only to attract foreign investment but also to reinforce the institutional framework if it wants to ensure that infrastructure development by foreign private capital contributes to the sound development of Cambodia. To this end, the Cambodian government needs to build institutional capacity in each sector as discussed later.

2-2 Issues on each sector

2-2-1 Roads

There are a number of problems concerning roads in Cambodia. Although the main national highways and urban trunk roads have been substantially restored, other roads remain in poor condition. Transportation on some of these roads is impracticable during the rainy season. Even restored roads, with some exceptions, are not suitable for heavy or high-speed traffic as repair work has generally been limited to restoring cracked and broken pavement of the existing roads. Nonetheless, these roads are used by vehicles carrying cargoes beyond their load capacity and large trailers whose design specifications are beyond the standards before the civil war. Along with poor maintenance, this has already resulted in "restored" roads being partly damaged.

Moreover, no action has been taken to cope with the increasing number of motorcycles, the number of which was far lower in the time before the civil war.

Although Cambodia's major trunk roads are designated as Asian Highways, they are not used for international traffic. This is because design standards are far lower than international standards and also a cross-border traffic control system is not being applied.

Even trunk roads are vulnerable to flooding in Cambodia, especially during the rainy season, partly due to nature of their routing. They cannot be used all year round without appropriate maintenance work. However, Cambodia lacks the organizations, systems and funds necessary to carry out such maintenance work.

Highways in local areas other than trunk national highways have not been improved. As a result, not all of the provincial capitals are connected by all-weather roads.

In addition, Cambodia has no systems to administrate

the transport services provided by buses, taxis and trucks. This makes problems for ensuring safety in these services.

2-2-2 Railways

Cambodia's railway services remain low in speed and volume as mentioned earlier. This is because restoration work conducted after the civil war was not aimed at full restoration, with damaged signals and communication systems left as they were. The axle load for the northern line is 13 tons, unchanged from the 1920s when the line was constructed. Even if the line is fully restored, it will not be able to compete with other modes of transportation as it is.

As discussed later, railways in Cambodia are expected to be part of the Asian railway network through linkage with the railway network in Thailand and Vietnam. To this end, it is necessary to link Sisophon with Poipet, and Phnom Penh with the Vietnam-Cambodia border.

Railways were once the predominant mode of transportation. However, road transportation now plays a central role. To be competitive with this mode of transportation, railways are required make use of their advantageous features and meet the needs of the users. However, the Royal Railways of Cambodia may not be managed in a way that will achieve this.

2-2-3 Ports and inland waterways

Even international ports in Cambodia have a number of problems. Firstly, their use is greatly limited by the inadequate management of port facilities, lack of water depth, and strength of the piers. Secondly, the ports cannot accommodate large container vessels because they have not fully responded to the shift in general cargo transport to container transport; only parts of the existing facilities have been converted to handle container cargoes. Thirdly, the utilization rate of restored facilities has not necessarily increased since navigation along the international river and the procedure for crossing national borders takes time and money. Therefore, these international ports are required to streamline management and operations, including the various procedures involved.

Passenger and cargo handling at coastal ports and inland ports except for international ports and along in-

land waterways is inadequate in terms of efficiency and safety due to a lack of the necessary facilities. As discussed earlier, even major inland waterways are not kept in good condition, posing a safety problem. Lake Tonle Sap is becoming shallower due to sedimentation, which is another safety problem.

There are other problems not directly connected with infrastructure. Cambodia has no established systems for the inspection and registration of vessels and the qualification of officers in accordance with international standards. There have been some cases in which a vessel flying the Cambodian flag called at a port in other countries and got into trouble due to the lack of such systems. Another problem is the lack of a search and rescue system.

2-2-4 Airports

Pochentong Airport has many problems when it comes to accepting Boeing 747 aircraft and other large airplanes commonly used for international flights. The length of the runway is adequate, but it is also inadequate in terms of strength and width. In addition to inadequate maintenance, the runway lacks a parallel taxiway, and other essential facilities and equipment. The airport terminal is also inadequate. Other airports have similar problems with the lack of facilities and proper maintenance.

The air traffic control over Cambodia is conducted from Bangkok.

2-2-5 Infrastructure for disaster prevention and parks

Phnom Penh and other major cities, as well as main transport networks, have problems in that they are vulnerable to flooding. There are no other serious problems at the moment as far as current agriculture and daily life is concerned.

Many parks and open spaces were once constructed in urban areas according to city planning. They are still in general use today. The problem is that they are generally in a poor state of maintenance, except for parks serving as tourist attractions and some kinds of monuments.

2-2-6 Telecommunications

Problems in the telecommunications sector include insufficient transmission capacity, a delay in the modernization of infrastructure, and the lack of human and financial resources. In addition, telecommunications facilities involve a variety of types and standards, posing a problem in terms of maintenance, management and efficiency.

Communication conditions have significantly improved in Phnom Penh with the restoration of regular telephone line networks and the wider use of cellular phones. On the other hand, disparities in access to the telecommunications infrastructure between the capital and the provinces are widening.

Cellular phones have played a significant role in improving communication conditions within a short period of time. On the negative side, they are extremely expensive and too business-oriented.

As discussed in section 2. Creating the Environment for Economic Development, this situation poses a major problem given the fact that the development of information infrastructure is crucial for industrial development and institutional capacity building of the government. It also constitutes a major hindrance to the management of transport infrastructure.

2-2-7 Electric power supply

Supply and demand for electric power are recovering. The generating costs are high because Cambodia depends on diesel power generation. The price of power purchased from IPPs is 15 yen per kilowatt. When the distribution costs are added, the total cost amounts to 30 yen per kilowatt. This translates into high power charges, which in turn may hinder Cambodia's economic development.

Presently, there is an issue of how to handle hydroelectric power projects launched before the civil war, the Prek Thnot development project and Kirirom hydroelectric power project, both of which were in the construction phase, and the Kamchai hydroelectric project, for which the detailed study was completed. Some experts are calling for the construction of dams at Khone Falls, Stung Treng, Sanbohru, and Sesan along the Mekong River. However, it is difficult to construct such dams in light of the requirements for environmental conservation.

3. Direction of infrastructure development

3-1 Basic concepts

Infrastructure development in this case is primarily designed to contribute to socioeconomic development in Cambodia. According to the first five-year Socioeconomic Development Plan for 1996-2000, Cambodia's general policy on transport infrastructure sets out the following objectives:

- (i) To establish a transport network aimed at securing national integration and maintaining law and order, as the top priority after the civil war.
- (ii) To secure transport networks and national land conservation for the development of the provinces, especially rural areas. The provinces, which account for most of the national land and requirements for improvement in the living standards of local farmers, are the key to Cambodia's stability and development.
- (iii) To form a transport network and gateways designed to foster export-related industries, and to improve living conditions in urban areas for the subsequent overall economic development of Cambodia.
- (iv) To form a transport network and gateways designed to develop tourism, an efficient industry in terms of earning foreign currency and creating jobs; and to develop infrastructure to make use of tourist attractions, including parks and beaches.
- (v) To develop a transport network and gateways that make use of Cambodia's geographical advantage at the center of Indochina, and to enable Cambodia to serve as the region's hub by promoting economic development that takes advantage of its location.

The buildup of the information infrastructure aimed at promoting industries and strengthening institutional capacity has recently emerged as a new pillar of overall infrastructure development. Above all, the development of telecommunications infrastructure is indispensable as it constitutes the linchpin of this information infrastructure buildup. The five-year telecommunications expansion plan for 1999-2003, which was formulated in 1999, sets forth a number of objectives including the buildup of telephone facilities not only in Phnom Penh but also the provinces, the modernization of telecommunications facilities in general, and the formation of domestic,

long-distance transmission networks using optic fiber cables or a digital microwave radio system. According to the five-year plan, the number of telephone units will increase from about 100,000 in 1999 to around 260,000 in 2003, and some 400,000 by 2009.

Cambodia needs to address the immediate need for restoration and reconstruction in both the transport and telecommunications sectors. However, at the same time, the country needs to move on to explore the next stage of development. This is because work for restoration and reconstruction alone is insufficient in both quality and quantity for bringing the development of Cambodia to the next stage. For the next three to five years, Cambodia needs to formulate a long-term master plan while striving to complete the remaining work for restoration and reconstruction. During this transitional period, Cambodia needs to lay the groundwork for the implementation of such a master plan by, for example, building up the necessary administration systems and human resources and creating a mechanism by which the achievements made under the plan will rapidly extend into the private sector.

The national land conservation sector requires special attention because it is different from other sectors in a number of ways. Firstly, the available technological data and knowledge is limited. Secondly, land conservation has a huge impact on the environment, society and the economy. Thirdly, it greatly affects neighboring countries. Last but not least, nationwide land conservation requires huge investment and a long-term perspective. Therefore, Cambodia first needs to conduct basic studies to enable it to form a feasible policy and make the policy work in practice.

3-2 Work to meet the immediate needs for rehabilitation and reconstruction

Much work has been carried out for the rehabilitation of Cambodia with the assistance of international agencies and donors, as discussed above. In some cases, however, such work should meet not only the immediate needs for rehabilitation, but also the longer-term needs for the country's development from the very outset. Taking this into account, the direction that the rehabilitation and reconstruction work should take is discussed below. The target year on rehabilitation and reconstruction is difficult to determine exactly because infrastructure development needs time for preparation

such as surveys, design and legal procedures and also construction work. Therefore the following are works that are immediately required. It should be noted that restoration and reconstruction must be carried out taking into account the capacity of Cambodia.

3-2-1 Roads

Cambodia needs to restore trunk roads that are crucial to the country's economic development within the transitional period of three to five years, including:

- Trunk roads linking the Thai border and the Vietnamese border via Battambang or Siem Reap and Phnom Penh,
- Trunk roads linking Phnom Penh with Kompong Cham and Sihanoukville,
- Urban trunk roads in Phnom Penh, and,
- The arterial road network around Phnom Penh.

Cambodia needs to set up the capacity to maintain these roads as practicable for transportation even during the rainy season. Of these roads, those crucial for international traffic need to be upgraded, or newly constructed as necessary, to meet international standards, as seen in the Phnom Penh-Ho Chi Minh City Highway Project.

As for provincial roads, Cambodia needs to link all provincial capitals with one another by all-weather roads as a top priority. Yet, as traffic is relatively low on these roads, improvement work on this period should be economically efficient and such improved roads should be easy to maintain. Other roads need to be restored as necessary.

3-2-2 Railways

Priority should be given to the south line, which can be competitive with other modes of transportation in carrying oil, cement, containers, and other large-volume freight. Cambodia needs to take a number of actions to improve the south line, including repairing and reinforcing sections that have been left unattended during the restoration work, linking the line with freight shipping facilities and dry ports, restoring switches to allow for daily service at least, and repairing signals and communications systems.

The north line also needs restoration work. Cambodia needs to restore the 48 km section between Sisophon and Poipet, so that international transport between Thai-

land and Cambodia requires transshipment only at the Thai border.

3-2-3 Ports and inland waterways

Cambodia needs to expedite the ongoing construction work of the container terminal at the international port of Sihanoukville and to promote the use of the terminal after it is completed.

Also, Cambodia needs to improve other coastal ports, inland ports and inland waterways as such improvement work will produce quick results. The improvement work includes building small-scale mooring facilities and dredging as necessary. In addition, Cambodia needs to ensure that inland waterways are maintained and managed properly.

3-2-4 Airports

Cambodia needs to expedite the ongoing BOT project to accommodate large airplanes. To this end, Cambodia needs to review the progress in the project and consider amending it if necessary to make it possible for large airplanes to land on the airport even on a temporary operation basis.

Regarding Siem Reap airport, Cambodia needs to take measures necessary to accommodate international tourists according to plan. Now Cambodia is developing telecommunications networks, paving the way for communication in such an air traffic control system. In addition to airport improvement, Cambodia needs to take the measures required to establish an air traffic control system covering both the airspace over the airport and the air routes, including building relevant facilities

3-2-5 National land conservation, etc.

Cambodia needs to take the following measures:

- To complete urban drainage systems and flood controls as necessary, and
- To repair and maintain parks and open spaces as the case may be, and if possible, work together with the private sector for this purpose.

3-2-6 Telecommunications

Cambodia needs to create new telecommunications systems rather than restore or rehabilitate the existing

systems, as Cambodia saw its telecommunications infrastructure ravaged and become outdated during the civil war.

As such, Cambodia needs to take the following actions to meet the immediate needs in this sector:

- To install more than 30,000 new telephone lines in Phnom Penh,
- To install over 50,000 such lines in the provinces, so that even villages will have one or more telephones,
- To develop long-distance transmission networks using optic fiber cables or a digital microwave radio system,
- To create a radio network covering the coastal areas and the Mekong Basin, and
- To establish a regional telecommunications network connecting with Thailand, Laos, and Vietnam.

3-2-7 Electric power supply

Securing power to meet the needs in Phnom Penh and lowering electricity charges are some of the immediate challenges Cambodia faces today. To address these challenges, Cambodia needs to set up a power line between Sihanoukville and Phnom Penh. Moreover, Cambodia needs to construct a medium-scale thermal power plant in Sihanoukville, for which a feasibility study is being conducted by the Japan International Cooperation Agency (JICA). Meanwhile, the World Bank is suggesting setting up a power line between Takaev and the Vietnamese border that would be linked to the above-mentioned power line on the assumption that Cambodia buys power from the O Mon Thermal Power Plant in Vietnam. However, this suggestion should be studied more in terms of economic efficiency and other factors.

3-3 Mid- to long-term work for infrastructure development

As discussed in 3-1, Cambodia is in a transitional period between the rehabilitation/reconstruction phase and the development phase. To embark on the development phase, Cambodia is now drafting the second Socioeconomic Development Plan. General policy on infrastructure will be spelled out in this new five-year plan. At the moment, a long-term master plan for infrastructure development for ten to 15 years has not been

formulated, although such a plan is necessary as infrastructure development takes time and money. Taking these circumstances into account, the direction for infrastructure development is discussed below from a mid- to long-term perspective.

Before discussing it, however, it should be noted that this mid- to long-term concept assumes that there will be encouraging prospects for achieving the objectives spelled out in 3-1. Though quantitative analysis and forecasts on socio economic conditions have not been carried out the following are reasonable assumptions:

- Agriculture and rural areas will achieve stable development.
- Seven growth poles - Phnom Penh, Sihanoukville, Kompong Chhnang, Battambang, Siem Reap, Kompong Cham, and Rotanak Kiri - will see the development of tourism and other industries as well as an increase in their population, and they will be more closely related to one another.
- The need for urban development in cities other than Phnom Penh will grow.
- Cambodia will strengthen relations with neighboring countries and other countries at large while taking advantage of its location in Indochina.

It should also be noted that Cambodia needs to do the following:

- To make its development activities consistent with national and local development plans,
- To set priorities for its development activities, and
- To consider participation of the private sector as necessary.

3-3-1 Roads

Cambodia needs to take the following actions concerning the main national highways to meet the mid- to long-term needs:

- To cope with increasing traffic volume,
- To upgrade national highways crucial for economic development and international traffic to meet international standards,
- To construct bypasses and/or alternative routes rather than to renovate the existing roads if their sections have problems related to their alignment, or if they are vulnerable to flooding or passing major city areas,
- To repair or rebuild large-scale bridges that have been left in a bad state of repair, and

- To construct bridges to replace ferry services at, for example, Prek Kdam on National Highway 1.

Regarding urban roads, Cambodia needs to give priority to major roads to form the key structure of the city and those crucial for tourism and industries.

As for provincial roads, Cambodia needs to give priority to roads with increasing traffic, those connecting provincial capitals with other provincial capitals, and those crucial to the overall development of the local areas in question.

3-3-2 Railways

Cambodia's railways need overall modernization to meet the mid- to long-term needs. This is necessary if Cambodia wants to use them as a key transportation mode. To this end, Cambodia needs first to study the comparative advantage of railways in the country in relation to road transport. If such a study proves that the potential demand will make railways economically feasible, then Cambodia needs to modernize the rolling stock, signals, communications systems and other facilities and boost their operating speed and transport capacity. As far as the north line is concerned, these actions should be taken with a view to exploring the possibility of through train services in conjunction with the State Railway of Thailand.

The insufficient transport capacity of Cambodia's railways is the result of the inadequate restoration work after peace was achieved. Roadbeds have been left as they were before the civil war. Large-scale bridges have also been left unattended even though they have structural problems. The transport capacity of the north line has remained at the level of the 1930s, with the result that the line can cope only with local transport needs.

Currently, the concept of a Trans-Asia Railway is being studied. If Cambodia wants to put this concept into practice, the country will have to restore the Thai-border section of the north line and construct a railway between Phnom Penh and the Vietnamese border. To realize the concept for the railway, it has to be ensured that it will be economically efficient, technical problems will be solved, and coordination will be ensured with the other countries concerned.

In any case, the mid- to long-term direction for railway development in Cambodia should be charted in the comprehensive transportation plan as discussed later.

3-3-3 Ports and inland waterways

Cambodia needs to take the following actions to meet the mid- to long-term needs. Firstly, Cambodia needs to improve the port of Sihanoukville. To this end, the country needs to restore the pier for general cargoes and renovate the terminal for bulk cargoes based on the results of a survey that has been completed. Cambodia also needs to expand the container terminal based on the trends in its use.

Secondly, Cambodia needs to improve the port of Phnom Penh. To this end, the country may have to build a new terminal depending on the progress of development projects in the inland areas and improvement of cross-border procedures. In this connection, Cambodia needs to study the possibility of the construction of a new wharf on the main stream of the Mekong River.

Thirdly, Cambodia needs to improve the existing coastal ports, inland ports, and inland waterways or construct such facilities anew to cope with the growing demand.

Fourthly, Cambodia needs to address the sedimentation and other problems in Lake Tonle Sap.

3-3-4 Airports

Cambodia needs to take the following actions to meet the mid- to long-term needs:

- To improve facilities at both Pochentong and Siem Reap airports to cope with the growing demand for passenger transport and increasingly larger aircraft; and to modernize navigational aids necessary to improve safety,
- To improve Battambang and Sihanoukville airports if sufficient demand is anticipated,
- To make airports in the provinces accessible for regular flights by paving the airstrips and taking other necessary measures, and
- To establish an air traffic control system.

3-3-5 National land conservation, etc.

Cambodia needs to take the following actions to meet the mid- to long-term needs:

- To reinforce flood control measures, including embankment protection for cities to allow for urbanization as a result of the development of industries and tourism,

- To construct facilities necessary to ensure that key infrastructure will be protected,
- To improve the existing parks and open spaces and, if necessary, construction such facilities anew, in order to protect ancient monuments and develop tourism, or as part of new urban development, and
- To explore the possibility of constructing public housing as a measure to cope with the potential increase in the urban population.

3-3-6 Telecommunications

As discussed earlier, a significant increase in demand for telecommunications infrastructure is anticipated. Therefore, Cambodia needs to upgrade and update telecommunications facilities in both the capital and the provinces after achieving the goal of meeting immediate needs as shown in 3-2.

3-3-7 Electric power supply

The World Bank report mentioned earlier anticipates a rapid increase in power demand in Cambodia. In addition to the suggestion mentioned in 3-2, the World Bank is now suggesting hydroelectric power projects along National Highways 3 and 4, and in the mountainous area of Krabang.

Another project being contemplated is a Thai-Cambodian joint hydroelectric project on the Thai-border area of the Cardamomes Mountain range to the east. This project is expected to provide economically efficient power.

Now that the supply and demand situation for electricity has more or less stabilized, at issue are the stabilization of power charges and electrification in the provinces.

Securing stable electric power resources in the long term is the key to the stabilization of power charges.

Regarding electrification in the provinces, there has been no proper survey carried out yet. The state-run utility Electricite du Cambodge (EDC) anticipates a significant increase in overall power demand. EDC says that demand in the provinces is extremely low compared with that in Phnom Penh. However, there is still a need to consider electrification in the provinces, including the use of energy locally available, as improving the living standards in rural areas and boosting agricultural production are crucial for the country's development.

3-4 Policy measures necessary for infrastructure development

3-4-1 Transport infrastructure

Transport infrastructure development requires the following policy measures. These are long-term policy measures. Quick results are not expected. Cambodia needs to set priorities for policy measures from the following perspectives, though quick results may not be expected:

- The policy measures should promote the ongoing restoration work; and
- The policy measures are essential for the mid- to long-term initiatives.

(1) Formulating a comprehensive transportation plan

Cambodia is now moving from the stage of rehabilitation and reconstruction to the next stage of full-fledged development. In this transitional period, the country needs to both formulate a comprehensive transportation plan consistent with the five-year Socioeconomic Development Plan and other plans and to carry out programs based on this transportation plan. This is necessary if Cambodia wants to develop its transport infrastructure both efficiently and effectively. At the same time, Cambodia needs to improve coordination among different modes of transportation. Table 3-5 shows a possible structure for such a comprehensive transportation plan.

It is essential to set out the framework of a comprehensive transportation plan before drafting a mode-specific plan. It is also essential for the Cambodian government as a whole to authorize such a comprehensive plan to make it practical. In addition, such a plan needs to consider key international transport as well as domestic transport, as Cambodia is located in the center of Indochina.

(2) Establishing traffic regulations

Explicit traffic regulations are the key to appropriate development, management and use of the transport infrastructure. Table 3-6 shows the scope of such traffic regulations.

The Cambodian government is making efforts to

Table 3-5 Comprehensive Transportation Plan for Cambodia (main items)

Part A: Overview of the plan
I. Basic concepts of the plan
II. Current transportation situation in Cambodia
III. Basic policy of the plan
Part B: Transportation demand forecast
I. Transportation demand forecasting technique
II. Estimates of the socioeconomic framework
III. Macroeconomic demand forecast
IV. Mode-specific demand forecast
Part C: Mode-specific transport planning
C1. Roads and road transport planning
I. Road planning
II. Road transport management policy
II-1. Transportation management
II-2. Policy on road transport business
C2. Railways
C3. Ports and inland waterway planning and water transportation policy
I. Ports and inland waterway planning
II. Policy on water transportation management
C4. Airport planning
C5. Special agendas for transportation planning

Source: Kaneko (1998)

establish traffic regulations, yet it needs to set priorities according to the need and urgency.

(3) Reorganizing and reinforcing the government structure

Reorganizing and reinforcing the government structure is urgently required for the appropriate development, management, and use of the transport infrastructure. The following four points are matters of great urgency.

- (i) Cambodia needs to reinforce the planning department so that its capacity will be built up through the drawing up of basic policies and plans, working out administration systems and regulations, and managing and disclosing information. To this end, the country needs to develop human resources.
- (ii) Cambodia needs to build up the government's capacity to maintain and manage the transport infrastructure. The government needs to secure equipment and materials, develop human resources and improve technical capacity concerning the transport facilities that it maintains, manages, and operates on its own. Currently, inadequate communi-

Table 3-6 Scope of Traffic Regulations

Administrative items	Subitems
Institutions	Administration of public infrastructure; administration of transport and traffic; administration related to the means of transportation; administration of transportation management
Infrastructure facilities	Planning; development; maintenance and management; operation
Transport service	License; business administration and management
Means of transportation	Registration; technical standards; maintenance and inspection
Transportation management	Traffic safety rules; license and education; traffic control

Source: Kaneko(1998)

cations systems hamper the government's activities for maintenance, management and operation of transportation infrastructure. However, as restoration and construction work for telecommunications facilities progresses, Cambodia needs to take advantage of this progress and improve such communications systems by, for example, creating the necessary telecommunications networks for transportation infrastructure. This action may be part of the Cambodian government's initiative in developing the information infrastructure.

- (iii) Cambodia needs to reinforce management capacity on the part of state-owned enterprises. To this end, the country needs to restructure them and develop human resources so that these enterprises will be able to be financially self-sufficient. Cambodia needs to set up a small but competent body within the Ministry of Public Works and Transport (MPWT) to deal with such restructuring.
- (iv) Cambodia needs to build up institutional capacity to supervise transport services provided by the private sector. Such supervision includes ensuring competition, regulating charges, and strengthening safety. Cambodia also needs to develop human resources for this purpose.

(4) Securing sufficient funds for maintenance

Cambodia needs to secure sufficient funds for maintenance from user charges, taxes and other sources.

(5) Promoting privatization in an appropriate manner and establishing the framework for privatization

Cambodia needs to promote privatization in the transport sector as many of its transport services should be provided by the private sector. At the same time, the

country needs to guarantee the appropriate activities of private businesses by establishing the necessary systems and strengthening government functions. In addition, Cambodia needs to promote the participation of the private sector in the development or management of infrastructure on a BOT basis or under other arrangements. The country therefore needs to spell out the criteria and procedures for such participation.

(6) Improving coordination with neighboring countries for the smooth operation of international traffic

International traffic with neighboring countries is expected to increase in volume. However, there are many impediments to crossing the borders. As such, Cambodia needs to improve coordination with neighboring countries to promote the smooth operation of international traffic. This requires Cambodia to conclude agreements on traffic arrangements with them and take other necessary measures.

(7) Establishing appropriate technical standards

Cambodia substantially depends on international support for its infrastructure development. However, technical standards applied to the construction and use of transport facilities vary from donor to donor. This may hamper the maintenance and use of such facilities in the future. This necessitates the establishment of basic technical standards by Cambodia.

3-4-2 Infrastructure for national land conservation, etc.

Cambodia needs to conduct fact-finding studies and work out basic policies regarding the infrastructure for

national land conservation, etc., based on the results of such studies. The country also needs to make arrangements for these studies within the government and to develop appropriate human resources. In doing so, Cambodia needs to improve coordination with other organizations concerned to ensure an efficient and effective response.

3-4-3 Telecommunications infrastructure

Telecommunications infrastructure development requires similar policy measures to those for transport infrastructure development as described in (1) to (7) above. In addition, the following points are important.

(i) Operational efficiency

The Ministry of Posts and Telecommunications (MPTC) plans to change the form of organization for state-owned enterprises under its management to that of public corporations within the year 2000. With this new form of organization and a new management method, the MPTC aims to promote operational efficiency for such corporations. This will be difficult for these public corporations, as they need to achieve the seemingly incompatible objectives of keeping user charges low and offering services in less profitable rural areas, while rapidly modernizing and expanding services.

(ii) Human resources development

There is an urgent need for Cambodia to develop the human resources required to maintain and manage the rapidly expanding telecommunications networks.

(iii) Review of the master plan

Cambodia needs to review the master plan for possible adjustments to the long-term objectives amid rapid changes in technologies and the state of affairs in Cambodia.

3-4-4 Infrastructure for electric power supply

Electric power in Cambodia has been supplied more like emergency power units. Cambodia now needs to formulate a long-term plan for electric power supply to secure stable power resources and electrify rural areas.

The role of the private sector in developing electric power resources should not be overemphasized, as the World Bank suggests. The World Bank's suggestion may be appropriate for Bangkok and other key major cities in Southeast Asia where the electric power market is well developed, but not so for Cambodia. In fact, the high cost of purchasing electric power from IPPs is hampering demand in Phnom Penh. Cambodia thus needs to use public funds for the development of power resources across the country. At the same time, Cambodia needs to study how to use public funds appropriately.

4. Direction of Japan's assistance

4-1 Basic policy

Section 3 above discusses actions and policy measures for infrastructure development in Cambodia. They may be carried out by the Cambodians themselves, international agencies and donors including Japan, or the private sector.

Japan, for its part, should concentrate on projects that will produce explicit results in order to make the most of Japan's aid--Japanese taxpayers' valuable resources--for infrastructure development in Cambodia and to ensure that its impact is recognized by Cambodians. Japan should also contribute to the development of human resources in Cambodia through technology transfer and other means, in addition to the development of the physical infrastructure.

Japan's assistance is currently limited to the southern part of Cambodia and the major cities and their surrounding areas. The following discussion assumes that Japan's assistance then will be extended to almost all parts of the country after security is restored.

(1) Assistance to meet the immediate needs for rehabilitation and reconstruction

This kind of assistance for infrastructure development is being conducted within the framework of international agencies and donors. Japan should concentrate on projects that produce immediate results while maintaining coordination with the donor community.

Small-scale restoration projects or those in remote areas may be conducted by the Cambodians themselves using machinery and equipment provided as part of

Japan's assistance programs to build maintenance and management capacity on the part of the Cambodians. These programs are discussed below.

Restoration work should be conducted with a view to the long-term use of such restored facilities. If funds are limited, it may be necessary to concentrate on the most effective projects. In addition, it may be necessary to use the facilities when restoration work has been partly completed.

As maintenance and management capacity in Cambodia is limited for now, it is necessary to ensure that such limited capacity does not reduce the impact of development projects through the prudent selection of projects, designs and construction methods.

(2) Mid- to long-term assistance for infrastructure development

In its long-term assistance, Japan is concerned with projects that are expected to play a key role in Cambodia's socioeconomic development, rather than with projects that basically just involve restoration. In the future, Japan should place more emphasis on projects that are considered strategically important in Cambodia's socioeconomic development, based on mid- to long-term plans such as a comprehensive transportation plan. Japan should also emphasize projects that are expected to contribute to Cambodia's socioeconomic development by strengthening coordination with the other countries of Indochina in cooperation with relevant organizations.

The private sector is expected to play a greater role in infrastructure development under BOT or similar arrangements. Japan should work together with the private sector in cases where private participation may contribute to achieving better results of projects assisted by Japan's aid.

Japan should maintain coordination among projects for regional development, those for industrial development covering agriculture, forestry, and fisheries, those for tourism development, and those for urban development, so that the impact of assistance will be felt in a wide range of sectors. In addition, Japan should ensure that its assistance projects will constitute a model for future development projects conducted by the Cambodians themselves.

4-2 Capacity building for developing and managing the infrastructure

Capacity building for the Cambodian government in developing, maintaining, managing, and restoring the infrastructure is important both for smoothly implementing Japan's assistance programs in relation to the basic policy spelled out in 4-1 and for making these programs effective. Therefore, Japan needs to extend assistance designed to promote such capacity building. The following three areas deserve special attention.

(1) Assistance for building capacity for establishing systems, formulating plans, etc.

As preconditions for infrastructure development, systems for maintaining and managing this infrastructure need to be established. Moreover laws need to be established to define who has what authority, and the responsibility for these activities. Based on the defined authority and responsibility, development plans can be formulated. Authority and responsibility is to be officially defined within Cambodia's legal system. Thus, Japan needs to focus on strengthening the policy planning capacity of the competent government offices.

(2) Assistance for building capacity to maintain and manage the infrastructure

Infrastructure facilities, including those built with Japan's assistance, should be maintained and managed by the Cambodian government itself in future. This requires the development of human resources as a matter of urgency. Japan should assist Cambodia in building operational capacity concerning technology and management. Japan should also assist Cambodia in acquiring the necessary equipment and materials in line with Cambodia's initiatives in this field. In addition, Japan should assist Cambodia in building up capacity for managing state-owned enterprises and other public entities in the market economy as far as these corporations run their business on a self-supporting, autonomous basis.

(3) Assistance for building the capacity of the Cambodian government to administrate private businesses

The Cambodian government needs to deal appropriately with initiatives by the private sector in developing and managing infrastructure under BOT or similar arrangements as privatization is progressing in the transport service sector. More specifically, the Cambodian government needs to build up its capacity to appropriately cope with technical, managerial and institutional problems in connection with privatization. Japan should assist the Cambodian government in building up its management capacity.

4-3 Assistance in formulating master plans, technical standards, etc.

If Japan wants to support infrastructure development efficiently based on the basic policy described in 4-1 above, official master plans, such as a comprehensive transportation plan, are essential. Such master plans are necessary to carry out a variety of means of assistance provided by international agencies and donors efficiently and effectively, and in maintaining and making use of the outcomes of such assistance. At the same time, technical standards are necessary to invite the private sector to participate in infrastructure development. Formulating these master plans and technical standards requires considerable experience. Japan should therefore provide assistance in this field, in addition to the assistance for capacity building as discussed in 4-2 above.

4-4 Objectives and strategies of Japan's assistance

Japan's mid- to long-term assistance in infrastructure development should be based on master plans such as a comprehensive transportation plan as discussed earlier. This subsection indicates the items Japan that should address in its assistance programs over the next three to five years while taking such master plans into account.

Regarding the overall transport sector, Japan is urgently required to assist Cambodia in formulating a comprehensive transportation plan. At the same time, Japan should provide assistance to promptly devise programs for capacity building for the Cambodian govern-

ment regarding overall transport administration as shown in subsection 4-2 above. After the projects that Japan should assist have been identified based on these programs, Japan should devise a number of packages of schemes for technical assistance. The details for each sector are shown below.

(1) Roads and road transportation

The major national highways play an important role in the Cambodian economy. Bearing this in mind, Japan should firstly address the following sections of national highways:

- (i) Sections from which sufficient returns will be obtained at an early stage if Japan works together with other donors and international agencies.
- (ii) Sections on which emergency repair work has been conducted, but which have been damaged by natural disasters and are in urgent need of fresh repair work.

Secondly, Japan should address the state of existing large bridges left unattended under the restoration program for national highways; these bridges are expected to constitute a bottleneck for national highway traffic. Japan should conduct technical studies and identify those in urgent need of replacing. Then Japan should assist in replacing these bridges. Thirdly, Japan should address the state of sections of national highways where there is heavy traffic that are also crucial in terms of international traffic. Japan could, if possible, construct bridges or bypasses to alleviate heavy traffic in cooperation with other donors and international agencies. Due to the large amount of investment that will be required, it may be necessary to extend loan aid if this proves feasible.

Japan has already launched an assistance program for building up Cambodia's capacity to maintain and manage roads. In the future, Japan should continue and reinforce the program as the proper maintenance and management of roads is crucial.

Japan should also address urban transport in Phnom Penh. Based on the results of an ongoing study, Japan should provide assistance not only for the physical infrastructure but also for traffic control, public transport development, and other aspects.

(2) Railways

Japan should, in principle, devise specific assistance programs for railways based on the policies to be set out in a comprehensive transportation plan. Nonetheless, Japan should provide assistance for the Phnom Penh-Sihanoukville section of the south line, for which there is a good prospect of quick results, to meet immediate needs, after checking the feasibility of such assistance from the economic and technical points of view. In doing so, Japan should work together with major shippers such as oil companies and the port authorities. In addition, Japan should assist the Royal Railways of Cambodia (CFRC) in building up its capacity to maintain, operate, and manage the railways, and also to build up capacity to operate and maintain signals and communications systems to be introduced in the future by themselves. Then the next logical step is to restore, or more precisely, construct the section between Sisophon with Poipet. The direction for the construction of this section will be given in a comprehensive transportation plan.

(3) Ports and inland waterways

Japan should expedite the ongoing construction work of the container terminal at the port of Sihanoukville and promote the use of the terminal after it is completed. In addition, Japan should provide assistance in capacity building for efficient management of the terminal.

As for inland ports and inland waterways, Japan should provide assistance where quick results are expected. Japan should also assist in capacity building for maintenance and management so that the Cambodians will be able to carry out surveys, maintenance dredging, and other necessary measures.

(4) Airports

Work to improve airport facilities is being conducted by the private sector and international agencies and donors. If Cambodia asks Japan to provide additional assistance, Japan should study the necessity and other factors before responding to such a request.

Regarding air traffic control, Japan should assist Cambodia in building up its capacity and in setting up air traffic control systems that cover the airspace over airports and possibly the air routes as well. Japan

should consider extending loan aid if this proves feasible.

(5) National land conservation

Japan should assist Cambodia in:

- Developing urban drainage systems and flood controls that are urgently needed,
- Assessing the current conditions,
- Conducting surveys on the economy in general and related technologies and administrative systems for formulating a basic policy based on such assessment, and
- Building up Cambodia's capacity to conduct the activities above.

(6) Telecommunications

Japan should assist Cambodia in:

- Further upgrading and modernizing facilities in Phnom Penh based on previous assistance,
- Providing standard telephone services and automatic long-distance telephone services to the middle regions of Cambodia--Sihanoukville, Kampot, Takaev, Kandal, the suburbs of Phnom Penh, and Kompong Cham--which are expected to play a more important role in the country's development when connected with Phnom Penh by higher capacity telephone lines, and
- Further building up the management capacity of the Cambodian government mainly through human resources development.

(7) Electric power supply

Japan is expected to give priority to the development of electric power resources in the capital with a view to stabilizing user charges. In addition, Japan needs to consider providing assistance for the electrification of the provinces across the country if security is guaranteed. Electrification of the provinces is important in narrowing the gap between the capital and the provinces.

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