14.4.2 Initial Examination of Environmental and Social Impact

(1) Social Environment

1) Involuntary Resettlement

Land acquisition will be required if the construction of a wastewater treatment plant with the size of 15 ha and a water treatment plant proposed in the Master Plan will be implemented. The proposed site for the wastewater treatment plant is rice field on the border between Siem Reab and Chreav communes. The picture below (left) shows the proposed site. As the picture shows, some houses are sparsely located. Therefore, location setting should be carefully done to minimize possibilities of resettlement. The site for the water treatment plant has not been considered.

The houses and buildings on the proposed new roads sites will be affected if the roads will be constructed. Rough locations of the roads are shown on the map below, and it is estimated that about 200 houses/buildings will be affected by the new road constructions scheduled by 2012 when the magnified map was checked. Therefore, the sites should be carefully set to minimize the impact on the existing buildings/houses, and avoid relocation of buildings/houses as much as possible.

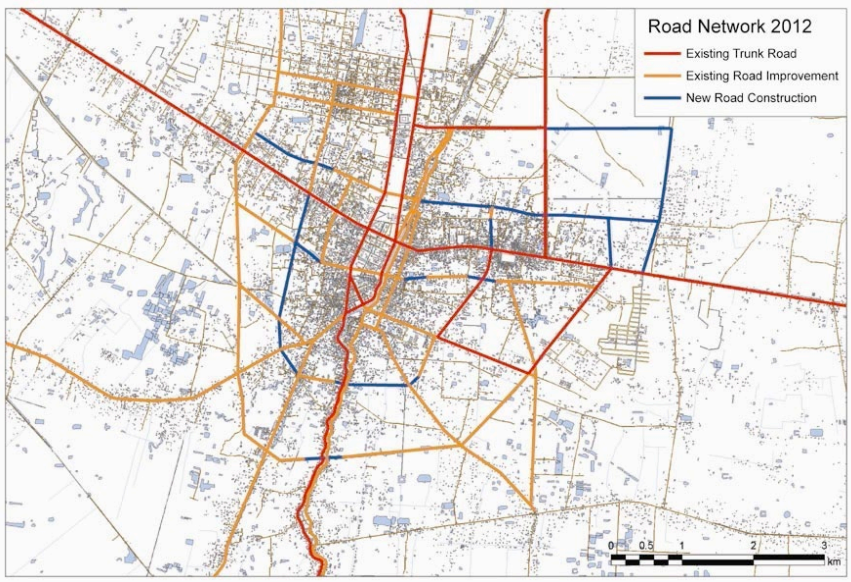


Figure III.14.7 Principal Road Network in 2012
Source: JICA Study Team

Improvement of the Siem Reap River is included as a component of the proposed project. As shown in the picture below (right), some illegal occupants live in the proposed improvement area (cf. Figure III.14.1). If the Siem Reap River will be improved, these illegal occupants will be relocated.

Proposed Site for Wastewater Treatment Plant

Illegal Occupants living near Siem Reap River in the South of City Center

Estimation of resettlement number cannot be done because accurate locations for the proposed projects have not been decided. To avoid involuntary resettlement, careful consideration for site selection and consultations with stakeholders are imperative. If resettlements cannot be avoided, resettlement plans and compensation should be set with agreements from the parties concerned.

2) Local Economy Such As Employment and Livelihood, etc

As mentioned above, a 15 ha of land, mainly rice fields, is proposed for the wastewater treatment plant. The land for the water treatment plant has not been proposed, but it is anticipated that a cultivated land will be used for the plant construction. If the lands will be acquired for the plants, the farmers working for the land will lose their income bases. Therefore, some countermeasures to compensate for their loss of incomes and to guarantee their livelihood need to be considered.

The projects that have a possibility to change the flow and flow volume of the Siem Reap River might affect the habitat of Lake Tonle Sap and a local fishery. Therefore, appropriate measures need to be taken for those projects to minimize the impact on Lake Tonle Sap.

3) Land use and utilization of local resources

Construction of roads, water/wastewater treatment plants, landfill requires land acquisition. Once the lands are acquired, the land will be used for another purpose. The land acquired will be mainly cultivated land. Therefore, production of some agricultural products might be decrease though the amount and the impact on market will be limited.

To minimize impact on local resource utilization, sites for the relevant projects should be carefully selected and set based on the surveys on land use and resources produced on the land.

4) Cultural Heritage

A Royal Decree approved in May of 1994 defines the initial implementation of zoning and specifies five categories of protected zones in Siem Reap/Angkor Region. The details of each zone are described in Table III.14.5. Projects located in Zone 1 and 2, the area that deserves high level of protection, are not suggested in the Master Plan, but

some of project components, such as improvement of Siem Reap River, installation of storm water pipe and trunk sewer, and groundwater development are planned in Zone 3 (the valley and mouth of the Siem Reap River is categorized as Zone 3), the area that is subject to regulations to control damaging and disruptive activities. Therefore, the locations of the project components should be carefully examined, and information of the projects needs to be disseminated clearly.

The Royal Decree designated whole of Siem Reap Province as Zone 5, the area that archaeological assessments are required before proposed projects are implemented. Therefore, the locations of the proposed projects should be selected to avoid impacts on cultural heritage. An archaeological survey of the specific sites also needs to be conducted if necessary before implementing projects. Artifacts may be found during construction. Therefore, guidelines need to be prepared to identify and to preserve unearthed artifacts. Careful attention should be paid to the surrounding areas of Phnom Krom and Wat Athvea, both are categorized as Zone 4 (the area subject to regulations to control damaging and disruptive activities as Zone 3) and located independently.

As shown in Table III.14.14, there are thirty-six pagodas in Siem Reap District. Each pagoda is a spiritual and religious symbol of the nearby residents. In addition, each pagoda has a pagoda commission, and the commission plays an administrative role in the area. Considering the importance of pagoda, locations for proposed facilities should be carefully decided to minimize the impact on pagoda to avoid disputes with the residents.

Table III.14.14 Pagodas Located in Siem Reap District

No.	Name of Pagoda		Location	
	Formal Name	Informal Name	Commune	Village
1	Kesraram	Thamayuth	Svaydangkum	Salakanseng
2	Reachbo	Bo	Salakamreuk	Watbo
3	Preah Prumrath	Prumrath	Svaydangkum	Mondol 1
4	Ponhean aranh somnos	Chaek	Svaydangkum	Svayprey
5	Prasat intrea	Kokpatri	Svaydangkum	Kruos
6	Svay	Svay	Salakamreuk	Svay
7	Damnak	Damnak	Salakamreuk	Watdamnak
8	Preahinkosei	Watleu	Slakram	Traing
9	Preahinkosa	Watkandal	Slakram	Boeungdounpa
10	Polangka	Poleu	Slakram	Slakram
11	Atithmasan	Thmei/Kbalkhmoch	Kokchaek	Trapaingses
12	Prasatkokchaek	Kokchaek	Kokchaek	Veal
13	Norkorinbatborei	Angkorkhangtboung	Norkorthom	Kravan
14	Inbatborie	Angkorkhangcheung	Norkorthom	Srasrang
15	Prin	Prin	Chreav	Chreav
16	Monysovann	Kongmoch	Siem Reap	Karkranh
17	Pobanteaychey	Pokrom	Siem Reap	Po
18	Atwea	Athwea	Siem Reap	Krasangroleung
19	Aranhsakor	Aranh	Siem Reap	Aranh
20	Phnomkrom	Phnomkrom	Siem Reap	Chheungphnom
21	Khnorngphnom	Khnorngphnom	Siem Reap	Phnomkrom
22	Chanlorng	Chanlorng	Srangae	Chanlorng
23	Chetdei	Chetdei	Sambuor	Chrey
24	Aranhhamvan	Preythom	Srangae	Preythom
25	Puthannorkoreach	Norkoreach	Srangae	Kaksekam
26	Ketkalyaram	Kanlyaram	Norkorthom	Srasrang
27	Vihearprampilveng	Prampilveng	Kokchaek	Angkorkrao
28	Svaydangkum	Svaydangkum	Siem Reap	Svaydangkum
29	Preahsear	Preahsear	Kokchaek	Kokbeng
30	Teppranam	Teppranam	Kokchaek	Angkorkrao
31	Korngchhum	Korngchhum	Kokchaek	Kokdoung
32	Sangtuk	Sangtuk	Kokchaek	Angkorkrao
33	Kokthlork	Kokthlork	Kokchaek	Kokbeng
34	Preahintep	Intep	Kokchaek	Angkorkrao
35	Prasattramneak	Tramneak	Slakram	Chongkaosuo
36	Popideum	Potpopideum	Slakram	Botwea

Source: Provincial Department of Cult and Religion

Reconstruction of the French Bridge is proposed in the Master Plan. The bridge is designated as an important cultural property, but it causes traffic congestions and does not have sufficient structural strength. Therefore, appropriate preservation measures need to be taken. If the bridge will be renewed to solve the problems, appropriate preservation measures need to be taken. Transferring the existing one to a new place with small traffic volume is one of the solutions for its preservation.

5) Local Conflict of Interests

A land use plan will be included in the Mater Plan. It is not clear whether the land use plan will be adopted or not, but the plan might lead to speculation in land. Local conflict of interest will occur if there is no restriction on the use of monetary and political powers to acquire relevant land. Individual landowners might be coerced to give up their lands if relevant laws and regulations are not appropriately enforced. The impact is small if institutional arrangement is set and relevant laws and regulations are strictly enforced. To avoid local conflict of interest at an earlier stage, consultations with stakeholders including landowners with small portion of land should be held until all the stakeholders agree to the land use plan before it is finalized.

6) Water Usage or Water Rights and Rights of Common

The estimated amount of groundwater consumption is 6,115 ㎥/day in Siem Reap District. It is estimated that this intake amount does not reduce the volume of groundwater because the maximum capacity of groundwater is estimated to be 15,000 ㎥/day according to the JICA Study on Water Supply System of Siem Reap Region. However, there is a possibility that the groundwater aquifer is not sufficiently recovered in some areas because the locations of the wells are concentrated in the central area of the district. To restrict ground water intake, establishment of system for registration of wells is proposed in the Master Plan. The system will lead to the restriction of groundwater intake, and hotels will be mainly subject to this system. Therefore, careful consultation and coordination have done before the system is set.

The rule for water allocation by sectors has not been completed in Cambodia. Water of the West Baray is currently used for agriculture. The study funded by Indian government proposed the usage of surplus water of the West Baray for water supply in city center, but coordination among related ministries and departments is strongly required because the rule for water allocation by sectors has not been prepared in Cambodia. This situation should be taken into account when the proposed projects on transmission pipeline development for water of the West Baray and on water resource development of Northeast Baray.

(2) Natural Environment

1) Groundwater

Most of the local people gain safe water from groundwater wells. About 90 % of wells are deep well with 20-30m depths, and the water is taken by handy pump. Poor families with no deep wells use water taken from shallow wells. Therefore, groundwater is critical for the lives of local people. A development of sanitary landfill is proposed in the Master Plan. Because the leachate might be generated from disposal

site and penetrate into groundwater aquifer, location of the landfill and leachate treatment measures should be carefully considered to prevent contamination of groundwater. Geological survey on the soil of the planned disposal site should be also required to check the permeability of the soil.

Development of groundwater near Lake Tonle Sap is proposed in the Master Plan. According to the survey conducted by SAWAC, a local consultant company, in 2000, groundwater quality in Chong Khnies Commune located near Lake Tonle Sap is relatively good. Table III.14.15 shows the result of the survey. The result indicates that the quality of groundwater meets the WHO criteria except Manganese (the survey on arsenic had not done). Therefore, the possibility of impact on human health is considered to be low though tests for groundwater quality need to be conducted before implementing project.

Table III.14.15 Result of Groundwater Quality Test in Chong Kneas Commune

Parameter	Test Result	WHO Criteria	
		Health Criteria	Consumer Criteria
Alkalinity (mg/L)	4.00	None	None
Manganeses (mg/L)	0.20	0.5	0.1
Fluoride (mg/L)	0.85	1.5	None
Iron (mg/L)	0.06	None	0.3
Ammonia (mg/L)	0.01	None	1.5
Nitrate (mg/L)	11.00	50 (acute)	None
Nitrite (mg/L)	0.013	3 (acute) 0.5 (chronic)	None
pH	6.3	None	None
Conductivity (μS/cm)	62	None	1500
Turbidity (NTU)	1	None	5

Source: Chong Kneas Environmental Improvement Project, Draft Final Report Vol. 6

The scale of the proposed groundwater development project has not been set, but a large volume of groundwater will be pumped up if the project started the operation. It is estimated that the quantity of groundwater and the volume of recharge water in the project site is sufficient, but a large volume of groundwater intake might affect the groundwater usage near the project area due to the lowering of groundwater table and the exhaustion of nearby wells. In addition, land subsidence in the alluvial and clayey layers might be caused. Therefore, hydro-geological survey (groundwater capacity) and pumping test needs to be conducted to assess the impact sufficiently and carefully before the project is implemented. Acquisition of drinking water is critical in the study area, especially in Chong Khnies Commune located near the Tonle Sap Lake where about 40% of people buy drinking water from the middlemen who gain the water from the wells located near Phnom Kraom. This situation should be carefully considered to minimize negative impact.

2) Hydrological Situation

Dredging of North East Baray and improvement of river shape near the lake are included in the Master Plan as components of the proposed project. The purpose of the project is to supply service water. Securing of water is a critical factor for sustainable development of the study area, but the impact on hydrological situation on North East Baray and the nearby river need to be conducted prior to the project implementation if it will be adapted.

Riverbed dredging of the Siem Reap River is included in the Master Plan as a component of the proposed project. The purpose of the project is to improve environmental flow of the Siem Reap River because stagnant river flow is considered to cause deterioration of water quality. However, it is expected that dredging of riverbed will change hydrological situation of the Siem Reap River. The water of the Siem Reap River runs into Lake Tonle Sap that is designated as Men and Biosphere Reserve by UNESCO and its biodiversity has a significant environmental value. Therefore, hydrological studies including hydraulic study need to be conducted sufficiently focusing on impacts caused by the change of river flow and flow volume.

Construction/installation of new storm water pipes and drains is proposed in the Master Plan to improve drainage in the study area. The existing drainage system acts as a combined sewer system for both domestic wastewater and storm water, but sewage ends up in the system due to due to low soil permeability. The proposed drainage system expected to contribute to solve the problems, but the construction of new pipes and drains affect the existing drainage system. Therefore, hydrological studies need to be done to prevent negative impacts by constructing new pipes and drains. Providing storm water outlets to the Siem Reap River is also proposed, and it might affect flow volume of the Siem Reap River. Though the impact is limited in the rainy season, hydrological study needs to be conducted to clarify the impact.

3) Flora, Fauna and Biodiversity

A detailed survey on flora and fauna has not been conducted, but endangered species have not been reported in the portion of the study area with relatively rich natural resources as described in 14.1.4. In addition, the northern part of flooded lake zone in the study area has been mostly converted to cultivated land. Therefore, it is anticipated that the impact on flora and fauna caused by construction activities of the proposed projects is limited

Special attention should be paid to the impact on Lake Tonle Sap, the habitat of 300 or more species of fish, 225 species of birds and about 200 species of plants. According to the UNDP biodiversity analysis (2001), 11 species of reptiles and 22 species of mammals are on the IUCN (International Union for Conservation of Nature and Natural Resources) red list, and 22 species of bird is listed as the IUCN threat categories in the Tonle Sap area. About 15 endangered species of bird habitat in Preak Toal (outside of the study area) located in 35 km southwest of the district center (cf. Table III.14.16). The projects that have a possibility to change the flow and flow volume of the Siem Reap River might have impacts on the habitat of Lake Tonle Sap. Therefore, implementation plan of the projects should be carefully set to minimize negative impacts, and the projects should be reconsidered if serious and irreversible impact is anticipated.

Table III.14.16 Endangered Bird Species in Preak Toal

	Name	Status
1	Spot-billed pelican	It nests in mixed colonies with other large waterbirds in Preak Toal (over 700 pairs).
2	Black-headed ibis	The largest colony in Southeast Asia, over 200 pairs.
3	Greater adjutant	The most endangered stork. Around 40 pairs breed in Preak Toal.
4	Lesser adjutant	40 pairs breed in Preak Toal.
5	Asian openbill	Over 1,500 pairs nest in densely packed colonies in Preak Toal.
6	Black-necked stork	Extremely rare in Asia.
7	Painted stork	Over 1,000 pairs congregate at Preak Toal. The largest colony in Southeast Asia.
8	Oriental darter	Starts to nest during the floods in Preak Toal (200 pairs)
9	Masked finfoot	Secretive species nesting during the wet season.
10	Grey-headed fish eagle	Internationally significant.

Source: osmose

4) Global Warming

Construction equipments and vehicles for construction work will emit CO2 though the emission volume is small. To minimize the emission of CO2, fuel efficiency needs to be raised. Therefore, the equipments and vehicles should be appropriately maintained, and construction schedule should be carefully planned to use equipments and vehicles efficiently.

Expansion of the existing power station, installation of a new diesel generator, and supply of electricity form Thailand are proposed in the Master Plan to cope with the demand increase in the study area. Increase of power supply leads to increase of CO2 emission. The emission will be offset to some extent because the projects are planned on the premise that individual power sources, such as hotel, will shift the supply from EdC, but energy efficiency should be taken into account when the details of new facilities are set. At the same time, appropriate regulations or economic measures need to be considered and implemented to restrict demand of electricity. Incentive measures are also required in the near future to shift the power source from generators to environment friendly energy based sources.

Operation of wastewater treatment plant and water treatment plant will contribute to increase of CO2. Therefore, energy efficiency should be considered when the details of those plants are decided. Further, landfill gas mainly composed of methane and CO2 might be generated because of biological decomposition in a disposal site if proposed new landfill site is constructed. Therefore, facilities for removing gas need to be required.

(3) Pollution

1) Air Pollution

Dust will be generated from construction activities for the proposed projects. In addition, exhaust gas will be emitted from construction vehicles at the project sites. The dust will be precipitated by heavy rain during the rainy season, but appropriate measures need to be taken to control the dust in the dry season. Regular watering needs to be done to minimize the volume of dust. Other countermeasures also need to be considered to decrease dust generation, such as covering of construction materials. Special attention should be paid to new road construction or road expansion projects that will generate a large volume of dust because of the use of a large quantity of earth

and sand. The impact of exhaust gas from construction vehicles is estimated to be limited, but construction equipments and vehicles should be maintained appropriately and construction should be evenly scheduled to minimize the impact of exhaust gas on the surrounding environment.

Emission of SOx, NOx and other pollutants will increase if the existing power station is expanded and a new diesel generator is installed. The impact of the emission increase on air quality is anticipated to be limited judging from present situation. However, studies need to be done on wind direction, wind speed, atmospheric stability and simulation of the atmospheric dispersion of pollutants to assess accurate impact because some houses and hotels are located near the proposed sites as shown in the pictures below. Installation of some equipment, such as scrubbers, might be required to reduce emission of pollutants, if necessary.

Spontaneous landfill fire might occur if the proposed new landfill is established. The fire generates a large volume of smoke and harmful gas. Therefore, soil should be covered daily to minimize occurrence of landfill fire.

Existing Power Station (new)

Site for a diesel power generators

2) Water Pollution

During construction period, topsoil might flow out from the site for land preparation or road construction in the rainy season, then turbid water might run into the ambient water bodies. Because local people including small children sometimes bathes in the surrounding water bodies, appropriate measures need to be taken to minimize topsoil erosion and turbid runoff. Usage and storage of hazardous/toxic materials should be carefully controlled to prevent mixture of the materials and rainwater runoff of the mixed water if the materials will be used.

Provision of storm water outlets directly the Siem reap River is proposed in the Master Plan to improve drainage in the town center areas along the river. The outlets might potentially increase the level of water pollution in the limited portion of the river, but the runoff would be diluted with a large volume of river water in the rainy season. Wastewater management system is proposed by zone in the Master Plan, and most of the wastewater will be discharged to irrigation canals upstream of Lake Tonle Sap. The lake is designated as a biosphere reserve, the treated water should meet at least the standard set by the sub-decree on water pollution control.

Leachate might be generated from the proposed landfill site, and if the leachate flows into the surrounding water bodies, the water will be contaminated. Therefore, treatment ponds need to be prepared to treat the leachate.

3) Soil Contamination

Contamination of materials for land preparation and road construction should be checked in advance. In addition, construction waste including hazardous/toxic substances needs to be appropriately disposed to avoid soil contamination.

If leachate from the proposed landfill site penetrated into the ground, soil nearby the site might be contaminated. To avoid soil contamination by leachate, geological survey needs to be conducted to test the permeability of the soil at the landfill site. If the permeability of the soil is high, some measures need to be considered to prevent leakage and penetration of the leachate into the ground. The proposed landfill should be designed to accept only non-industrial wastes and a system needs to be established to treat medical and industrial wastes separately from non-industrial waste to avoid soil contamination.

4) Solid Waste

A certain amount of construction wastes, such as demolition waste, debris and surplus soils, might be generated during the construction period of each of the proposed projects. The waste needs to be appropriately disposed. Therefore, waste collection and management system should be established with securing disposal sites before the construction starts.

Sludge from the proposed wastewater treatment will be used for horticulture, agriculture and land filling. Land for drying sludge is required, but waste will not be generated if the sludge will be actually reused.

5) Noise and Vibration

Construction equipments and vehicles will cause noise and vibration. To minimize the impact of noise and vibration, construction schedule and working hours should be carefully set, and periodical maintenances need to be done. Installation of acoustic walls or sheets should be considered if necessary (especially if construction activities will be implemented near public facilities, such as school and hospitals). In addition, several routes need to be established for the operation of construction vehicles.

Expansion of the existing power station and installation of 7MW diesel generators proposed in the Master Plan will raise the level of noise and vibration in the vicinity of project site. The noise and vibration levels of the nearby houses located in 100 m from the existing power station with 10MW capacity is predicted to be 49.9 dB (A) and 39.1 dB (A) respectively according to the basic design study on the project for Siem Reap generating facilities. This noise level is below the noise of background of common residence area, and the vibration level is intangible for most of the persons. The scale of expansion has not been decided, but the combined noise and vibration levels of the existing one and expanded one will be relatively low with appropriate mitigation measures judging from the estimated present noise level.

The level of noise and vibration might go up near the sites of the planned new roads. The impact is anticipated to be small because traffic volume will be dispersed with the new roads, but establishment of buffer zones might be necessary in some portions of the sites.

6) Ground Subsidence

A project on ground water development in Tonle Sap area is included in the Master Plan. Groundwater development might cause ground subsidence because of pumping up of groundwater. Therefore, hydro-geological survey and simulation of groundwater drawdown need to be done accurately and sufficiently to anticipate the possibility of ground subsidence before the project is implemented. In addition, fluctuations of ground and groundwater levels need be studied with installation of observation wells. Recovery of groundwater level should be also studied. If ground subsidence is anticipated, the contents of the project should be reconsidered.

Periodical survey on ground subsidence needs to be conducted by installing observation facilities and equipments during and after operation period.

7) Offensive Odor

Offensive odor will be emitted from the proposed landfill site because of decomposition of organic waste. To mitigate the impact of offensive odor, the location of landfill needs to be decided taking into account of wind direction and speed. Soil cover on landfill site should be done on daily basis to minimize emission of offensive odor during the operational period.

Establishment of a wastewater treatment system is included in the Master Plan. Offensive odor might be generated on the process of septage treatment and sludge treatment. Therefore, the location of the treatment facilities needs to be carefully decided taking into account of the distance from nearby communities and wind direction.

14.5 Mitigation Plan of Predicted Impacts of the Master Plan

A mitigation plan of the predicted impacts of the Master Plan needs to be established to mitigate negative social and environmental impact caused by implementations of the projects. The plan is to provide inspection and monitoring on environmental/social conditions and mitigation measures during pre-construction, construction and operation period.

EIA or IEIA on each of the projects proposed in this Master Plan needs to be conducted during feasibility study and detailed design if it is required by the legal framework of environmental and social conditions in Cambodia.

14.5.1 Environmental Mitigation Measures

(1) Pre-Construction Period

1) Consultation with Stakeholders

To avoid local conflict of interest at an earlier stage, consultations with stakeholders including landowners with small portion of land should be held until all the stakeholders agree to the land use plan proposed in the Master Plan.

2) Careful Site Selection for Each Project

Sites for each of proposed projects should be carefully selected to minimize relocation and avoid involuntary resettlement, especially in the case of the projects requiring vast land area, such as wastewater treatment plant, water treatment plant and road construction. Consultations with stakeholders are imperative on the site selection process. If resettlement cannot be avoided, appropriate resettlement and compensation plans need to be established with agreements from the parties concerned.

3) Archaeological Investigation

The study area covers the protected cultural zone defined by a Royal Decree, and an archaeological impact assessment is required for the project proposed in the zone before its implementation. Therefore, archaeological investigation needs to be conducted during pre-construction period. When an archaeologically significant finding is reported, appropriate measures need to be taken.

4) Securing Alternative Jobs for Landowners of the Project Sites

Alternative jobs need to be secured, if the landowners of the acquired project sites gain income directly form activities based on the land. This measure should be taken even if the acquisition is done based on the agreement to sustain poor households.

5) Groundwater Quality Test

Suitability of groundwater near Tonle Sap Lake for drinking needs to be tested by installing test wells. Quality of groundwater in Chong Kneas Commune near Tonle Sap Lake was evaluated in 2000 and the results indicated the quality meets WHO criteria, but the survey should be done again including arsenic test.

6) Hydro-geological Survey

Hydro-geological survey including pumping test needs to be conducted to carefully and sufficiently assess the impact on groundwater table and ground subsidence before water resource development project is implemented. Hydrological studies need to be conducted for the projects with the estimated negative impact on the rivers and reservoirs.

7) Inter-Ministerial Coordination on Water Usage

Rules and regulations for water allocation by sectors have not been established in Cambodia. Therefore, inter-ministerial coordination needs to be secured to avoid conflict among related ministries and smoothly carry on the projects regarding water resource development projects.

8) Geological Survey on Soil

Geological survey on the soil of the planned disposal site should be required to check the permeability. The result of survey should be applied to consideration of leachate treatment measures from the proposed sanitary landfill.

9) Atmospheric Survey

Studies on wind direction, wind speed and atmospheric stability need to be done, and atmospheric dispersion of pollutants should be simulated to access accurate impact of SOx and NOx emission from the proposed projects to expand power supply.

(2) Construction Period

1) Mitigation Measures for Impact from Construction Activities

General mitigation measures to be taken for negative environmental impact during construction period are described below.

Appropriate Control of Construction Materials

Contamination of construction materials for land preparation and road construction should be checked before its usage to avoid soil contamination. In addition, construction materials should be properly covered to minimize scattering of dust and other small particulates. Usage and storage of hazardous/toxic materials should be carefully controlled to prevent mixture of the materials and rainwater runoff.

Sprinkling of Roads

Dust form construction activities needs to be suppressed by sprinkling construction roads especially in the dry season.

Appropriate Maintenance of Construction Equipments and Vehicles

Noise and emission of gas and odor from construction activities should be minimized with appropriate maintenance of construction equipments and vehicles.

Turbid Water Control

Appropriate measures needs to be taken to control turbid water from construction sites to avoid contamination of nearby water body.

Establishment of Construction Waste Collection System (Includes Securing Appropriate Disposal site)

Large volume of construction waste will be generated though the amount cannot be estimated at this stage. To prevent illegal dumping of construction waste and facilitate appropriate waste management, appropriate waste collection system with obtaining disposal site needs to be established.

Appropriate Construction Schedule/Planning/Management

Maintain normal traffic flow near the project site requires careful construction schedule and planning with placement of flagmen at appropriate place. Securing alternative route with an appropriate traffic control during some period of construction phase needs to be considered if necessary. This measure will also contribute to mitigate impact of noise and vibration caused by construction activities and to

decrease emission of greenhouse gases.

Installation of Acoustic Wall or Buffer Zone
Installation of acoustic wall or buffer zone should be considered to minimize noise or vibration by construction activities if there is a social facility near the construction site.

2) Appropriate Procedures for Archaeological Discovery

The construction contractor needs to stop construction activities immediately if archaeological finding is reported. The findings need to be investigated by archaeologists if necessary, and an appropriate measure needs to be taken to recover it.

3) Return of Construction Affected Areas to Original Condition

All the areas affected by the project implementation needs to be recovered to original condition after the construction completion. All equipments, machinery and vehicles for construction should be removed, and construction waste, unused materials and contaminated earth need to be properly disposed.

(3) Operation Period

Various mitigation measures need to be considered and implemented during operation period by each project. These measures need to be considered and established at a sector Master Plan or a feasibility study level because the details of each project has not been clarified at this stage. Impact mitigation measures considered at this stage for some projects are described below.

- Landfill gas mainly composed of methane and CO2 might be generated from the proposed landfill site due to biological decomposition. Therefore, Facilities for removing landfill gas need to be installed.
- Spontaneous landfill fire might occur at the proposed landfill site, and the fire generates a large volume of smoke and harmful gas. In addition, offensive odor might be emitted from the proposed landfill site because of decomposition of organic waste. Therefore, soil should be covered daily to minimize occurrence of landfill fire.
- Treatment ponds need to be prepared to treat leachate generated from the proposed landfill site.
- Installation of equipments might be required to reduce emission of pollutants from diesel generators.
- Periodical survey on ground subsidence needs to be conducted by installing observation facilities and equipments during and after operation period.

14.5.2 Environmental Monitoring Plan for Project Implementation

Serious adverse impacts might be caused without appropriate construction and operation of proposed projects in the Master Plan even if the projects are properly planned and designed. Therefore, periodic monitoring needs to be conducted during pre-construction, construction and operation period.

Parties responsible for environmental monitoring shift by project implementation phases. Parties responsible for each of implementation phases are as follows:

1) Pre-Construction Period: Design and Construction Engineer (supported by Provincial Department of Environment and Department of Public Works and Transport)
2) Construction Period: Contractor of Construction (supported by Provincial Department of Environment and Department of Public Works and Transport)
3) Operation Period: Provincial Department of Environment, Development Committee (proposed)

The proposed development committee is an organization to evaluate and approve proposed projects in the Master Plan and to monitor development projects. The committee consists of committee members and advisory members. The committee members include provincial government and APSARA Authority as well as all line departments of the province. The Advisory members consist of international donors, resource persons and private sector.

The contractor of construction should establish an environmental management office that is responsible for implementing impact mitigation measures, and for inspecting and monitoring environmental/social conditions in the project affected area.

Monitoring items, parameters to be monitored, location and frequency of the monitoring at pre-construction and construction stages are shown in table III.14.17. Monitoring plan for each of the proposed project during operation phase needs to be considered at sector Master Plan or feasibility study level. Estimating monitoring cost is difficult at this stage because details of each proposed projects have not been decided. Therefore, the estimation of monitoring cost for each project needs to be done at a sector master plan or a feasibility study stage.

Table III.14.17 Monitoring Plan during Pre-Construction and Construction Phases

Pre-Construction Phase

Monitoring Item	Parameters	Location	Frequency	Remarks
Archaeological Investigation	Compliance with related laws and regulations, and APSARA requirements	Project Sites	One Time	All Projects
Test for Groundwater Quality	Fluoride, Manganese, Nitrate, E. coli, Chlorine Residual, Taste/Odor, Iron, Total Dissolved Solids, Arsenic	Test Wells	One Time per Test Well	Water Resource Development Projects

Construction Phase

Monitoring Item	Parameters	Location	Frequency	Remarks
Construction Activities	Dust, Noise, Offensive Odor, Inspection of Solid Waste	Construction Sites		All Projects
Transportation of Construction Materials	Impact in populated areas along the haul route (noise, air pollution, land use, schedule)	Along Haul Routes	Twice a week	All Projects
Transportation Control	Traffic Sign, Signboard for Attention, Schedule	Construction Related Sites	Daily	All Projects
Underground Water	Conductivity, pH, Chlorine	Monitoring Well	Daily	Water Resource Development Projects, Drainage/Sewerage Projects
Surface Water Quality	DO, SS, COD, Total-N, Total-P, Conductivity, Total Dissolved Solids, NH3, Coliform	Locations Affected by Construction Activities	Weekly	All Projects
Disposal of Dredge Material	Compliance with Disposal Plan, Suspended Solids	Dredge Disposal Sites,	Weekly during dredging	Dredging Related Projects
Preservation of Archaeological Findings	Archaeological Findings	Archaeological Discovery Sites	Daily during excavation	Projects with Archaeological Discovery
Recovery of Construction Site	Removal of Construction Materials and Waste	Construction Sites	After completion of construction	All Projects

Responsible Parties of the Monitoring Plan

Project Phase	Responsible Parties	Supporting Parties
Pre-Construction Period	Design and Construction Engineer	Provincial Department of Environment Provincial Department of Public Works and Transport
Construction Period	Contractor of Construction	Provincial Department of Environment Provincial Department of Public Works and Transport

Source: JICA Study Team

14.5.3 Institutional Capacity Building for EIA

Capacity building will be required for the Environmental Impact Assessment Office in Provincial Department of Environment to strengthen capacity to undertake EIA or IEIA at provincial level. Training by an international EIA specialist should be given to the office staff if some of the projects proposed in the Master Plan will proceed to the next stage.

Training for staff in the Department of Environment and the Department of Public Works and Transport is recommended to appropriately implement the above-mentioned environmental monitoring plan. Training should be provided by an domestic or international environmental specialist with skills and knowledge for monitoring. In addition, materials for environmental monitoring during construction and operation phases need to be provided to the Department of Environment.

Capacity building for relevant organization to appropriately operate each of the proposed projects needs to be considered at sector Master Plan or feasibility study level.

14.5.4 Outline of EIA

The following fifteen projects have been selected as priority projects/programs in this master plan at this stage.

	Sector	Proj. ID	Title	Schedule	Importance		Reasoning
					Short-term	Long-term	
1	Urban	U-1	City Center Area Improvement	2006-2007	X		A breakthrough to upgrade vividly urban/tourism environment of the city center, with a target on the vicinity of Old Market.
2	Urban	U-2	Urban Planning Capacity Building	2006-2007		X	Strategic to incorporate and to strengthen urban policy/management in the provincial administration. A priority topic is streamlining of land use planning/management and a more effective provincial committee for city planning.
3	Environ-ment	E-2	Enhancing Environmental Awareness	2006-2012		X	Important to let the pilot project "A More Beatiful Siem Reap" more sustainable and more broad-based
4	Tourism	TO-1	Khmer Heritage Tourism Network and Tourism Facilty Dev	2007-2012	X		Important to redescover the value of Khmer culture.
5	Tourism	TO-3	Public-Private Partnership Tourism Quality Improvement	2006-2020	X	X	An essential program to coordinate, specifically for the tourists, various projects, to regulate private sector in advance and to promote the target tourism market.
6	Agricultural Diversifi-cation and Local Product	A-1	HRD and Local Product Promotion Center	2006-2008	X		Important to let the pilot project "Angkor Product Fair" sustainable by strengthening Angkor Products Promotion Center (APPC).
7	Trans-portation	TR-1	French Bridge Improvement	2006-2012	X	X	Essential to reinforcing substantially a major East-west access of the city with preserved current Bridge.
8	Trans-portation	TR-2	Sub-arterial Road Network (Phase 1)	2006-2008	X	X	Essential to debottleneck the NR6 urgently
9	Trans-portation	TR-7	Rural Heritage Network Rehabilitation	2006-2009	X	X	Indispensable to pomote diversification of tourism attractions and ensuring easy access scattered historical monuments.
10	Water	W-3	Replacement of Obsolete Cement Pipeline	2006-2007	X		Unavoidable to replace the old pipes used in the existing system for enabling the full fledged operation of a new water supply project as an integral part of the whole urban water supply system.
11	Water	W-4	Strategic Study on Integrated Water Resources Management for Siem Reap and Roluos River Basin	2007-2011	X	X	Strategic and urgent to determine the realistic ways and means to substitute unorganized individual groundwater drawing by public water supply on step-by-step basis and ensuring the lomg-term water management for different beneficiaries and places in Siem Reap.
12	Sewerage/ Drainage	SD-2	Drainage System Development	2006-2020	X		Essential to improve sanitation and environment of the central part of city where both tourism facilities and population concentrate. An ADB-assisted project plans to develop a treatment plant in this connection.
13	Power	P-1	Urgent Installation of Diesel Generators	2006-2007	X	X	Effective and easily implemantable as an immediate measure to largely alleviate chronic black-out.
14	Local Admini-stration	L-1	Development Committee for Project Approval	2006	X	X	Strategic to enabling the provincial government to eliminate disorganized planning by line departments, to propote urban policy and to ensure the public services for which user charges can hardly be expected.
15	Local Admini-stration	L-2	Human Resources Development of Province	2006-2012		X	An essential component in supporting the initiative of provincial government for inter-sectoral coordination, urban development and local public services.

According to the sub-decree on Environmental Impact Assessment Process in Cambodia, EIA will be required for the following six projects/programs of these priority projects/programs; U-1, TR-1, TR-2, TR-7, SD-2 and P-1. Screening/scoping processes and results of initial examination of environmental/social impact have indicated that several adverse impacts will occur as results of the proposed projects/programs implementation. Most of the anticipated negative impact caused by each of projects/programs could be minimized if the above mentioned mitigation measures would be taken. However, further studies/surveys need to be done as environmental impact assessments regarding these six projects/programs. The outlines of EIA for each of five projects are shown below.

U-1 City Center Area Improvement Project

Category	Items	Contents
Social Environment	Involuntary Resettlement	・survey on residents in the project affected area ・confirmation of residents' intention on resettlement if resettlement cannot be avoided ・consideration of resettlement plan if necessary
	Local Economy	・impact on livelihood of the project affected residents
	Cultural Heritage	・consideration for French Bridge preservation
Natural Environment	Hydrological Situation	・hydrological survey focusing on impact of Crocodile Weir reconstruction
	Water Pollution	・impact of turbid water on Siem Reap River
	Waste	・impact of construction waste disposal on the existing landfill site

TR-1 French Bridge Improvement

Category	Items	Contents
Social Environment	Cultural Heritage	・impact on the exisitng French Bridge ・consideration of preservation measures for the existing French Bridge if necessary
Natural Environment	Waste	・impact of construction waste disposal on the existing landfill site

TR-2 Sub-Arterial Road Network (Phase 1)

Category	Items	Contents
Social Environment	Involuntary Resettlement	・survey on residents in the project affected area ・confirmation of residents' intention on resettlement if resettlement cannot be avoided ・consideration of resettlement plan if necessary
	Utilization of Local Resources	・possibility of blockading resients' movement during construction phase
	Cultural Heritage	・archaeological survey before project implementation
Natural Environment	Air Pollution	・impact of dust generated from construction activities on residents ・estimation of traffic volume and pollutants emission, and impact on residents
	Waste	・impact of construction waste disposal on the existing landfill site
	Noise and Vibration	・impact of noise and vibration on residents along the roads constructed by the project

TR-9 Rural Heritage Network Rehabilitation

Category	Items	Contents
Social Environment	Involuntary Resettlement	・survey on residents in the project affected area ・confirmation of residents' intention on resettlement if resettlement cannot be avoided ・consideration of resettlement plan if necessary
	Utilization of Local Resources	・possibility of blockading resients' movement during construction phase
	Cultural Heritage	・archaeological survey before project implementation
Natural Environment	Air Pollution	・impact of dust generated from construction activities on residents ・estimation of traffic volume and pollutants emission, and impact on residents
	Waste	・impact of construction waste disposal on the existing landfill site
	Noise and Vibration	・impact of noise and vibration on residents along the roads constructed by the project

SD-2 Drainage System Development

Category	Items	Contents
Social Environment	Involuntary Resettlement	・survey on residents in the project affected area ・confirmation of residents' intention on resettlement if resettlement cannot be avoied ・consideration of resettlement plan if necessary
	Local Economy	・impact on livelihood of the project affected residents
	Utilization of Local Resources	・surveys on land use and resources produced on the proposed site for wastewater treatment plant
	Cultural Heritage	・archaeological survey before project implementation
Natural Environment	Water Pollution	・impact of water pollutant generated from the proposed wastewater treatment plant on ambient water
	Waste	・estimation of effluent and sludge amount genereted from the proposed wastewater treatment plant ・consideration of treatment measures for sludge and effluent from wastewater treatment plant
	Offensive Odor	・Impact of offensive odor from the proposed wastewater treatment plant on neighboring area

P-1 Urgent Installation of Diesel Generators

Category	Items	Contents
Natural Environment	Global Warming	・prediction on the amount of CO2 emission from diesel generator
	Air Pollution	・wind direction, wind speed and atmospheric stability ・prediction on the amount of pollutants emission (NO2, SO2) from diesel generator ・impact on the ambient air quality
	Water Pollution	・impact of coolant on the ambient water bodies
	Noise and Vibration	・impact of noise and vibration caused by the generator operation on the neighborhood

14.6 Public Participation

To gain stakeholders' comments and ideas and to reflect them into the Master Plan, stakeholder meetings were held four times. Some alternative scenarios that would be bases for the Master Plan are explained at the first and second meetings, and the participants agreed to support the scenario in favor of sustainability with quality tourism. Therefore, the study team started to consider a master plan based on this scenario.

Many of comments and ideas suggested through group discussions in each of stakeholder meeting have been utilized when the study team considered the master plan and proposed projects in the plan. The contents of comments and ideas expressed in the group discussions are described below.

14.6.1 First Stakeholder Meeting

The 1st stakeholder meeting was held on February 3, 2005 at Preah Khan Hotel in Siem Reap to explain about the background and objectives of the JICA Study, and to realize local needs for development, inviting relating stakeholders, such as Local residents, local authorities, NGOs and private sectors.

(1) Objectives

The objectives of the 1st stakeholder meeting are as follows:

- To explain about the JICA study based on the contents of the Inception Report and to build consensus among stakeholders on the results of the analysis on the present situation of the study area done by the study team based on the contents of the Progress Report 1;
- To enhance awareness of various stakeholders for the JICA study, to grasp stakeholders' opinions for the JICA study, and to realize local issues through the dialogue with various stakeholders;
- To exchange opinions and facilitate mutual understandings among the various stakeholders.

(2) Participants

Total 194 people attended to the meeting and 128 attendants participated in the group-discussions held in the afternoon session. The composition of participants is shown in the list below.

Number of Participants to the 1st Stakeholder Meeting

Breakdown	Number
Members of the Steering Committee	22
Counterparts of the JICA study team	9
Provincial Departments and Other Institutions:	26
Siem Reap District Office	14
Public Offices under the Siem Reap District	11
Representatives of 10 Communes in Siem Reap District	10
Local NGOs	25
International NGOs & Donor Organizations	21
Private Sector	3
Public School	4
Private School	2
Hospital	1
Pagoda	1
Travel Agencies and Souvenir Shop	4
Restaurant	1
Hotel & Guest House	2
Local People living near Siem Reap River	5
Local People living near Tonle Sap Lake	7
Local People from 10 Communes in Siem Reap District	16
Member of the JICA Study Team	10
Total	**194**

(3) Program

The program of the 1st stakeholder meeting is as follows.

Program of the 1st Stakeholder Meeting

7:30 – 8:20	Registration	
8:20 – 8:25	Announcement	Mr. Ouk Keo Rattanak
8:25 – 8:30	National Anthem	
8:30 – 8:50	Opening Speech (Khmer – English)	Provincial Government APSARA
8:50 – 9:20	Summary Presentation of the Study (English – Khmer)	Dr. Jinichiro Yabuta, Leader, JICA Study Team
9:20 – 10:00	Comments from Steering Committee Members	Steering Committee Members
10:00 – 10:20	Coffee Break	
10:20 – 10:40	Summary Presentation of Asia Urbs Project (English – Khmer)	Ms. Birgit Schnindhelm
10:40 11:40	Question and Answer	
11:40 – 12:00	Guidance for Group Discussion and Grouping (English – Khmer) 4 Groups	Mr. Masahiro Ibayashi, Expert of JST /Facilitator
12:00 – 13:30	Lunch Break	
13:30– 15:00	Group Discussion	
15:00 – 15:20	Coffee Break	
15:20 – 16:40	Presentation of Each Group (Khmer – English)	Representative from each group
16:40 – 17:00	Closing Remarks (English – Khmer)	Dr. Jinichiro Yabuta, Leader, JICA Study Team

(4) Outcome

The following outcomes were accomplished through the meeting.

- Many participants eagerly participated in the group discussions.
- It was recognized that stakeholders have various awareness and concerns on issues relating to environment, tourism and education.
- The future direction of the master plan that the study team is considering was well explained and accepted by the participants.
- Various opinions and issues were given in the group discussion as described below,

and these opinions and issued were shared and recognized among stakeholders including JICA study team members.
- The stakeholders including farmers and high-ranking officials could freely exchange their opinions and understood each other.

(5) Summary of Group Discussions

Four group discussions were held in the afternoon secession. Four groups are 1) urban planning and infrastructure, 2) Environment, 3) Tourism, and 4) General topics. A facilitator was assigned for each group to proceed the discussion by taking workshop style. The objective of the group discussions was to grasp concerning issues of the stakeholders on each topic. It was observed that many participants were concerned about environmental issues judging from the result of the group discussion. Issues raised in each discussion are as follows;

Group A: Urban Planning & Infrastructure (29 participants)
- Traffic issues: traffic jam, lack of parking space, lack of traffic sign, increasing traffic accidents and few cars with number plates
- Illegal construction
- Complicated administrative procedure
- Weakness of law enforcement and corruption

Group B: Environment (59 participants)
- Sewerage: no sewerage-treatment plant, deterioration of water quality of the Siem Reap River and the Tonle Sap Lake, damage to fauna and flora, damage to health, and damage to economy
- Solid waste: problem of disposal site, needs for improvement of the garbage collection and recycling system, and lack of people's awareness for beautification of the town
- Air pollution: increasing number of cars, many individual generators, garbage burning and firewood usage
- Environmental education, needs for improve people's awareness and manner

Group C: Tourism (15 participants)
- Worsening traffic jam and environmental pollution; negative impact on tourism
- Lack of water supply due to the increase of water demands
- Insufficient infrastructure due to the rapid increase of the tourist number
- Small and limited re-distribution of the Angkor Wat entrance fee to local people in Siem Reap, and lack of transparency and accountability of finance system
- Increase of migrants to Siem Reap Region from other provinces
- Lack of standard setting for tourism services, such as taxi fee, etc

Group D: General Topics (25 participants)
- Needs of improvement for labor condition: conflict between labors and investors in terms of labor condition
- Increase of health related problems, such as drug, sexual trafficking and HIV
- Low agricultural productivity because of the lack of irrigation system, technology and insufficient market development
- Industry: low competitiveness, low quality of products and insufficient IT environment
- Low education level of laborer, child labor cases, low quality of facility and low

level of instructors

Summary of Group Discussions

- Insufficient law enforcement: illegal construction, corruption and bribery
- Difficulty of preserving public space: decrease of public space due to land development and land enclosure;
- Inequitable benefit distribution in the region: profits from tourism should be fairly distributed among the local people;
- Needs for encouraging community participation in environmental improvement and tourism industry;
- Importance of education and awareness raising.

Scenes of the 1st Stakeholder Meeting

Plenary Session


Plenary Session


Group A: Urban Planning & Infrastructure


Group B: Environment


Group C: Tourism


Presentation by a group representative

14.6.2 Second Stakeholder Meeting

The 2nd stakeholder meeting was held on March 10, 2005 at Preah Khan Hotel in Siem Reap to build consensus among stakeholders on a scenario and a strategic plan for future development of Siem Reap District.

(1) Objectives

The objectives of the 2nd stakeholder meeting are as follows:

- To explain about a scenario and a strategic plan for future development of Siem Reap District, which the JICA study team is considering
- To discuss with stakeholders about the scenario/strategic plan and measures (actions to be taken, roles of the government and so on) to accomplish the scenario/strategic plan

(2) Participants

Total 67 people attended to the meeting and almost all the attendants participated in the group- discussions held in the afternoon session. Because the 1st stakeholder meeting was held just one month before this meeting, the number of attendants was narrowed.

The composition of participants is shown in the list below.

Number of Participants to the 2nd Stakeholder Meeting

Breakdown	Number
Members of the Steering Committee	6
JICA Advisory Committee	1
Counterparts of the JICA study team	10
Provincial Departments and Other Institutions:	15
NGOs and Donor Organizations	13
Private Sector	8
Others	1
Member of the JICA Study Team	13
Total	**67**

(3) Program

The program of the 2nd stakeholder meeting is as follows.

Program of the 1st Stakeholder Meeting

7:30 – 8:00	Registration	
8:00 – 8:10	Opening Speech (Khumer – English)	Provincial Government APSARA
8:10 – 8:40	Summary Presentation of the Study (English – Khumer)	Dr. Jinichiro Yabuta, Leader, JICA Study Team
8:40 – 9:00	Question and Answer	
9:00 – 9:10	Guidance for Group Discussion and Grouping (English – Khumer)	Mr. Masahiro Ibayashi, Expert of JST /Facilitator
9:10 – 9:25	Coffee Break	
9:25 – 11:15	Group Discussion A: Environment B: Tourism C: Rural development	
11:15 – 12:15	Presentation of Each Group (Khumer – English)	Representative from each group
12:15 – 12:30	Closing Remarks (English – Khumer)	Dr. Jinichiro Yabuta, Leader, JICA Study Team
12:30 –	Lunch	

(4) Outcome

The following outcomes were accomplished through the meeting.

- Many participants eagerly participated in the group discussions.
- Future scenario and strategic vision that the JICA study team suggested were supported by the counterparts and accepted by the attendants with no objections.
- Various opinions and issues were given in the group discussion as described below, and these opinions and issued were shared and recognized among stakeholders including JICA study team members.
- Counterparts supported for preparation and management of the meeting, and the representative of the counterparts made presentations based on the contents of each group discussion.
- Vice governor of Sien Reap Province, Deputy Director General of APSARA and Vice Mayer of Phnompenh Municipality attended the meeting.

(5) Summary of Group Discussions

Three group discussions were held in the afternoon secession. Three groups are 1) Environment, 2) Tourism, and 3) Rural Development. A facilitator was assigned for each group to proceed the discussion by taking workshop style. In addition, an

assistant facilitator for each group was appointed from the counterpart members as a part of training. The objective of the group discussions was to grasp concerning issues of the stakeholders on each topic. Issues raised in each discussion are as follows;

Group A: Environment (25 participants)

[Issues]

- Negative and positive impact on environment caused by the increase of tourist;
  - Negative impact is larger than positive impact
  - Positive impacts are such as increase of job opportunity and expansion of Khmer culture understanding
  - Negative impacts are such as garbage increase, water demand increase, water and air quality degradation, traffic congestion, over limit of environmental capacity and so on

[Countermeasures to prevent negative impact]

- Improvement of environmental management
  - Importance of water management: surface water/groundwater management and study on water demand are required
  - Forestry: preservation of forest and reforestation are imperative
- Improvement of living condition
  - Establishment of linkage between agricultural products and tourism industry
  - Deepening local people understanding on importance of linkage between agriculture and tourism
- Improvement awareness and capacity of local people
  - Job training (agriculture, traditional handicraft, other industries)
  - Education on environment, sanitation and society
  - Realization of actual problems and accepting opinions of local people
- Needs of private sector involvement

[Roles of the government]

- Implementation of appropriate laws and regulations
- Information dissemination for local people
- Environmental education, needs for improve people's awareness and manner

Group B: Tourism (18 participants)

[Issues]

- Transportation: Lack of road network and access
- Lack of master plan and appropriate policy
- Insufficient linkage between tourism and agriculture

[Countermeasures to prevent negative impact]

- Solve the gap of tourist numbers between rainy and dry seasons
- Necessity of internationally standardized tourism industry, especially hotel personnel
- Improvement of access to scattered tourism site
- Study on unknown ruins
- Study on tourist needs and marketing

[Roles of the government]

- Dissemination and notification of information, and campaigning
- Training for employee

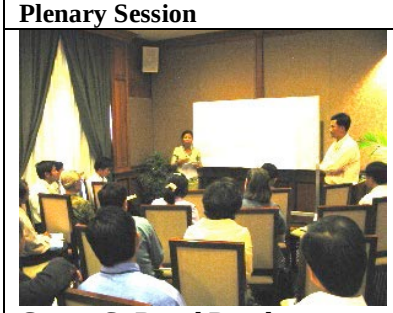
Group C: Rural Development (23 participants)

[Issues]
- Production of agricultural products not on the market demand
- Difficulty of job finding in urban area by the farmers who sold their farm lands
- Loss of cultural and traditional skills through Pol Pot regime
- Insufficient road network between urban and rural area: difficulty of access to tourism resources in rural area, insufficient access for shipping of agricultural products
- Insufficient agricultural market
- Insufficient business planning capacity (knowledge, know-how, skill)
- Difficulty of cooperation and coordination
- Insufficient knowledge of farmers

[Countermeasures to prevent negative impact]
- Skill training for agriculture and handicraft
- Improvement of rural road
- Development of eco tourism
- Acknowledgment and education on organization and community
- Promotion for hotels and restaurants

[Roles of the government]
- Micro credit
- Improvement of irrigation system
- Improvement of land management system by the Land Agency
- Establishment of advanced community model

Scenes of the 2nd Stakeholder Meeting

<table>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Plenary Session</td><td>Group A: Environment</td><td>Group B: Tourism</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Group C: Rural Development</td><td>Discussion</td><td>Discussion</td></tr>
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14.6.3 Third Stakeholder Meeting

The 3rd stakeholder meeting was held on November 24th, 2005 at Preah Khan Hotel in Siem Reap for the purpose of reporting progress of the draft master plan, making officials, NGO workers, private sectors, and people in Siem Reap understand the importance of the development with a master plan, and gathering ideas/opinions of

participants.

(1) Objectives

The objectives of the 3rd stakeholder meeting are as follows:

- To explain about the results of the study and draft master plan of Siem Reap based on the contents of the Interim Report
- To build consensus among stakeholders on the draft master plan done by the study team, and
- To discuss and grasp the ideas of various stakeholders on the specific issues.

(2) Participants

About 100 people participated from the government officials, NGO, and businesses.

(3) Program

The program of the 1st stakeholder meeting is as follows.

Program of the 3rd Stakeholder Meeting

7:30 – 8:00	Registration	
8:00 – 8:05	Announcement	Mr. Ouk Keo Rattanak
8:05 – 8:10	National Anthem	
8:10 – 8:20	Opening Speech (Khmer – English)	Provincial Government
8:20 – 8:50	Summary of Interim Report (English – Khmer)	Dr. Yabuta, Leader, JICA Study Team
8:50 – 9:10	Question and Answer	
9:10 – 9:30	Coffee Break	
9:30 – 9:50	Presentation of Counterpart Training in Japan (Khmer - English)	Mr. Ung Tong Eang (Counterpart)
9:50 – 10:10	Presentation of Environmental Campaign (Khmer - English)	Mr. Phoung Lina (Counterpart)
10:10 – 10:30	Presentation of Angkor Products Fair (Khmer - English)	Mr. Lok Sokthea (Counterpart)
10:30 – 11:40	Group Discussion	
11:40 – 12:00	Presentation of Each Group (Khmer – English)	Representative from each group
12:00 – 12:10	Closing Remarks (English – Khmer)	Dr. Yabuta, Leader, JICA Study Team (JST) H.E. Mr. Some Son, Governor

(4) Outcome

The following outcomes were accomplished through the meeting.

- Many participants eagerly participated in the group discussions.
- The future of Siem Reap is recognized as a compact, human-scale and environment-considered city as proposed in the draft master plan.
- Various opinions on the environment and pilot project were given in the group discussion as described below, and these opinions and issued were shared and recognized among stakeholders including JICA study team members.

(5) Summary of Group Discussions

Two group discussions were held after the plenary secession. Two groups are 1) environment, and 2) pilot project: Angkor Products Fair. Counterpart facilitated the discussion in each group by taking workshop style. The objective of the group

discussions was to deepen the discussion on the solid waste management and Angkor Products Fair. Issues raised in each discussion are as follows:

I. Group Discussion on Environment

Topics for this group include:

1.1 Issues on solid waste management
1.2 Solutions for solid waste management
1.3 Suggestions

Results of Discussion:

1.1. Issues on solid management

A. Garbage Collection Company:
- Still has no big location for storing the garbage in places that the garbage truck cannot enter.
- The garbage truck does not go to collect the garbage punctually. Therefore, the garbage remains in the place and gives bad smell.
- The garbage cannot be taken out of the city 100 % (It's better find its causes.).
- Lack of labor for collecting the garbage
- Garbage collection fee is problematic.

B. People:
- Knowledge of people on the solid waste management is still low.
- Impossibility of paying the garbage collection fee for all
- The garbage is not well packaged.
- Lack of trash bin in houses

C. Slum and Construction

D. Lack of Solid Waste Management Dissemination:
- Lacking the solid waste management dissemination to people is a cause of throwing the garbage carelessly.
- Dissemination is not adequate, and monitoring of the technical officials is still loose.
- Environmental education at schools is not broad.

1.2. Solutions for Solid Waste Management:

A. Individual
- Saves, implements, recycles and reduce the use of materials that produce the garbage.
- Self-controlled garbage

B. Family and Community
- Classify the garbage for recycling.
- Produce compost from the rotten garbage.
- Grow grass on vacant land and unused payment in order to keep the beauty of the city and to stop throwing the garbage in pubic space.
- Create communities in villages, commune for solving the garbage issue by including numbers of people living the village/the commune, quantity of existing garbage, cost of garbage collection service, and location of the garbage dump).

C. Authorities

- Raise a triumphant pilot garbage collection project in a village to be use as a good model for others.
- Strengthen and increase socialization activities of the environmental educations in houses, schools, villages, and communities by explaining the disadvantages of the garbage.
- Go directly to implement the garbage collection in the places where the garbage exists with routine control.
- Implement the garbage management in the Angkor Product Fair by appointing young people as a core force for educating adults and old people.
- Make fence around the unused land to protect people from throwing the garbage into the land.
- Make gardens in the places where the garbage is thrown.
- Encourage good model citizens who are able to manage the garbage well.
- Clear measures should be introduced in a form of contract at markets, at schools, inside the city and so on.
- Law enforcement should be carried out strictly.
- Any person who throws the garbage in the public place should be fined.

1.3. Suggestions:

- MICC Garbage Collection Company should take all the garbage out of the city.
- The solid waste management should be disseminated by Provincial Department of Environment to the people in the place.
- Plastic bag utilization should be reduced.
- Solution for solving the stagnant garbage in Trapaing Po of Svay Dangkum commune should be made as soon as possible.
- The Provincial Department of Environment should link the environmental work with institutions and other units in the circle of Siem Reap town.
- Garbage collection companies should be two or more to collect the garbage due to the determined separate places so that they can compete with each other.

II. Group Discussion on Angkor Product Fair

Topics for this group include:

2.1. Local products issues
2.2. Strategic solution for promoting local products
2.3. Suggestions

Results of Discussion:

2.1. Local Products Issues:

- Khmer people are still bad at small and medium enterprise sector.
- Some places have a lot of pineapples, but people do not know which markets are suitable for their products.
- Local vegetables cannot compete with the imported ones because these local products lack support and promotion from the government.
- Infertile land causes low yields.
- People have low knowledge of agriculture.

- Lack of financial and technical supports for enhancing both quantity and quality of the agricultural products
- In rainy season, vegetables can be grown only on a small amount of land.
- In dry season, water is insufficient.
- Lack of promotion and explanation of our local products
- We have had experience in producing rice, but lack support
- Siem Reap has a lot of hotels, but they don't provide the Khmer food, which must be cooked by good Khmer cooks and chefs to the tourists.
- The tourists complain about souvenirs, which are mostly imported from foreign countries, mainly from the neighboring countries and sold in Siem Reap town. Conversely, they prefer Khmer products reflecting culture and identity of Khmer although the quality is poor.

2.2. Strategic Solution for Promoting Local Products

- Train workers, farmers, souvenir sellers, producers, and businessperson to be aware of a standard of product, recognized in the international level.
- Produce quality-oriented products rather than quantity-oriented products.
- Set up association to be mutually helpful and to seek market and techniques for the local products.
- To be internationally recognized, it is necessary to make efforts to get ISO for the Khmer local products.
- Set up a sculpture association to jointly discuss, to introduce, and to widely promote handicrafts in every place.
- Unity of setting price for the products

2.3. Suggestions

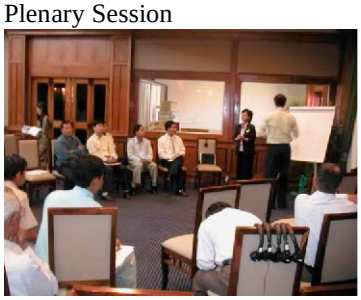
- Siem Reap should have a center of Khmer food in which the foods are made from the local raw materials.
- Request the government to help the farmers to set up booths for selling organic vegetables or machinery installation for checking the organic vegetables.
- A quality standard monitoring committee should be formulated with precisely skillful expert to build up trust in our local products
- Already generated strategies for the local products should be put into real practices with encouragement.
- Request JICA to help set up a sculpture association in Siem Reap province
- Setting up law for controlling and protecting the local products
- A sense of loving the Khmer local products should be inculcated into the Khmer people.

Scenes of the 3rd Stakeholder Meeting


Plenary Session


Presentation by CP


Group I: Environment


Group II: Angkor Product Fair


Presentation by a group representative

14.6.4 Fourth Stakeholder Meeting

The 4th stakeholder meeting was held on January 31st, 2006 at Preah Khan Hotel in Siem Reap for the purpose of reporting the master plan, making officials, NGO workers, private sectors, and people in Siem Reap understand the master plan, and gathering ideas/opinions of participants.

(1) Objectives

The objectives of the 4th stakeholder meeting are as follows:

- To explain about the draft master plan of Siem Reap based on the contents of the Draft Final Report, and
- To build consensus among stakeholders on the draft master plan done by the study team.

(2) Participants

About 200 people participated from the government officials, NGO, and businesses.

(3) Program

The program of the 4tht stakeholder meeting is as follows.

Program of the 4th Stakeholder Meeting

8:00 – 8:30	Registration	
8:30 – 9:00	Opening Speech	Provincial Government
9:00 – 9:40	Summary of Master Plan (English – Khmer)	Dr. Yabuta, Leader, JICA Study Team
9:40 – 10:00	Coffee Break	
10:00 – 10:20	Presentation of Angkor Products Fair	Mr. Lok Sokthea (Counterpart)
10:20 – 11:40	Question and Answer	
14:00 – 12:00	Closing Remarks	Dr. Yabuta, Leader, JICA Study Team H.E. Mr. Some Son, Governor

(4) Results of the Stakeholder Meeting

The following comments were raised on the Draft Final Report.

- Capacity development for provincial personnel is important.
- Legal framework is to be clarified.
- Siem Reap River and areas along the river should be cleaned to be a park.
- Financial support to Angkor Product Fair is needed.
- Landscape should be improved.

PILOT PROJECTS

PILOT PROJECTS

Chapter 15 A More Beautiful Siem Reap

15.1 Outline of the Pilot Project

15.1.1 Design Conditions

(1) Background of the Pilot Project

In the Progress Report 1 meeting held in January 2005, many of the participants strongly proposed a pilot project to enhance people's awareness of environmental protection. This proved that many people are concerned about the recent rapid deterioration of the environment in Siem Reap town and its environs caused by rapid economic development. Environmental preservation is, therefore, certainly one of the important policies of the master plan.

The proposed measures for environmental preservation can mainly be divided into two groups: 1) institutional measures and 2) public education to change people's attitude toward environmental protection. Institutional measures take a long time to implement, while public education can start immediately. Considering the fact that it takes a long time to change people's attitude, environmental education should start as soon as possible.

The Study Team, therefore, decided to formulate a pilot project to enhance people's awareness of the environment focusing on the issue of waste, which is the topic of most concern for the citizens.

(2) Goal

The goal was to make Siem Reap town more beautiful with the cooperation of the people, where "beautiful" means not only cleanliness but also abundant nature.

The title of the pilot project was, therefore, as follows:
Enhancing People's Awareness for "A More Beautiful Seim Reap" meaning "Let's beautify Siem Reap".

(3) Strategies

The following strategies to achieve the goal were adopted.

1) From Target Sites to Wider Areas

It is too difficult to make all of Siem Reap town beautiful at once. The practical measure is to target certain sites first and gradually widen and increase the target areas. We proposed to target schools first and then gradually widen the target areas to the surroundings of schools, then to neighboring communities, and finally to all of Siem Reap town.

2) Targeting Various Age Groups by Different Approaches

The environmental education should target the whole population at the same time to make it effective. The project shall, therefore, be split into several programs according to the target groups.

3) Utilization of Social Capital

In order to maximize the sustainability of the project, the available social capital shall be fully utilized for the execution of the project.

(4) Policies for Implementation

The Study Team adopted the following approaches to achieve the objectives:

a) The project must be manageable by the counterparts by themselves with little technical assistance by the Study team only in the initial stage.
b) The pilot project shall employ only locally available materials, equipment and human resources so that they can be expanded.
c) The pilot project must be continued after the Study team leaves the site. Therefore, the Study team shall only provide the counterpart with technical assistance and financial assistance only for the investment.

15.1.2 Description of Formulated Project

The pilot project consisted of two sub-projects according to the target group: one targeting primary school children and their parents and the other targeting general adults.

(1) Project Targeting Primary School Children and Their Parents

The traditional way of life is rapidly changing with economic growth and the trend is heading toward a resource demanding society, which is characterized as a "mass-production, mass-consumption, mass-disposal" society. People, children in particular, are rapidly losing the important mentality of saving. Therefore, one of the measures which has to be taken urgently is to educate children on the importance of saving. The education of children should start immediately because it takes many years to take effect. In addition, early commencement can help to protect their traditional way of life which is more environmentally friendly.

The Study team planned the following education measures as the pilot project.

- Firstly, school children learn the importance of cleanliness, reuse, recycling, etc. by using picture books to be prepared.
- Then, as a practical lesson they actually do recycling activities in the school. Through participation in the school recycling, they learn that waste is the same as money if it is sorted. The experience helps them to more deeply understand the importance of recycling and saving activities. Some of the school children who understand the benefit gained by the recycling activities may start recycling at their homes, which means that the school recycling program changes their attitude and the recycle activities are expanded from schools to homes.
- In order for the school recycling program to succeed, the parents should be educated as well because their cooperation is essential. Therefore, leaflets showing not only the method of the school recycling program but also important topics of environmental protection are distributed to the parents. In other words, the school recycling program targets not only school children but also their parents.
- In addition, the leaflet showing the method of the school recycling is expected to help other schools not only in Siem Reap district but the whole country to introduce the program to their schools, as implementation by nine schools will

have considerable presence.

- It is advised that the income from the school recycling program be utilized in future to improve the condition of not only the inside of the school but also the school surroundings. Finally, it will cultivate the importance of beauty in the people surrounding the schools. Therefore, in this pilot project, the Study team shall provide funds to nine schools for their beautification activities to demonstrate the method of implementing such activities within a short period. The Study team will provide up to 300 USD per school in response to the beautification proposal prepared by them.

This project aims:

- to expand the recycling activities from the target schools to other schools,
- to expand the recycling activities from the target schools to their homes,
- to expand the recycling activities from school children to their parents, and
- to expand the beautification from schools to the surrounding communities and villages and then finally the whole town.

(2) Project Targeting General Adults

The education of general adults is more difficult than school children because there is no formal opportunity to educate them. The measures have to be very simple and visual. Therefore, the following are proposed.

a) Distribution of environmental logo stickers to be created for Siem Reap
b) Distribution of leaflets for adults
c) Installation of trash bins showing the environmental logo along main streets
d) Execution of the campaign

- An environmental logo which is the symbol of environmental protection for Siem Reap is created and shown on all items for environmental education. Generally, people never repeatedly read the education leaflet. However, if people remember the environmental logo when they read the leaflet, they will be reminded of the importance of environmental protection when they see the logo. An attractive environmental logo shown in many places in the town can motivate people to protect the environment.
- Trash bins placed along main streets can be very effective advertisement signboards, as they are seen by a large number of people. Trash boxes showing the environmental logo are, therefore, placed along the main streets.
- A campaign aiming to raise people's awareness for making Siem Reap more beautiful is executed by the Provincial government of Siem Reap in collaboration with other relevant authorities. Participants voluntary walk along main streets and distribute leaflets and stickers to people for publicity.

(3) Overall Approach

The overall approach is shown in the following figure and table.

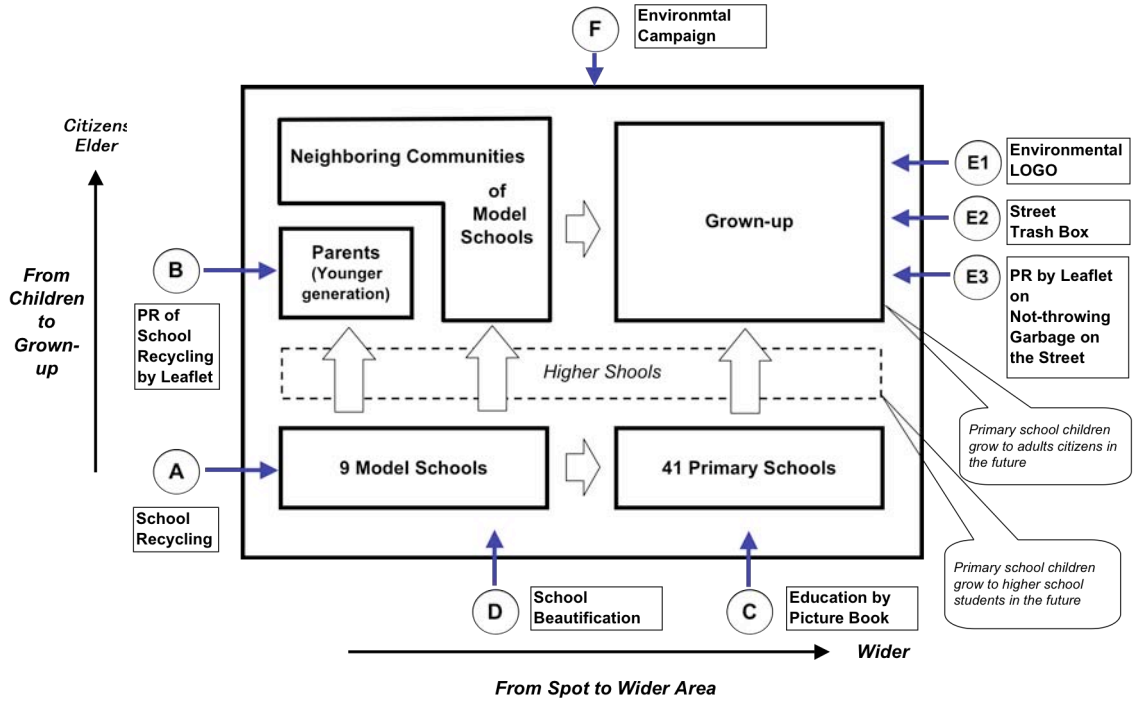


Figure III.15.1 Conceptual Image of the Pilot Project

Table III.15.1 List of Activities in Pilot Project

Target groups	Code	Name of activity	Description
Students and parents	A	School Recycling	Students are requested to bring recyclable garbage from their homes such as empty aluminum cans, PET bottles, etc. and separate and keep them in the store houses. Once they accumulate, they are sold to a middleman and the school buys school equipment with the income. This project aims to cultivate children's ecological mentality to save. This will be implemented at nine primary schools.
	B	Education to Parents	Raising the environmental awareness of parents is necessary to support the implementation of Project A, because parents are indirect participants. Leaflets will be printed and distributed to parents at nine primary schools.
	C	Education to School Children	3,220 copies of small picture books on garbage are printed and distributed to all 41 primary schools in Siem Reap District. 100 large picture books for teaching will be produced.
	D	Beautification of Schools	The study team provides funds to 9 primary schools for beautifying in/around the schools by creating flower beds, planting, etc. to cultivate the importance of beautification in people's minds.
General adult people	E-1	Environmental logo stickers	An environmental logo is created. 10,000 stickers with the environmental logo are distributed.
	E-2	Street trash bins	100 trash bins showing the environmental logo and the advertisement of the sponsor are placed along main streets.
	E-3	PR by leaflets	Leaflets for environmental education will be distributed.
	F	Clean Up Campaign	A campaign to raise people's awareness of the environment will be executed by many volunteers wearing a T-shirt that says "A More Beautiful Siem Reap".

15.1.3 Project Design Matrix

Project name: Enhancing School Children's Environmental Awareness

Target area: Nine primary schools
Target group: Primary school children
Implementation period: Feb. - Nov. 2005, Oct. – Nov. 2005
Date: June 2005

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal 1. School children's awareness of the environment is enhanced. 2. Neighborhood's awareness of the environment is enhanced. 3. The surroundings of target schools are beautified.	Beautiful surroundings near the schools.	Monitoring survey	
Project Purposes School children's awareness of waste is enhanced.	Beautiful appearance of the school	Monitoring survey	
Outputs 1. Recycling activity is carried out. 2. Education on waste is carried out. 3. The school is beautified.	1-1 More than 70% of school children experience the school recycling. 1-2 Schools buy goods with the income from selling recyclables more than twice a year. 2-1 100% of the school children receive the lecture on waste issues within a year. 2-2 All new school children receive the lecture on waste. 3-1 The facilities beautified are maintained or expanded.	Monitoring survey Monitoring survey Monitoring survey Monitoring survey Monitoring survey	The market prices of recyclables do not decrease.
Activities 1-1 Store houses for recyclables are constructed. 1-2 Leaflets for school recycling are distributed. 1-3 The school recycling project is explained to parents. 2-1 Picture books on waste issues are produced. 2-2 Picture books are distributed. 3-1 A proposal for the beautification is prepared by the schools. 3-2 The required materials are provided.	Inputs JICA Study Team Human Resources • Experts Materials and Facilities Qty • Store houses 8 • Leaflets 20,000 • Picture books (small) 3,220 • Picture books (large) 100 • Beautification project 9 schools $2,700	Siem Reap Human Resource • DOE staff	Pre-Conditions Schools cooperate in the project.

Project name: Enhancing Adults' Environmental Awareness

Target area: Siem Reap
Target group: Citizens
Implementation period: Jul. - Nov. 2005
Date: June 2005

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Siem Reap town becomes beautiful.	Beautiful appearance of Siem Reap town.		
Project Purposes Citizens' awareness of waste is enhanced.	Beautiful appearance of Siem Reap town.	Monitoring survey	
Outputs 1. Many people see the environmental logo. 2. Road is kept clean. 3. Many people read the leaflets. 4. Many people participate in the clean up campaign.	Number of environmental logos shown in the town. Amount of scattered waste. Number of people that read the leaflet. Number of participants. Frequency of the campaign.	Monitoring survey Monitoring survey Monitoring survey Monitoring survey	The market prices of recyclables are maintained.
Activities 1-1 An environmental logo is created. 1-2 Logo stickers are distributed. 2-1 Street trash bins are produced. 2-2 Trash bins are installed along busy streets. 2-3 Waste in trash bins is collected. 3-1 A leaflet is created. 3-2 Leaflets are distributed. 4-1 T-shirts are prepared. 4-2 A clean up campaign is arranged. 4-3 The clean up campaign is executed.	Inputs JICA Study Team Human Resources • Experts Materials and Facilities Qty • Stickers 10,000 • Street trash bins 100 • Leaflets 10,000 • T-shirts 2,000	Siem Reap Human Resource • DOE staff	Pre-Conditions MICC collects waste from trash bins.

15.2 Results of the Pilot Project

15.2.1 Project for "Enhancing School Children's Environmental Awareness"

(1) Actual Implementation Schedule

- On 19 May 2005, the target schools were jointly selected by the Department of Environment and the Department of Education.
- On 2 June 2005, all headmasters of those were briefed on the projects at the DOE.

The actual activity schedule is shown in the following figure.

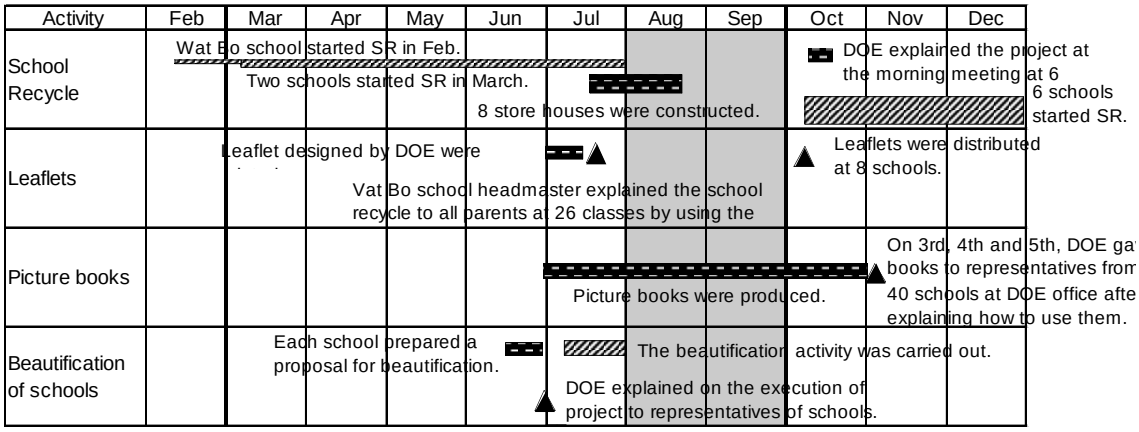


Figure III.15.2 Actual Schedule of Enhancing School Children's Environmental Awareness

(2) Description of Each Activity

Activity A: School Recycling

The school recycling activity started at three schools in February 2005 under the assistance of a JOCV volunteer working for the Provincial Department of Environment in Siem Reap. The pilot project supplemented the school recycling and expanded from three to nine schools.

A store house to keep recyclable materials was built at eight target primary schools in July and August. Wat Bo primary school constructed a store house by themselves using the income from school recycling.

Table III.15.2 Progress of Target Primary Schools As of December 1, 2005

Name of School	No. of Pupils	No. of Classes	Start	Total income (Riel)	Items purchased with income
a) Wat Bo primary school	3,864	88	Feb.	5,077,400	Stone bench, elephant statues, bird statues, mower, trash bins, plants, etc.
b) In Kosey primary school	1,187	31	Mar.	226,127	Stone bench, flower pots
c) Anuvat Karukosal primary school attached to the teacher training institute	478	16	Mar.	86,680	Nothing yet
d) Polanka primary school	1,175	35	Oct.	36,250	Nothing yet
e) Wat Svay primary school	1,416		Oct.	73,450	Pay for waste collection charge
f) Kessararam primary school	1,850	54	Oct.	Not yet	Nothing yet
g) Hun Sen Kruos primary school	809	27	Oct.	Not yet	Nothing yet
h) Muk Neak primary school	2,548	60	Oct.	Not yet	Nothing yet
i) Po Bantey Chhey primary school	1,462		Oct.	34,100	Nothing yet


Store house built at Hun Sen Primary School


Explaining the program to parents


Recyclables are kept in the store house after being precisely sorted.


A recycle shop buys recyclables at school.


Wat Bo school bought statues of elephants with the income from school recycling.


In Kosey school bought a stone bench with the income from school recycling.

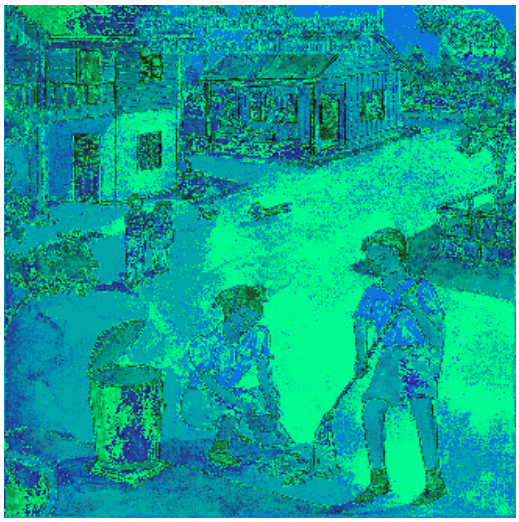
Activity B: Education to Parents

The Environmental Department of Siem Reap Province designed the leaflet shown below and 20,000 leaflets were printed for distribution.

In Wat Bo primary school, the headmaster distributed and explained the leaflets to parents at 26 class parents meetings in July. At the other 8 schools, the leaflets were distributed to all school children at the morning meeting in October 2005.

Activity C: Education to School Children

Three thousand two hundred and twenty (3,220) small picture books for pupils and 100 large picture books for teachers were produced and distributed to the 40 primary schools in Siem Reap. Before receiving the books, a few teachers from each school gathered at the Department of Environment on the 3rd, 4th and 5th of November, and received a lecture on using the picture books by the Department's staff. Each school received enough small books for all pupils in the class (60 to 70 books) and one or two large picture books for teaching. The books are kept in the library and they are sometimes taken to the class for use.



Picture book for hygiene education

Activity D: Beautification of Schools

On 2 June, the Department of Environment explained about the beautification activity to the headmasters of all nine target schools.

All nine target schools prepared and submitted a proposal for the beautification plan in late June. They received a budget of 300USD on 30 June 2005 and executed the beautification activity in July 2005.

Pupils constructed flower gardens with materials provided by the Study team.

Table III.15.3 Evaluation Summary

	Relevance		Effectiveness		Efficiency		Impact		Sustainability	
Overall Goal	▪ The objective of M/P is the environmental preservation. ▪ The Provincial government and the provincial department of Siem Reap give the priority to the environmental education.	+ +					▪ No negative impacts to the existing recyclers. ▪ 37% of pupils' families started the recycle at home. ▪ The recycle shop purchase the recyclable waste collected from schools at the higher prices. ▪ Some parents complained for letting pupils to collect recyclable waste, however the leaflet made them to understand. ▪ Some donors and other schools inquires on the school recycle to schools and the department of environment.	+ ++ ++ + +	▪ All schools still continue the school recycle and three of them have continued more than 10 months already. ▪ All headmasters of the target schools have committed to carry on the school recycle and beautification of the school. ▪ All headmasters of the target schools have committed to recommend the school recycle to other schools. ▪ 100% of pupils are willing to participate on the school recycle. ▪ 6 of 9 target schools have got the revenue from selling recyclable wastes collected. ▪ 3 of 9 target schools have spent the revenue for the beautification of their schools. ▪ The maximum total revenue gained by a school since the beginning has reached 1264 $ for 10 months. ▪ The recycle shop operated by the father of one of pupils purchase the recyclable waste collected from schools at the higher prices ▪ The facilities which were improved by the beautification activity are well maintained.	+ + + + + + + +
Project Purpose			▪ 37% of pupils' families started the recycle at home.	+						
Outputs					▪ All target schools use the store houses to keep the recyclable waste collected. ▪ The leaflet convince parents for the school Recycle.	+ +				
Activities					▪ The picture book on waste is used and will be used as well. ▪ The facilities which were improved by the beautification activity are well maintained and even expanded. ▪ All school still continue the school recycle.	+ + +				

Table III.15.4 Overall Evaluation

Criterion	Result	Basis	Justification for Basis
Relevance	Very high	▪ The objective of M/P is the environmental preservation. ▪ The Provincial government and the provincial department of Siem Reap give the priority to the environmental education.	▪ Most stakeholders have more deeply understood the importance of the environmental education through the implementation of the project. In this sense, the project was effective in term of the environmental education to the administration.
Effectiveness	Progressing	▪ It is too early to determine the result of the project at present because it started only a few months ago although the education ordinary takes effect after a long time. ▪ However, the fact that the 37% of pupils' families started the Recycle at home after the introduction of the school recycle shows that the effect began to appear.	▪ The project should be evaluated after around October 2006 when the project proceeds for one year because it is too early to do it.
Efficiency	High	▪ Most equipment and facilities imputed by the Study team are fully utilized. ▪ Most equipment and facilities imputed were obtained locally and they cheaply achieved the targets. ▪ Most equipment and facilities imputed delayed and the beginning of the project therefore delayed by 3 months after the summer holiday.	▪ It was effective to minimize the equipment and facilities procured. ▪ The cost could be minimized because all materials were obtained locally. ▪ The project when the Study team can monitor was shorten because the project commencement delayed.
Impacts	Positive impacts only	▪ 37% of pupils' families started the recycle at home. ▪ Some donors and other schools inquires on the school recycle to schools and the department of environment.	▪ The project information could be disseminated to other neighboring schools due to being implemented by 9 schools and including a teacher training school. ▪ The provincial department of environment can utilize the leaflet and the presentation to introduce people the project which were prepared by the Study team. ▪ Because the amount of recyclable waste brought by a pupil is negligible, it has no negative impacts to recyclers working in the town. ▪ In particular, the leaflet has been effective to prevent negative impacts.
Sustainability	Very high	▪ All schools still continue the school recycle and three of them have continued more than 10 months already. Every school has learnt the way and all headmasters of the target schools have committed to recommend the school recycle to other schools. ▪ The recycle shops have expanded their business and the recyclable waste collected at school are profitable for them. Therefore, it is likely to be able to sell stably recyclables in future. ▪ 100% of pupils are willing to participate on the school recycle and in addition the parents cooperate to the school Recycle as well.	▪ The way of the school recycle is simple enough for pupils to do. ▪ The school recycle can increase the revenue with the increase of recyclable amount collected without spending expenses. ▪ Teachers, pupils and the parents are happy for the school to purchase useful goods for the schools because the most primary schools in Siem Reap have poor equipment and facilities. ▪ Their activity for the school recycle generate the goods which can be remained for a many years as achievement. ▪ The existence of parents' cooperation to the project such as the purchasing recyclables at higher rate by one of pupil's fathers helps the project sustainability very much ▪ The distribution of leaflets very much helped to get parents' cooperation to the project.

15.2.2 Project name: Enhancing Adults' Environmental Awareness

(1) Actual Implementation Schedule

Activity	Jul	Aug	Sep	Oct	Nov	Dec
Logo stickers	Desig	Productio	Distributio			
Trash bins	Fabricatio		Installatio			
Leaflets	Desig	Productio	Distributio			
Campaign			▲ 27 Sep			▲ 5 Dec

Figure III.15.3 Actual Schedule of Enhancing Adult People's Environmental Awareness

(2) Description of Each Activity

Activity E-1: Environmental Logo Stickers

The following logo drawn by Mrs. Koide, an architect living in Siem Reap, was selected from four candidate logos prepared.

Environmental Logo for Siem Reap

Relief on Bayon Temple

The logo shows many small animals happily living in the abundant nature. The image of this logo was taken from a relief on the Bayon Temple shown above.

Ten thousand environmental logo stickers were printed for distribution and the logo was also printed on all educational materials produced.

Activity E-2: Street Trash Bins

One hundred trash bins were fabricated and installed in September 2005 along roads which are very busy with pedestrians such as tourists and local people.

Although the trash bins were donated by the provincial government, MICC collects the garbage from the trash bins. MICC appreciates the installation of the trash bins because they reduce MICC's street sweeping work by reducing waste scattered, despite the increase in cost to take care of the bins. In addition, they help keep the roads and sidewalks cleaner.

The trash bins are effective as publicity tools because they are placed along very busy streets, and the environmental logo shown on the trash bins reminds people to preserve the environment.

Dotted line shows the roads where trash bins were installed.

The 100 trash bins installed in Siem Reap greatly help to reduce waste scattered. In order to prevent them from being stolen, the legs of the trash bins were concreted.

Activity E-3: PR by Leaflets

Ten thousand leaflets to educate adults on hygiene were prepared and distributed. Leaflets are often thrown away immediately after they are received. In order to avoid this, a beautiful picture of the Angkor Wat temple was placed on a full page with the phrase "A More Beautiful Siem Reap" and the environmental logo, aiming for people to hang it in their homes and look at it everyday.

Activity F: Clean Up Campaign

1st Clean Up Campaign

The 1st clean up campaign was conducted by two parties on 27 September, 2005. One party executed it in the center of Siem Reap town and the other in six communes. Participants were more than 1000 people and 42 different organizations in total. The schedule was as follows.

Table III.15.5 Schedule of Campaign on 27 Sep.

Time	Comment of Program	Speaker
7:00 a.m.	Arrival of Organizing Committee	
7:30 a.m.	Arrival of Participants	
8: 00 a.m.	Arrival of Honorable Guests and Delegates	
8: 00-8:15 a.m.	Announcing of Program National Anthem of Kingdom of Cambodia Announcing of Participating Honorable Guests and Delegates	Mr. Moeung Vuthy, MC
8:15-8:25 a.m.	Remark by JICA Representative	Mr. Yabuta, Leader of Master Plan Study Team for Siem Reap/Angkor Town
8:25-8:40 a.m.	Trash Bin Provision as a Symbol to Provincial Government	Mr. Yabuta
	Trash Bin Provision as a Symbol to Provincial Department of Environment and six communes	Provincial Governor
8:30-8:40 a.m.	Remark by H.E. Provincial Governor	H.E. Soem Son
8:40 a.m.	Announcing of Parade of Garbage Collection along the Siem Reap River	Program Organizer
11: 30 a.m.	Closing Program	

There was good coordination among villages, communes, units, departments, and institutions in the realm of Siem Reap city and the provincial leaders, mainly H.E. Provincial Governor Soem Son played an active leading role during the city's environmental campaign.

The Environmental Day sent a very positive signal to enhance people's awareness of the importance of cleaning the city environment. The campaign gave pride to Siem Reap city. Pictures of the campaign on 27 September 2005. are shown below.

The Governor and Deputy General Director of APSARA Authority participated in the clean up.

Many people gathered in front of the Grand Hotel.

The Study team handed over 100 trash bins to the Provincial government.

The Governor gave T-shirts with the environmental logo to commune chiefs.

The Governor helped pick up the scattered trash.

The primary deputy governor leads the campaign.


MICC cleans up the Siem Reap river using a boat.


Many people in communes clean the space.

People in many communes conducted the campaign.


Many men and women participated in the clean up.


Many public servants from various organizations participated in the clean up.


The collected trash was put into trash bins.

2nd Clean Up Campaign

The Provincial government organized the 2nd campaign on 5 December. 2005. This was decided and arranged by the governor without the Study team's assistance and without even informing the Study team.

Participants were about 2000 people in total and various organizations including primary school pupils and junior high school students. Because they did not wear the uniform T-shirts in this campaign, it was not so distinguished but it was more natural and sustainable than the 1st campaign.

Table III. 15.6 Evaluation Summary

	Relevance		Effectiveness		Efficiency		Impact		Sustainability	
Overall Goal	▪ The objective of the M/P is environmental preservation. ▪ The Provincial government and the provincial department of Siem Reap give priority to environmental education.	+ +					▪ Some shops and residents discharge their waste in the public trash bins. ▪ The environmental logo stickers on many of the trash bins were stolen. ▪ Vat Bo primary school purchased and installed 6 trash bins imitating the trash bins provided by the Study team.	- 0 ++	▪ Most shops near the trash bins installed highly evaluate the trash bins installed along the roads. ▪ MICC established a task force team for collecting the waste from the trash bins. ▪ Installation of trash bins generated an additional cost of $300 per month; however, it reduced the street sweeping work cost. Overall, MICC feels there are more merits than demerits. ▪ The governor of the provincial government committed to execute the clean up campaign every 3 months after executing the 2nd clean up campaign on 5 Dec. ▪ 100% of shop owners show strong support for the clean up campaign.	+ ++ ++ ++ +
Project Purpose			▪ It is too early to evaluate the effectiveness of the project because it started only a few months ago.	-						
Outputs					▪ Most trash bins are utilized by many pedestrians. ▪ The environmental logo fixed on trash bins are seen by many pedestrians.	+ +				
Activities					▪ T-shirts were officially used only in the first clean up campaign. ▪ Although most of the leaflets were distributed, only 10% of shops received them according to the survey. This suggests the distribution method was not efficient. ▪ According to the survey of 30 shops, 9% said “It got very clean” and 89% said “It got clean”.	0 - +				

Table III.15.7 Overall Evaluation

Criterion	Result	Basis	Justification for Basis
Relevance	Very high	▪ The objective of the M/P is environmental preservation. ▪ The Provincial government and the provincial department of Siem Reap give priority to environmental education.	▪ Most stakeholders have a deeper understanding of the importance of environmental education through the implementation of the project. In this sense, the project was effective in terms of environmental education to the administration.
Effectiveness	Progressing	▪ It is too early to determine the result of the project at present because it started only a few months ago and education ordinarily takes effect after a long time.	▪ The project should be evaluated after October 2006 when the project has proceeded for about one year because it is too early to do it at present.
Efficiency	High	▪ Most of the equipment and facilities provided by the Study team are fully utilized. ▪ Most of the equipment and facilities provided were obtained locally and they achieved the targets cheaply.	▪ It was effective to minimize the equipment and facilities procured. ▪ The cost could be minimized because all materials were obtained locally.
Impacts	Mostly positive impacts	▪ Some shops and residents discharge their waste in the public trash bins. ▪ The environmental logo stickers on many of the trash bins were stolen. ▪ Wat Bo primary school purchased and installed 6 trash bins imitating the trash bins provided by the Study team.	▪ It could be foreseen that some shops and residents would discharge their waste in the public trash bins to avoid paying the waste collection fee under the present condition. ▪ That Wat Bo primary school imitated the public trash bins provided by the Study team suggests that the design was simple and functional. Many other target primary schools want to have the trash bins provided by the Study team.
Sustainability	High	▪ Most shops near the trash bins installed highly evaluate the trash bins installed along the roads. ▪ MICC established a task force team for collecting the waste from the trash bins. ▪ The governor of the provincial government committed to execute the clean up campaign every 3 months after executing the 2nd clean up campaign on 5 Dec. ▪ 100% of shop owners show strong support for the clean up campaign.	▪ The amount of waste discharged in the public trash bins by shops and residents without payment is minimized because they were installed only in places where they are very necessary. ▪ MICC appreciates the reduction of the street sweeping load due to the reduction of waste scattered with public trash bins, even though the cost for collecting waste from public trash bins increased by $300 per month. ▪ The governor is active and has been very positive for the execution of the campaign. ▪ Although the uniform T-shirts were officially worn only once in the first campaign, they helped to encourage many people to participate in the clean up. The uniform T-shirts were not used in the 2nd campaign so the style of the campaign was more natural and sustainable.

15.3 Lessons and Recommendations

15.3.1 Project for "Enhancing School Children's Environmental Awareness"

Results

It was too early to determine the result of the project because most of activities started only a few months ago. The project is generally going well and has already showed very good achievement at some of the schools. Considering the fact that most stakeholders strongly support the project and that activities are going well without any problems, it is expected that the project will proceed with success. The main reasons for the success are as follows:

- There is a high demand for environmental preservation
- The project is not only very fitting to the present demand but also each activity is easily carried out due to its simplicity.

The grounds for the result of high sustainability of the project are 1) its fitness to the high demand, 2) easy execution, 3) an assured income without any financial risks, etc. In addition, the involvement of the parents has made the project more sustainable.

Recommendation

Because it has been judged that the all target schools have sufficient capacities to carry on the project by themselves, the assistance to them should be terminated.

There have been several inquiries on the project to the target schools from other primary schools and in addition, all headmasters of the target schools support expanding the project to other schools. The expansion of the project to other primary schools and junior high schools should, therefore, be examined.

Although the project objective is to improve people's environmental consciousness not income generation, the income generated from the project actually increases the project's sustainability. However, people sometimes opt to aim at income generation while forgetting the primary objective and stop pupils from sorting the recovered material, which is an important process for the pupils to learn the importance of recycling. Therefore, the effectiveness of the environmental education should always be kept in mind in order to maximize the project's effectiveness.

Lessons

Involving the pupils' parents is useful for the project and the distribution of leaflets has been effective for this purpose. The leaflets made should, therefore, be fully utilized.

It is essential to let the pupils sort recyclable wastes because the project's objective is for pupils to learn the importance of recovering materials from waste to contribute to environmental preservation. It is particularly important to let the pupils keep the store house tidy.

The provision of primary collection points near the classrooms where pupils can deposit recyclable materials anytime made it easy for them to bring recyclable waste from their homes.

In the school recycling project, it is said that to collect enough recyclable materials to make the project a success requires a minimum of about 1000 pupils, while one school having slightly less than 500 pupils just managed to do the school recycling. This proves that it is possible for schools having about 500 pupils to carry out the school recycling project.

It was found at some schools that some of the waste collected piled up in the store houses because they had no market value. This might discourage pupils from carrying on the school recycling. Therefore, the items to be collected should be carefully decided before implementation.

15.3.2 Project for "Enhancing Adults' Environmental Awareness"

Results

It was too early to determine the result of the project because it started only a few months ago. However, considering the fact that the campaign has been executed twice and there have been no serious obstructions encountered, it is highly likely that the provincial government will execute the campaign by themselves. This is because the project will meet the demand.

Recommendation

The raising of adults' environmental awareness is very important, as they are the majority and the main actors in economic activities. However, this is very difficult to do because there is no official occasion to educate them, they have different interests, and they are more independent than pupils. The education of adults should be steadily executed with patience by trial and error.

The clean up campaign should focus on motivating people and publicity rather than on practical effects such as cleaning up the town.

It appears that many of the beautiful environmental logo stickers placed on the trash bins have been stolen because they are loved by many people. Therefore, the sale of goods showing the environmental logo such as T-shirts should be considered.

The project targeted beautification this time. However, to achieve environmental preservation, the education should cover not only the solid waste sector but also water supply, wastewater, electricity, etc. The beautification project should be understood as the first step for further expansion of the education project.

Lessons

The Study team provided the provincial government with public trash bins while MICC collects waste from them, and both benefit from the publicity of putting their names on the trash bins. The public trash bins are very effective for publicity because they are installed along busy roads for pedestrians. Therefore, it is possible to get companies' assistance for public trash bins in return for allowing them to utilize the bins for publicity. The administration should promote PPP (Public and Private Partnership) for environmental preservation by working as an intermediary to link the public and private sectors.

The clean up campaign is an effective tool for enhancing people's awareness. Therefore, rather than implementing a complicated campaign requiring various preparations, the campaign should be as simple as possible and involve various people in order to unite many people and make the campaign sustainable.