

CHAPTER 17

INITIAL ENVIRONMENTAL EXAMINATION

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17.1 ENVIRONMENTAL EXAMINATION

The Initial Environmental Examination (IEE) surveys were carried out in order to preliminarily identify the possibility of any negative impact that may result through the implementation of any of the proposed projects in the Master Plan. The Master Plan includes various types of transport improvement projects that comprise physical measures as well as institutional improvements. Main results of the initial field examination and analysis of collected data are presented in the following sections.

17.1.1 Natural Environment

The major items of the natural environment that were investigated under the IEE include the following:

- Meteorology
- Geology and Soil
- Topography
- Hydrology
- Flora and Fauna
- Landscape

The seasonal rainfall pattern of is dominated by the influence of the monsoon climate regime. Heavy rains occur between mid-April and October. The analysis of data collected during the last ten years shows that the rainfall amounts fluctuate from year to year. There was a gradual rise between the year of 1993 and 1998. The rainfall amounts reached a peak in 1995. The average annual rainfall for the last 10-year period is about 1362.5 mm. Data records have shown that the annual evaporation depths from 1981 to 1997 vary between 1,224 mm and 2,145 mm, with a mean of 1,623 mm. The amounts are larger than the annual rainfall amount as open pan evaporation measurements during the dry season give much larger values than those in actual fields.

The minimum and maximum monthly temperatures are 23.8 °C and 32.3 °C on average based on data of the years from 1991 to 2000. The minimum average temperature is 21.5 °C in January, which has the lowest monthly average record of 20.6 °C. The warmest month is April in which the temperature increases up to 34.3 °C on the average from year 1991 to 2000, while the highest monthly average was 36.7 °C. High humidity usually occurs during rainy season, especially from March to September, which ranges between 68.2 % and 85.8 %. Research has shown that humidity increases during the rainy season and decreases during the dry season.

Other features show that the monthly mean atmospheric pressure reaches a peak in December and falls gradually from June to July. According to the data of 1999, the daily sunshine hours range between 9.4 in March and 5.9 in September. Strong wind usually occurs during the rainy season, particularly between April and June, with directions from south, southwest and west.

The geological structure of Mekong Delta Region features the Mekong plain with Tonle Sap as one of the physical geographic units used to characterize the physical resource base of the lower Mekong Basin and comprises the bulk of the Cambodia landmass. Soil types are generally cohesive and compressive soil.

The topography of the study area generally slopes down in a moderately from west to east and from north to south. The difference between the lowest and highest elevations is approximately 10 meters with a high terrain zone of 14 meters between the western part of Pochentong airport and Prey Key village. The Boeng Pongpeay area has a low elevation of 5 to 6 meters while the lowest point is located at Tumpun area with an elevation of 4 meters.

Cambodia 's hydrology, in general, is the determining feature of the country's history and culture, both of which are centered on the annual flooding of the Mekong River and the Tonle Sap Basin, where the Study Area is located. The agricultural systems and ecology of the country have evolved to be dependent on the annual flooding cycle of the Mekong and its deposition of silt rich in organic matter. Approximately 70% the Mekong River's total flow is derived from China, northeast Thailand and Lao, with the remaining portion from northeast Cambodia, Vietnam and the Tonle Sap Basin. Very large areas of Cambodia are flooded every year due to the fluctuation in Mekong water level. Once the delta has been flooded, small increases in water level cause large areas of marginally flooded land to be inundated.

A landscape survey was conducted in the Study Area in order to settle the problems of incredible increasing of vehicles, which are expected to use the highways, main roads and other boulevards in the 3 districts of: Russey Kaev, Dang Kao, and Mean Chey. The survey was commenced from the Cambodia-Japan Friendship's Bridge to western part of the Municipality of Phnom Penh along the National Road No.5. Along the National Road No.5 at eastern and southern parts adjacent to the Tonle Sap River is an area of residences, stores/shops, restaurants and hotels as well as some factories. This area was determined as Former City Zone that has a border from the Cambodia-Japanese Friendship's Bridge to Kob Srov Dike, including Sangkat (commune) Russey Kaev and Sangkat Chrang Chamresh.

At the southern part of the city, there is the National Road No.2, keeping as a border of Municipality Phnom Penh and Kandal Province. Due to the development, the National Road No.2 is in a more proper condition than National Road No.5. This road crosses the natural stream, namely, Stung Prek Hor, one waterway which carries wastewater treatment through natural process from the Boeng Trabek, Boeng Tumpun and Boeng Cheung Aek, and runs off to the Tonle Bassac River.

17.1.2 Social Environment

The major items of the social environment that were investigated under the IEE include the following:

- Demography and Community
- Land Use
- Transportation
- Infrastructure and Public Facilities
- Water Rights and Rights of Common
- Archaeological and Historical Attributes

Phnom Penh is the biggest city of the Kingdom of Cambodia as it accounts for about 32 percent or nearly one third of the urban population in the country. The density of population is 3,448 per km², which is the highest among all the provinces. The average annual growth rate of the population is approximately 6.72% (1980-1985); 9.5% (1985-1990); 6.75% (1990-1995); 2.7% (1995-1999) and has varied depending on different economic and stability conditions.

There are many communities and settlements in the Study Area that may be positively or negatively affected by this Transport Master Plan. The history of these settlements goes back to 1979 and

continued up to 1997. Information on the community and settlement distribution pattern is presented in Table 17.1-1.

Table 17.1-1 Population Distribution

District	Number of Settlements	Number of Houses	Number of Families	Population
Prampi Makara	116	6,347	6,700	34,856
Toul Kork	61	6,843	7,219	29,499
Daun Penh	91	1,462	1,779	7,478
Chamkar Mon	78	4,386	4,936	26,436
Mean Chey	15	1,102	1,542	8,956
Dang Kao	86	10,025	11,581	58,217
Russey Kaev	25	1,324	1,348	7,182
Total	472	31,482	35,105	172,624

Source: *Urban Poor Communities Survey Report, January 1999*

Agricultural land occupies more than 60% of the total area while the share of urbanized areas is about 25%. Practically, urban lands and particularly vacant land on the city fringes are under private control. The private control can take many forms of possession and ownership. However, for any land development schemes, the Government must purchase or expropriate land or impose development restrictions. The Ministry of Economy and Finance attempted to assess the land ownership situation by issuing a circular instructing all Government institutions to take stock of all building and land, register them with the Land Titles Department. After that, all land and building registrations have to pass to the Ministry of Economy and Finance. While the circular may have had some impact, it seems that many assets have yet to be registered. Notwithstanding the lack of information on government ownership patterns, there is a general consensus among the Land Titles Department officials, that government administrations do not own substantial quantities of land.

Transportation development in Cambodia was faced with security and financial problems during the 1990s. However, due to the reconciliation and political stability, the transport network had the chance to be reconstructed and repaired. The following transport sectors compose the transport network in the Study Area.

Air: Pochentong International Airport is the biggest airport in the country for civil aviation and military traffic as well.

Railway: There are two main railway lines that carry passenger and freight traffic in Cambodia; these are the Northern Line and the Southern Line. In addition, there is a branch line from Phnom Penh, close to the railway station, to a port on the Sap River, which leads to warehouses.

Inland Water: Waterways compose a traditional transport mode in Cambodia. When roads are flooded during the rainy season, this mode seems to be more efficient. Some of the rivers, however, are navigable throughout the year.

Road Transport: The road network in the Study Area is handling the highest share when compared with other transport sectors. For the passenger transport, motorcycles are the most dominant transport mode, especially for short distance trips.

As the capital of the country, the Municipality of Phnom Penh accommodates most of the public agencies and facilities of the country. In the educational sector, the municipality accommodates 3,270 pupils in 19 kindergartens out of 102 in the whole country with a ratio of 5.72%. The number of schools and children are decreased every year due to shortage in fund. The number of primary schools is about 94 with 1.75% of the whole country. The number of colleges is 12 or 3.31% of the

whole country while secondary schools are 11 with a share of 7.74%.

In the health sector, most of the hospitals usually concentrate at the center of cities or provinces, and the government is planning to provide each commune with a health center. In Phnom Penh, the number of hospitals is considerably high compared with other provinces. In total there are 9 hospitals and 37 health centers, which are under the supervision of the Ministry of Health. Such health facilities are currently subject also to environmental impact due to nearby traffic.

The number of markets in Phnom Penh is higher than any other city in the country. In total, there are 17 main markets in the seven districts of the city, which are operated by the private sector but under the supervision of the municipality. In addition, small markets are scattered in the city

As for solid waste disposal, there is the Steung Mean Chey landfill, which is located about 5km from the center of Phnom Penh with an area of 6.8ha. It is actually an open dump burned landfill, which is the cheapest form of municipal solid waste disposal procedure. The landfill is still in-use although it is already full, and a new location is under preparation. The major drainage open channels in the Municipality are Trabek, Toul Sen and Salang Channels. These channels are in many parts clogged with debris and sediments. As a result, the flow capacities are remarkably restricted. The channels are cleaned from time to time by the DPWT and partially by subcontracting with local firms.

For the electrical power in Phnom Penh, there is an independent power operator producing 60MW plant facility in a joint venture agreement with Electricite Du Cambodge (EDC), the city's anticipated needs for electrical power in the near future. Four main plants will provide power production with a distribution network to be implemented by international assistance.

The Phnom Penh Water Supply Authority, which is a semi-autonomous state enterprise with its own budget under the Governor of Phnom Penh, is responsible for the water supply system in the Municipality. Sanitation and drainage of Phnom Penh rest directly with the city authorities and is paid for out of the city budget. The water supply system is being rehabilitated under the financial assistance of many foreign resources, including JICA, WB and ADB.

The system used to provide telecommunication is out-of-date comprises worn-out VHF radio links and manual exchanges in poor condition. The ongoing project under UNDP has produced a master plan for the full rehabilitation, commercialization and restructuring the Ministry of Post and Telecommunication (MPT) that will take several years to accomplish.

In regard to the water rights and rights of common, the Article 58 of the Constitution of the Kingdom of Cambodia, provided that: "*State property notably comprises land, mineral resources, mountains, sea underwater, continental shelf, coastline, auspice, islands, rivers, canals, streams, lakes, forests, natural resources, economic and cultural centers, bases for national defense and other facilities determined as state property*". With this meaning, the government is empowered to control/monitor, manage, and use the state's property according to the law. The water body management process, however, faces with a complicated ownership structure.

The preservation of existing culture, archaeological and historical attributes as well as local traditions is a main task that should be fully considered in all the Master Plan stages. The cultural heritage of the Khmer dynasties is influencing arts and architecture of many Southeast Asian countries. In the Study Area, data on the historical and cultural assets were obtained through information from the National Museum and the Department of Culture and Fine Arts of Phnom Penh. The most important places are the Royal Palace, Wat Phnom, the Independence Monument, the National Museum and the Tuol Sleng Genocide Museum. Other assets include 20 historical attributes and culture assets, 85 pagodas, 13 mosques and 4 churches. Pagodas in Cambodia are the center of social life especially in rural areas.

17.1.3 Environmental Pollution

Measurements were done in different locations in the Study Area in order to assess the present condition of environmental pollution and the quality levels of air, water, noise and vibration. Seven sites are selected, as illustrated in Figure 17.1-1, to carry out the measurement on air pollution. Out of these sites, three locations are within the urban area and the others are within the suburban area.

To evaluate the water quality, another five sites were selected for the water samplings, in which two sites were sampled from the lakes; while the other three sites were sampled from rivers and canals. Results of the following survey items are presented in Tables 17.1-2 to 17.1-5.

- Air Quality
- Water Quality
- Vibration
- Noise

Table 17.1-2 Air Quality Analysis Results

Station	TSP	SO ²	NO ²	CO
1**	0.4278	0.0047	0.0093	2.3067
2*	0.1958	0.0044	0.0101	2.5033
3**	0.2723	0.0052	0.0177	2.3267
4**	0.4042	0.0052	0.0101	0.4433
5**	0.2795	0.0044	0.0093	0.9867
6*	0.3985	0.0075	0.0169	4.4167
7*	0.9523	0.0075	0.0152	5.6667
Standard	0.33 mg/m ³	0.3 mg/m ³	0.3 mg/m ³	40 mg/m ³

Note: * Urban ** Suburban

Table 17.1-3 Water Quality Analysis Results

Parameter	Unit	Station					Standard for Biodiversity Conservation	
		1*	2*	3**	4*	5**	River	Reservoir/Lake
pH	-	6.50	6.50	6.50	8.00	7.00	6.5-8.5	6.5-8.5
Temperature	° C	25.00	27.00	27.50	28.00	25.50	-	-
SS	mg/l	21.33	19.00	35.00	83.00	31.67	25-100	1-15
TS	mg/l	227.50	220.00	415.00	720.00	368.00	-	-
DO	mg/l	3.90	2.86	5.30	2.10	8.80	2.0-7.5	2-7.5
Nitrate	mg/l	0.19	0.09	0.45	0.24	0.50	-	Nitrogen 0.1 -0.6
Phosphate	mg/l	1.02	2.71	0.19	9.04	0.29	-	Phosphorus 0.005-0.05
BOD	mg/l	36.00	56.00	32.00	88.00	28.00	1-10	-
COD	mg/l	120.00	340.00	98.00	380.00	88.00	-	1-8
Grease / Oil	mg/l	3.60	3.00	1.20	3.30	1.80	-	-
Coliform Bacteria	MPN/100ml	>1600	>1600	>1600	>1600	540	<5000	<1000

Note: * Reservoir/Lake ** River

Table 17.1-4 Vibration Level Survey Results

Station	Peak Vibration Level mm/s	3 – day Average mm/s
1**	0.2 - 1.1	0.4
2*	0.2 – 1.4	0.6
3**	0.2 – 1.4	0.6
4**	0.3 – 1.5	0.6
5**	0.2 – 0.8	0.3
6*	0.2 – 1.4	0.6
7*	0.2 – 1.6	0.5

Note: * Urban ** Suburban

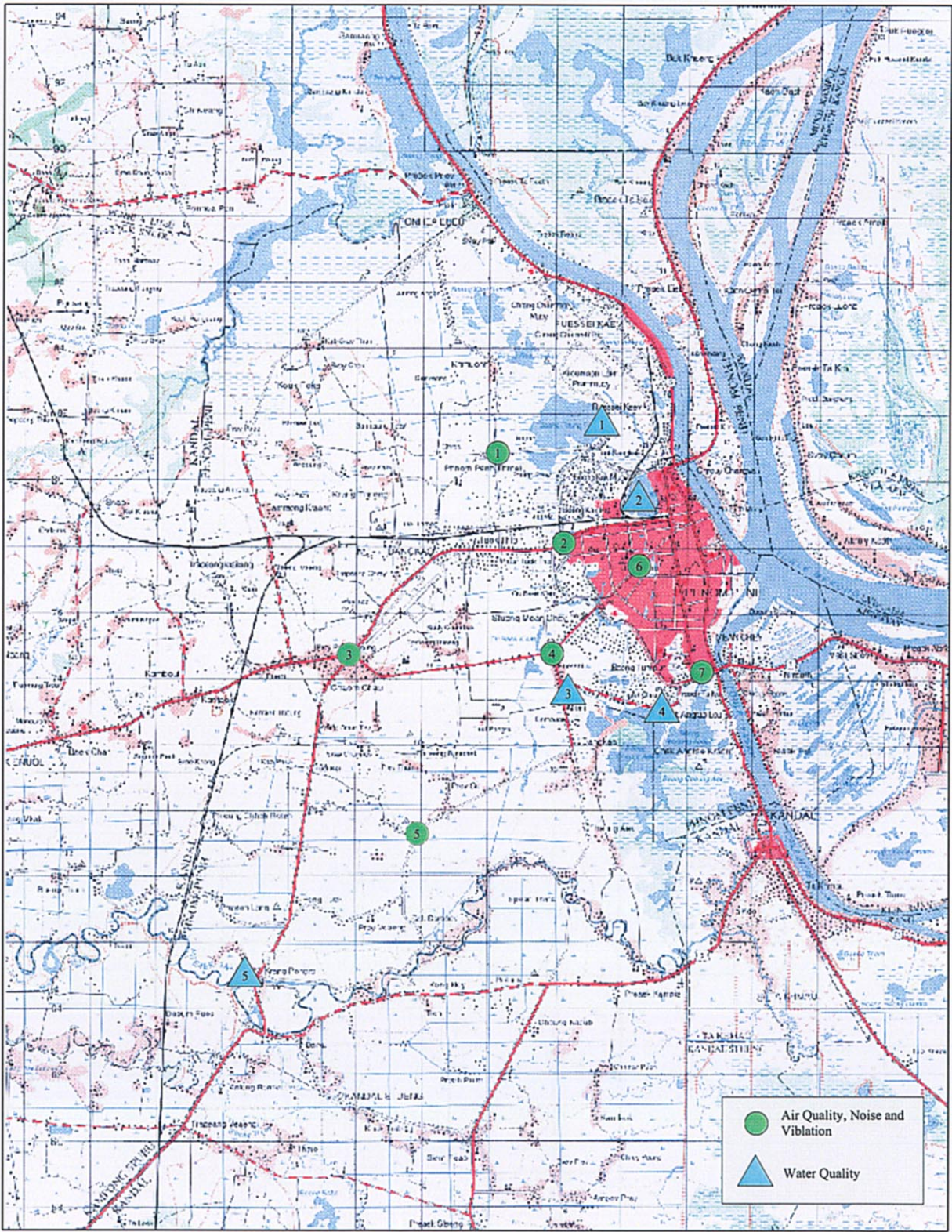


Figure 17.1-1 Pollution Survey Location Map

Table 17.1-5 Noise Level Measurements

Station	LAND-USE	Noise Level – dB(A)		
		06.00 - 18.00	18.00 - 22.00	22.00 - 06.00
1	Agricultural Area	92	86	87
2	Residential mix with industry	90	88	83
3	Residential Area	98	89	97
4	Industry	96	88	92
5	Agricultural Area	86	87	86
6	Commercial Area	100	88	77
7	Commercial Area	95	95	85

Major air pollution survey results show that, the measured TSP values show high rates within the city area. In particular, the crossing area between National Highway No.1 and No.2 (Station 7) shows between two and three times of the standard of 0.33 mg/m^3 . With respect to the suburban area, the measured TSP sometimes exceeds the standard. High concentration is mainly occur in the dry season due to unpaved surface of laterite road. The Pollution caused by SO_2 can be judged as not serious. In spite of the location, all the measured values ($0.0042 - 0.0084 \text{ mg/m}^3$) were far and less than the standard value of 0.3 mg/m^3 . In addition, the concentrations of NO_2 -1hr at all stations are well below the ambient NO_2 standard of 0.3 mg/m^3 . As for the concentrations of CO-1hr, all the measurements are far below ambient CO standard of 40 mg/m^3 at all sampling stations.

The water quality results vary to a large extent between the collected samples. SS values are generally higher than standards in lakes while DO values are high in rivers. Other high values are those of Phosphate, BOD and COD. In general, the water quality in the Study Area is not well suitable for biodiversity conservation and there is a possibility of causing eutrophication problems where inorganic nitrogen and phosphorus exceed the standard values.

Vibration levels in the Study Area are still low in general. The lowest records are during nighttime due to low traffic volumes. On the other hand, noise levels are exceeding the standard values for all measured periods. Old vehicular fleets and motorcycles are the main sources of noise, and strict measures should be applied in order to alleviate this problem.

17.2 IDENTIFICATION OF IMPACTS

For the identification of impacts, the screening and scoping method approved in Cambodia that is the "Qualitative Method Checklist" is applied. Under the screening process, Master Plan Projects are categorized into groups based on their expected environmental impact. All projects are first categorized into two major groups of:

Category 1: Projects with high potential negative impact

Category 2: Projects with low potential negative impact

Table 17.2-1 presents the scoping results of Master Plan Projects that are categorized as those projects with high potential to affect the environment. The project numbers are those of the Master Plan Projects as presented in the Overall Implementation Schedule.

Projects with high potential negative impact are subject to a detailed scoping process through the evaluation levels of:

A: Serious impact is predicted

B: Some impact is predicted

C: Extent of impact is unknown and an examination is needed. Through the progress of the Study, the impact may become clear

D: No impact is predicted and there is no need for EIA.

17.3 EVALUATION OF IMPACTS AND MITIGATING MEASURES

Under this process, the applied factors in order to determine the importance and potential of environmental impact are as follows:

- Number of people subject to the impact
- Extent of the impact
- Impact duration and intensity
- No. of environmental components simultaneously affected by the impact
- Cumulative aspect of the impact
- Irreversible impact
- Mitigating Measures

As a result of this process, the major negative impacts can be predicted. Resettlement and land-use may suffer major negative impact in pre-construction stage on road projects in suburban areas. In addition waste may cause major negative impact in both construction and operation stages. Other minor negative impacts are on economic activities, traffic and public facilities, public health condition, topography and geology, soil erosion, landscape, air pollution and vibration in both construction and operation stages. Table 17.3-1 summarizes the scoping results for each of the three main project packages of the master plan.

17.4 STUDY ITEMS DURING EIA STUDY

Based on the evaluation results of the IEE, it is clear that some projects from each of the three main project packages of the Master Plan require further detail environmental examination and assessment, through an Environmental Impact Assessment (EIA) study.

Other projects of minor improvement works such as road surface improvements and management projects do not require detailed environmental examination due to the low predicted impact to be generated by these projects. It is more effective to group similar projects together in order to prepare items of Reference for the EIA studies. Proposed projects are categorized by project type into three types:

1. Urban Roads
2. Public Transport
3. Traffic Control

The items to be thoroughly investigated and assessed during the EIA stage are:

Category A:

- Resettlement
- Waste and Soil Contamination

Category B:

- Land use and economic activities
- Infrastructure and Public facilities
- Topography and Geology
- Hydrology
- Flora and Fauna
- Landscape
- Air Pollution
- Water Pollution
- Noise and Vibration

Table 17.3-1 Summary of Scoping for Proposed Project Packages

Items	Urban Road Improvement	Public Transport	Traffic Control
<i>Social Environment</i>			
Resettlement	B	D	D
Split of Communities	D	D	D
Land-use	B	B	D
Transport	B	C	D
Infrastructure and Public Facilities	B	B	D
Water Rights and Rights of Common	D	D	D
Archaeological and Historical Attributes	B	D	D
<i>Natural Environment</i>			
Metrology	D	D	D
Geology and Soil	D	D	D
Topography	D	D	D
Hydrology	B	C	D
Flora and Fauna	D	D	B
Landscape	D	C	D
<i>Pollution</i>			
Air Pollution	B	B	B
Water Pollution	C	D	D
Vibration	B	B	B
Noise	B	B	B
<i>Overall Evaluation</i>	B	C	C

Table 17.4-1 Main Items under EIA Study

Environmental Items	Urban Road Improvement	Public Transport	Traffic Control
<i>Social Environment</i>			
Resettlement	B	D	D
Split of Communities	D	D	D
Land-use	D	B	D
Transport	B	C	D
Infrastructure and Public Facilities	B	C	D
Water Rights and Rights of Common	D	D	D
Archaeological and Historical Attributes	B	B	D
<i>Natural Environment</i>			
Metrology	D	D	D
Geology and Soil	D	B	D
Topography	D	D	D
Hydrology	B	D	D
Flora and Fauna	D	C	D
Landscape	D	B	D
<i>Pollution</i>			
Air Pollution	B	C	B
Water Pollution	B	C	D
Vibration	B	B	B
Noise	B	B	B
<i>Overall Evaluation</i>	B	B	C

Evaluation Categories:

A: Serious impact is predicted

B: Some impact is predicted

C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses)

D: No impact is predicted. EIA is not necessary

17.5 MASTER PLAN EVALUATION

The air pollution components of NO_x, CO and HC are estimated for the two cases of Do-nothing and With Master Plan. Results that are presented graphically in Figure 17.5-1 show that there will be significant improvement in the air quality of Phnom Penh Metropolitan Area with the implementation of the Master Plan.

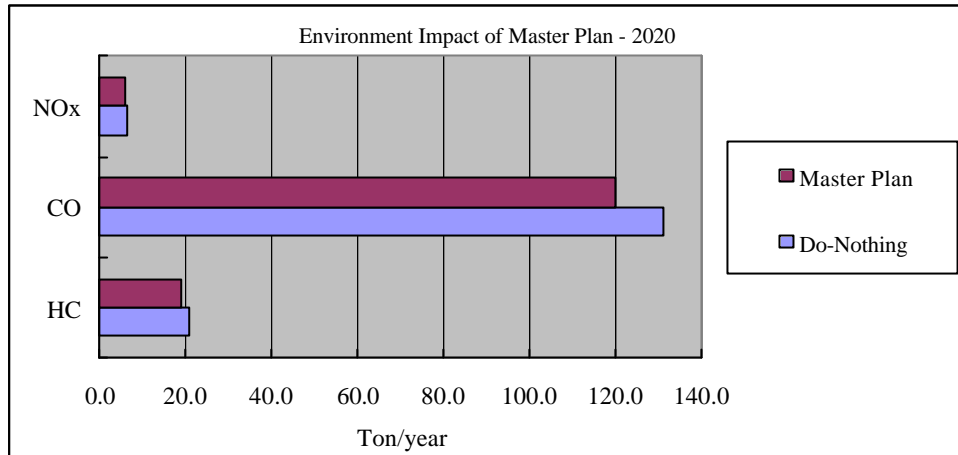


Figure 17.5-1 Master Plan Impact

CHAPTER 18

INSTITUTION AND CAPACITY DEVELOPMENT PLAN

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INSTITUTION AND CAPACITY DEVELOPMENT PLAN

Based on the issues pointed out in Chapter 8 requiring institutional and organizational development and human resources capacity building, a development plan to realize the objectives for increasing capacities of the government institutions and their personnel is proposed in this chapter. The plan is intended for the organizational units and their personnel directly related to the projects proposed in the Study. All the target organizations and staff belong to the Department of Public Works and Transport (DPWT), Municipality of Phnom Penh (MPP), and the plan shall be consistent to the national policy and strategies on capacity building set forth in the draft of the Second 5-Year Socioeconomic Development Plan.

The capacity of institution and personnel referred to in this chapter is defined as the ability of individual or organizational units to perform respective functions effectively, efficiently and sustainably. The development plan is proposed through intensive research to identify and to solve the problem areas within the target organizations and their personnel in terms of performance, efficiency and effectiveness. The discussions relating to institution and capacity building are given in Appendix 18.

18.1 IDENTIFIED PROBLEM AREAS

The identified problem areas facing the DPWT in connection with the implementation of the projects proposed in the Study are as follows:

- Unclear goals and unclear responsibilities of the middle management and engineering (engineer and technician) levels,
- Improper organizational structures to match the changing economic and social environment,
- Insufficient technical skills on each specific field at the engineering level,
- Poor physical working conditions of the personnel at lower levels,
- Low motivation and morale of the personnel at lower levels, and
- Insufficient dissemination of the information on the DPWT activities to the citizens.

18.2 METHODS APPLIED FOR PLAN FORMULATION

The following methods and steps have been applied for the plan formulation.

- (1) Review of the past performance and experience pertaining to the institutional reform and human resources development, referring to the documents such as:
 - First Socioeconomic Development Plan 1996-2000, details of which are presented in Appendix A18.2,
 - Completion Report of Institutional Capacity Building, March 2000, by Norwegian Agency for Development (NORAD), details of which are shown in Appendix A18.3.1,
 - Technical Assistance and Capacity Development in an Aid-dependent Economy, the Experience of Cambodia (WP 15, August 2000), by Cambodia Development Resource Institute (CDRI), details of which are presented in Appendix A18.3.3, and
 - Cambodia: Enhancing Governance for Sustainable Development (WP 14, May 2000), (CDRI), details of which are shown in Appendix A18.3.3.
- (2) Identification of the objectives, policy and strategies of the administrative civil service reforms set forth in the draft of the Second 5-Year Socio-economic Development Plan 2001-2005 and Action Program for 2001-2010, in order to keep consistency with the national framework on these issues. The details of these issues are discussed in Appendix A18.2.

- (3) Intensive hearings and discussions with the executives and counterpart members of the DPWT, and the resident consultants of NORAD, based on the questionnaire on these issues, identifying the problem areas and the needs for the DPWT's institutional and organizational reforms and capacity building of the DPWT personnel.
- (4) Formulation of the plan.

18.3 PLANNING STRATEGIES AND TARGETS

(1) Basic Strategies

As of January 2001, the total number of the DPWT staff was 1,293; of which full-time staff stands at 556 persons and the remaining 735 persons are part-time employees. The organizational structure of the DPWT and the staffing table are presented in Chapter 8.

The ultimate goal of the institution and human resources development plan for the DPWT in relation to the Study is to improve, promote and facilitate the broad-based, sustainable transport system of the Phnom Penh Metropolitan Area, which would contribute to the economic and social growth in the area. The strategies of the plan are summarized to:

- Clarify the responsibilities and functions of the DPWT and its organizational units, which shall be pursued every day,
- Reformation of the organizational structures wherever necessary, so that the DPWT can fully accomplish its functions and responsibilities,
- Improve the efficiency and effectiveness of the organizational performance of the DPWT to better serve the citizens of the Municipality on the development, improvement and maintenance of the transport infrastructure facilities and public transport services, and
- Improve the professional skills of the staff of the DPWT.

(2) Targets

The targets for the capacity building for institutions and human resources of the DPWT related to the Study, in particular, for implementation of the projects proposed in the Study are to:

- Restructure the organization structures to add research, planning and implementation functions,
- Enhance the overall management capacity and civil services of the DPWT, mainly targeted at the executive level,
- Improve the engineering knowledge and skills of the professional staff of the DPWT, in particular, in such fields as urban planning, traffic surveys, road planning, public transport planning, traffic management and natural and social environments, preparation of tender documents and their related fields, for middle management and engineering levels,
- Develop skills in the use of relevant computer software for planning and design of various infrastructure facilities including CAD among the professional staff in DPWT, in particular, at the middle management and engineering levels, and
- Improve the English proficiency of the professional staff, in particular, at the engineering level, in DPWT.

18.4 ORGANIZATIONAL REFORM PLAN FOR INSTITUTIONAL IMPROVEMENT

In order to rectify and solve the identified problem areas on institutional efficiency, the following organizational reform plans are recommended:

- (1) Establishment of a Budget Formulation Unit in the existing Finance and Planning Office of the DPWT which shall be under the direct supervision of the Director:

The Budget Formulation Unit shall formulate not only the fiscal administrative expenses, but also those required budgets for new construction, improvement and repair/maintenance of all the infrastructure facilities, in addition to the budget for Research and Development purposes. Also, the budgetary system of the MPP shall preferably be revised so that annual budgets of all the departments in MPP including those of the DPWT shall be summarized and reviewed at the Department of Finance, and then forwarded to the higher authorities so that these budgets can gradually be secured in the future.

The Unit in the DPWT shall be formed with a staff of about seven (7) members, comprising a manager (chief of division), two (2) accountants, one (1) engineer and three (3) clerks. The Unit shall be responsible for formulation of the administrative expenses and capital investment costs required for development, improvement, rehabilitation and maintenance of all the infrastructure facilities and operations in the DPWT. Also the Unit is to monitor the project-base disbursement for proper implementation. Of course, a close coordination with the similar organs at the Ministry of Public Works and Transport is required, but it is recommended that the budget formulation and disbursement of the DPWT shall be independent at the municipal level to follow the decentralization policy of the central government.

- (2) Establishment of a Public Transport Management Unit in the Transport Office under the supervision of the Deputy Director responsible for the Transport Office:

With the introduction of the public transport system, in particular by the introduction of comprehensive bus passenger transport services in the metropolitan area as proposed in the Study, it is necessary to set up a specialized organizational unit responsible for planning, monitoring and administration of all modes of public transport system in Phnom Penh. The Study is proposing a fleet of about 1,150 buses to cater for about 8.5 % of all passenger transport trips in the year 2,015.

The Unit shall be formed with a staff of about 20 to 25 members, comprising a manager, approximately three (3) public transport planners, five (5) traffic engineers, three (3) transport economists, five (5) surveyors and their assistants.

The Unit will be responsible for the periodic surveys on passenger and cargo transport demands by modes of transport, and the planning of the optimum public transport system and sub-system of each mode for all the routes and zones of the metropolis, with application of transport economy and traffic engineering including traffic management. The Unit is to investigate the existing public transport system in comparison with the planned optimum system, and to administer and improve the existing system. It is also responsible for projection of the future transport demands and to formulate the revised public transport plan alternatives for actual implementation by the various public transporters.

- (3) Establishment of a Laboratory under the direct supervision of the Director:

The functions of the Laboratory is to test the construction materials to be used for various infrastructure facilities such as roads and bridges, public lighting including traffic signals and markings, drainages and sewerages and others, along with the preparation of specifications of the vehicles used for public transport services.

The Laboratory will be responsible for the preparation and up-dating of various specifications on construction materials and equipments to be used for the transport infrastructure facilities of the metropolis, and also the formulation of the guidelines for the implementation

supervisors of the DPWT on various types of construction by the contractors.

There will be a need to secure a new location for the Laboratory having a suitable space and building with required testing apparatuses and tools which shall be further studied on a project basis. Similarly, the staffing of the Laboratory shall be determined based on the study.

- (4) Establishment of a Data Base Formulation Unit in the Technical and International Relations Office

The function of the Unit is to design the various formats for computerized data-bases of the infrastructure facilities, in particular, the roads and bridges inventory logs. The Unit will then formulate these databases, periodically up-dated to reflect the rehabilitation or improvement of such facilities. These inventory logs stored in the databases shall be forwarded to the respective organizational units within the DPWT for full utilization in planning of improvements and maintenance of the infrastructure facilities.

The proper size and staffing together with the required computer system of the Unit shall be determined in detail, after completion of the institutional reform and implementation of the human resources capacity development plan proposed herein.

After completion of the education and training program as proposed in the following section, reformation of the organizational structure of the DPWT shall be planned for better performance of its functions and responsibilities. Such reformation shall take into account the improved and newly developed capacities of knowledge and skills of the DPWT personnel.

- (5) Establishment of an Urban Transport Research Center:

Apart from above organizational reform plan for institutional improvement, it is advisable for the DPWT to have an additional organization, possibly in the form of an urban transport research center. This center is to have a suitable number of staff with professional skills and expertise, and an adequate number of testing and training equipment and tools, and to assume the following functions:

- To monitor the performance of all works performed by each division or office of the DPWT,
- To carry out comprehensive studies on the transport sector in the metropolitan areas, covering infrastructure facilities, public transportation system and traffic management,
- To regularly disseminate the results of the above studies to the relevant divisions or offices of the DPWT
- To plan and execute regular training courses on management and engineering aspects to the DPWT personnel, to the contractors of transport facilities, and transport operators,
- To plan and hold traffic rules and safety programs for the citizens, including school pupils.

However, it seems that there might be a plan for the Ministry of Public Works and Transport (MPWT) to newly establish an autonomous body (Transport Management Authority) with similar functions. In such case, it would be better for the DPWT to use this body.

18.5 HUMAN RESOURCES CAPACITY DEVELOPMENT PLAN

In line with the proposal for organizational reforms as presented above, the most important factor for improvement of the efficiency and effectiveness of the institutions lies in the development of the capacity of human resources of all the staff in the institutions. Therefore, a human resources capacity development plan for selected staff of the DPWT is proposed hereunder.

Basic Methods of Capacity Development

There are many methods to acquire professional skills; management and supervision skills at the

executive level, leadership and engineering skills at the middle management level, and engineering, computer and language skills at the engineering level, etc. The typical methods that are widely adopted and that have proved to be effective are the following:

- In-house class room teaching by expatriate advisors;
- On-the-job training including case study, by expatriate advisors.

Target Organizational Units and Skills Related to Study

The target organizations for efficiency improvement and for personnel skill development are the following units and their staff in the DPWT:

- Department Secretariat including Deputy Directors,
- Road and Bridge Division,
- Transport Office,
- Public Lighting Division
- Technical and International Relations Office, including Project Management Unit,
- Finance and Planning Office, and
- Administration, Personnel and Human Resources Office.

The field of skills to be improved shall cover, but not limited to, the following:

- Top management, institution and organization planning,
- Linguistic skills,
- Urban planning including relocation plan,
- Road planning including network plan,
- Public transport planning,
- Transport economy,
- Traffic management,
- Traffic surveys and analysis,
- Natural and social environments,
- Computer (CAD) operation, and
- Tender documentation and evaluation.

Organization for Plan Implementation

A group of expatriate consultants shall be assigned to provide the technical and managerial assistance for the improvement of the capacity building of the related organizational units and their personnel of the DPWT. The expatriate consultants will coordinate with the local consultants, such as the Cambodia Development Resource Institute, for the language improvement-training plan.

A joint Project Steering Committee consisting of members of concerned authorities in the MPP shall be organized to direct the plan implementation and evaluate the result by periodical monitoring of the implementation activities.

Consultants Requirements and Training Period

At least 8 qualified expatriate consultants shall work in advisory capacity to the DPWT, MPP to provide consulting services for implementation of the development plan. The specific expertise of the consultants that shall be required for the plan, as indicated in Table 18.6-3, will include urban planning, traffic surveys, road planning, public transport planning, traffic management and natural and social environments, together with expertise in the top management and leadership and computer usage including the CAD system. Local consultants will provide the language proficiency training. The total input will be about 40 man-months, 27 man-months for the expatriate Consultants and 13 man-months for the local consultants.

The training with the assistance of the consultants is to be divided into two (2) phases in two (2) years (one (1) year in each phase). The first phase will cover the basic course of each field of expertise as mentioned above, and the second phase will cover the advance course including case

studies. In each phase, a top management course for the executive level and a computer course for the middle management and engineering levels are to be conducted.

Based on the above intensive training program, selected DPWH staff will participate in on-the-job training. The selected DPWT staff will be those in charge during the period of the implementation of the project proposed in the Study.

Training Programs

There will be about 120 officers in the DPWT as the candidate participants of the training programs with five (5) officials at the executive level, 27 officers at middle management level and 91 engineers and technicians at engineering level. In order to accomplish fruitful training results, it is suggested that the numbers of the participants at middle management and engineering levels shall be carefully selected to form a group of approximately 7 to 10 persons and 10 to 15 persons respectively.

All fields of training programs have two (2) phases, one for dissemination of the basic knowledge and required level of skills in the form of in-house training, and other for accomplishment of advanced knowledge, know-how, and planning and implementation of the improvement measures, mainly through case studies and discussions among the attendees with guidance by the consultants. The case studies shall be selected from those projects proposed in the Transport Master Plan to be implemented in the very near future. The results of the case studies shall be evaluated by the consultants with recommendations for institution and organization development of the DPWT, and also for the future training program on human resources improvements at the DPWT.

The fields of training cover eleven (11) areas of skill as described above, and the training program is summarized in Table 18.5-1, with details in Appendix A18.6.

Table 18.5-1: Human Resources Capacity Building Program

No.	Course	Participants			Training Program	
		Ex	Mm	Eg	1st Phase	2nd Phase
1	Inst. & Organization Improvement	O	O		Clarification of function and duties of each organizational unit. Stipulation of category-wise job description. Top and middle management	Leadership strengthening, delegation of authority, morale motivation, institutional performance indicators formulation
2	Linguistic Skills	O	O	O	Reading, writing, speaking and hearing skill-up of English: Basic course	Reading, writing, speaking and hearing skill-up of English: Advanced course with role playing
3	Urban Planning		O	O	Identification of existing conditions, various surveys, land-use pattern, development directions and other planning data collection	Case study of urban planning at selected areas of MPP, divided into several groups
4	Road Planning		O	O	Fundamentals of road planning like road inventory, topographic and other surveys, design standards, alignments, etc.	Case study of road designs at selected road sections, including bridge, culvert and other structures
5	Public Transport Planning		O	O	Basic flow of public transport plan based on total traffic demands, modal split, optimum transport mode for cargo and passenger	Case study on actual passenger public transport mode, based on the data obtained and analyzed for experimental bus service
6	Transport Economy Plan		O	O	Basic concept of transport economy such as total transport costs and benefits and their components, traffic assignment, modal split, etc.	Case study to grasp the concepts of transport economy, using the materials by TMP
7	Traffic Management Plan			O	Traffic regulations and rules and basic knowledge of traffic management and control with use of various control devices and methods	Case study of traffic management at selected street intersections, dividing the participants into groups
8	Traffic Surveys Methods			O	Basic methods of traffic surveys, such as volume count, intersection movement, cordon line and screen line, origin/destination, and their analyses	Case study of the data analysis methods, using the data obtained in TMP
9	Natural & Social Environment			O	Existing laws and regulations on environmental protection and preservation, Effects and study components of IEE & EIA	Case study of IEE at some of the selected areas in the MPP
10	Computer (CAD) Operation			O	Exercise of Auto-CAD applications applied on streets, with supplementary practice of MS Word and Excel by specialist guidance	Case study of road network designs at selected MPP areas
11	Tender Document & Evaluation		O	O	Procedure and formalities of the tender, with the contents of typical tender and bidding documents, together with the standard bidding	Case study of the special specifications of the tender documents of street improvement projects, and related evaluation method

Source: JICA Study Team

Remarks: 1) Ex = Participants at Executive Level of the DPWT, 2) MM = Participants at Middle Management Level, 3) Eg = Participants at Engineer & Technical Levels

4) TMP = The JICA Study on the Transport Master Plan of the Phnom Penh Metropolitan Area.

Follow-up Evaluation

After completion of each phase, the DPWT and the organizational units directly related to implementation of the projects proposed in the Transport Master Plan shall be carefully guided by the consultants through each field of training to receive insight and recommendations on the following:

- Evaluation on the performance of each organizational unit, and the entire department;
- Problem/constraint areas on the existing organization and management;
- Possible and practical measures to overcome the problems and constraints;
- Suggestions for development of the capacity of human resources and improvement of personnel performance, and;
- Recommendations on the improvement of institutional capacity and efficiency for good governance.

It is to be emphasized that training aimed at development and improvement of the capacities of institutions and human resources or personnel performance shall be continued approximately on a 3-year cycle to cater for the other staff of the DPWT, to cope with rapidly changing socio-economic environment in the Kingdom of Cambodia.

18.6 STAGING PLAN

The organizational reform plan and training program are recommended to be urgently put into implementation as follows:

(1) Preliminary Cost Estimate

Institution and Organization Development (Organization Reform)

For the cost estimation of the proposed organization reform, the followings are assumed:

- The personnel needed to establish the proposed new organization are transferred from the existing organizations of the DPWT, and no additional cost is necessary.
- The office spaces for the new organizations are available within the DPWT premises without substantial cost.

Consequently, the cost necessary to establish the new organization mainly consists of the cost of the necessary equipment. Table 18.6-1 summarizes the cost for the proposed institution and organization development.

Table 18.6-1: Cost for Establishing New Organization

Unit: US\$1,000

Name of Proposed Organization	Necessary Equipment	Cost	Remarks
Budget Formulation Unit	8 Personal Computers	20	Work station computer is shared by all the units
Public Transport Mgm`t Unit	15 Personal Computers	30	
Laboratory	Testing Equipment for Soil, Concrete and Asphalt	300	
Data Base Formulation Unit	1 Work Station Computer 10 Personal Computer	50	
Total		400	

Human Resource Capacity Building (Training)

In estimating the cost for the proposed human resources building, the followings are assumed:

- The room for training is available in the DPWT premise without cost.
- The computers used in the new organizations can be used in the training.

Accordingly, the main part of the cost of the proposed training is fee for the consultants. Table 18.6-2 shows the cost for the training based on the Consultant Assignment Schedule in Table 18.6-3.

Table 18.6-2: Cost of Proposed Training

Unit: US\$1,000

Consultant	Necessary Man-Month	Unit Cost	Amount
Expatriate	26.5	18.0	480
Local	12.5	1.6	20
Total	39.0		500

Implementation Schedule

The human resources capacity building training program is proposed to be implemented from year 2002 to year 2003 for a period of two (2) years, and the institution and organization development is to be implemented from the middle of year 2003 to the middle of year 2004 for one (1) year after completion of the training program, when the capacities of the DPWT personnel have substantially improved with regard to their performance and professional skills.

Table 18.6.3: Consultants Assignment Schedule

No.	Consultant Team	1st year												2nd year						Total M/M			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6				
1	Team Leader/Top Management	0.5		1	1	1										0.5							4.0
2	Urban Planning Sepcialist			1	1	1																	3.0
3	Road Planning Sepcialist					1	1	1															3.0
4	Public Transport Specialist							1	1	1													3.0
5	Transport Economy Specialist									1	1	1											3.0
6	Traffic Survey Specialist											1	1	1									3.0
7	Traffic Management Specialist												1	1	1								3.0
8	Computer Specialist	0.5						1	1					1	1								4.5
	Sub-total	1	0	2	2	3	1	3	2	2	1	2	2	3	1	1.5	0	0	0				26.5
9	Linguistic Specialist (Local)	0.5		1	1	1	1	1	1					1	1	1	1	1	1	1			12.5
	Total	1.5	0	3	3	4	2	4	3	2	1	2	2	4	2	2.5	1	1	1				39.0

Source: JICA Study Team