

3.6 Social and Environmental Investigations

3.6.1 Urban Development and Tourism Plan

(1) The Existing Situation

1) The Siem Reap Town

The town is the administrative center of the province and its only important urban center. The town is also the focus for the region's economy and a major station for inter-regional transport and exchange. The immediate proximity of the Angkor heritage area makes it the most important pole for tourism in the country. The town thus serves administrative, commercial and tourist functions, which strongly influence the urban landscape and the organization of space. However, for the most part, the administrative buildings are grouped in the 'administrative area' occupying approximately 100 ha in the center of town

A traditional provincial town, Siem Reap lives in a complementary relationship with the nearby villages, which are areas of agricultural production and also of traditional craft industry and even small-scale industry. This complementary relation between towns and villages is accompanied by a continuing desire on the part of the non-urbanized population to reside in the rural zones. This can limit urban growth and the type of demographic explosion common in the cities throughout the world. This is a unique way in which the Siem Reap Region constitutes a rare and fragile cultural heritage that must be recognized and protected from the negative effects of uncontrolled development. Indeed, the economic balance will be difficult to maintain if the town is rapidly transformed into a major tourist center with tremendous profits to be made. Especially in the sectors of transportation, merchandise, construction and retailing of manufactured goods, while the countryside is left to develop slowly or to stagnate, in an economic boom whose benefits are funneled to the lucky few. It will be difficult to maintain an economic balance.

2) The Development Trends

The following urban characteristics of the town are recognized by the two defining features of its location: the river, and the intersection of the region's two main roads. It is the river that imposes the north-south orientation on the urban landscape, influenced by local geology as well as human hands. The predominance of linear development in residential settlements along the river course is repeated along the other transportation arteries. The town, whose urbanized sectors have no depth beyond the several hundred meters nearest to the river, has extended in a similar manner along the National Road No. 6 running east-west and crossing the river transversely in the center of town.

The tendency to stretch the town out along transportation and access roads, thereby pushing new development far away must be brought under control. Without such measures, as concluded by APSARA (APSARA-UNESCO Report, 1996), it will be increasingly difficult to provide the necessary urban infrastructures and services as the city develops.

3) The Demographic Trends

The past two decades have seen strong increase in the growth of the town. A small locality of 10,000 inhabitants in 1970, emptied by force in 1975, Siem Reap District's population was multiplied three times to approximately 30,000 in 1979 (APSARA-UNESCO Report, 1996). The 1997 population is around 98,000.

4) Tourist Attractions

The major tourist attraction of the town is, of course, the Angkor heritage and other archaeological sites. There are also other features that can be developed to broaden the tourists' experience and increase their length of stay. As one of the greatest tourist attractions in Southeast Asia, Angkor Area is rapidly establishing its preeminence on the tourist circuits of the region.

Tonle Sap, the largest fresh water lake in Southeast Asia also attracts tourists because of its natural beauty, mangrove forest, and floating villages.

5) Tourism Activities

Tourism can bring many benefits to the town and province, indeed to the country as a whole. However, modern mass tourism can also cause incalculable destruction to Cambodia's cultural heritage, both in terms of damage to the archaeological sites and in terms of irreversible loss of the diverse non-physical traditional cultural beliefs and practices that form the foundation of the social structure in the rural Cambodia. It is clear that difficult decisions will soon have to be made in balancing, on the one hand, financial appetite that demands ever-growing tourist exploitation, and on the other, cultural concern that calls for firm limits on tourist expansion. It has to be noted that maximal long-term tourist development will depend on preserving much of the cultural specificity of the site.

However, the current situation of the town is far from that of a modern tourist center. The state of basic existing infrastructure is rudimentary and calls for complete rehabilitation or renewal. Access to the region is difficult as the national road network is in need of extensive repair and the airport's capacity is limited. Though a number of luxury hotel groups plan to establish operations in the town, hotel accommodation remains, for the time being, relatively low and marked by poor quality facilities and services. Park entrance fees are collected by a private sector without a coordinated reinvestment strategy. Hence the challenge will be to improve the facilities for cultural tourism so as to prevent an onslaught of low-quality mass tourism provoking irreversible destruction of Angkor's cultural and natural heritage.

According to APSARA-UNESCO study (1996), there are two types of tourists coming to the area, special interest tourist and general interest tourist. Special interest tourists normally travel in small groups accompanied by a qualified guide. They seek comfortable but not luxurious facilities and are sensitive to the need for conservation and management of sites. They tend to be interested in the process of conservation itself. This type of tourist stays from three to five days, and makes the best economic contribution to the area. General interest sightseeing tourists, whose visits are normally shorter (two to three days), are packaged into large groups. Their demands on site facilities and management are high but their expenditure in the local economy is more limited. So long as there is a reduced carrying capacity of the site, the same study concludes that these general interest tourists are of lower priority as target groups.

6) Site Capacity

It is essential to establish the physical, environmental, and aesthetic capacity of the Angkor monuments in order to formulate a tourism development and management strategy. The physical capacity is the measure of the number of visitors that can be accommodated at one place at a given time. The environmental capacity is the amount of use that the archaeological structures, the forest, and the landscape features can withstand without damage either to the monument sites or to the ecological fabric. The aesthetic capacity is the measure of how many visitors can be accommodated without loss to the quality of the experience of visiting the site. A study by ZEMP team (1993) suggests that Angkor Wat can withstand between 767,000 and 1,278,000 visits per year. Based on this assessment worked out by ZEMP team, APSARA-UNESCO study (1996) concluded that 639,000 visitors per year are the most optimistic scenario. The study assumed an average stay of three days in Siem Reap, which corresponds to an average 5,250 visitors in town per night.

It is estimated (APSARA-UNESCO, 1996) that the number of visits, both domestic and international, to Siem Reap will be in the range between 250,000 and 500,000 per year in 2001, rising to 1,000,000 per year by 2006.

7) Facts and Figures related to Tourism

A private company was responsible for revenue collection. The yearly contract fee in 1999 is learned to be 1 million US\$.

To enter the Angkor Wat and other main archaeological monuments, Cambodian people do not pay any money. As a result it is not possible to determine the number of local residents entering the archaeological park. All foreigners either has to pay for ticket to enter the Park or take prior permission from the tourism office, if entitled.

The number of persons who bought an entrance ticket in last few years is given as follows.

Year	Total Tourist entering Angkor Wat
1994	25,293
1995	44,833
1996	55,560
1997	31,472
1998	30,255

Source: Tourist Office, Siem Reap

Note: Unstable condition prevailed in 1997 and 1998 caused lower number of tourists.

To enter the Park by ticket, one was a choice of three different options. These are shown in the following table.

Price of Tickets

1 day ticket	20 US\$
3 day ticket	40 US\$
7 day ticket	60 US\$

Source: Discussion among the Study Team and Provincial Tourism Office

The flow of tourists is not even throughout the year. The peak season is from November to March.

The total income by the Provincial Tourism Office was US\$ 1,480,939 in 1996. Out of which, US\$ 1,427,940 were earned by ticket sale; US\$ 46,956 were earned from vehicle entrance fee and transportation fee; and the rest was earned from the fee collected for the use of latrine.

At the end of 1998, the total number of hotels in Siem Reap was 25 with 1,045 rooms (Single 147, Double 898), and that of guest houses rooms are 274 (Single 117, Double 157). Hotel occupancy rates greatly fluctuate because the tourism in Siem Reap is highly susceptible to season. A simple survey carried out by the Study Team revealed that, the rate is near 75 to 90% in peak season while it is around 20 to 50% during low season. The total number of restaurants is 17. In addition to that, there are 3 nightclubs and 1 discotheque. In all of these, there are 280 tables.

It is estimated that about 2,000 persons are employed directly in tourism (Tourism Development Strategy in Siem Reap, July 1996).

8) Facts and Figures related to Transportation

National Road No.6 provides land access from Phnom Penh to Siem Reap but this road is now not in good condition and the journey is long and arduous. At present, only 15 boats operate between Phnom Penh and Siem Reap, out of which 3 are fast boats. The daily traffic is about 100 persons per day in dry season and 200 persons per day in wet season. However, a survey by the Study Team predicts that this value is higher. There is a small port at Phnom Krom at the north end of the lake, 13 km from Siem Reap. This port can be used only in wet season and the landing facilities are not satisfactory.

Siem Reap Airport is the only airport of the region with a 2,550 m runway, which is situated 7 km from the town. At present, flights are operated from Siem Reap to Phnom Penh and Bangkok.

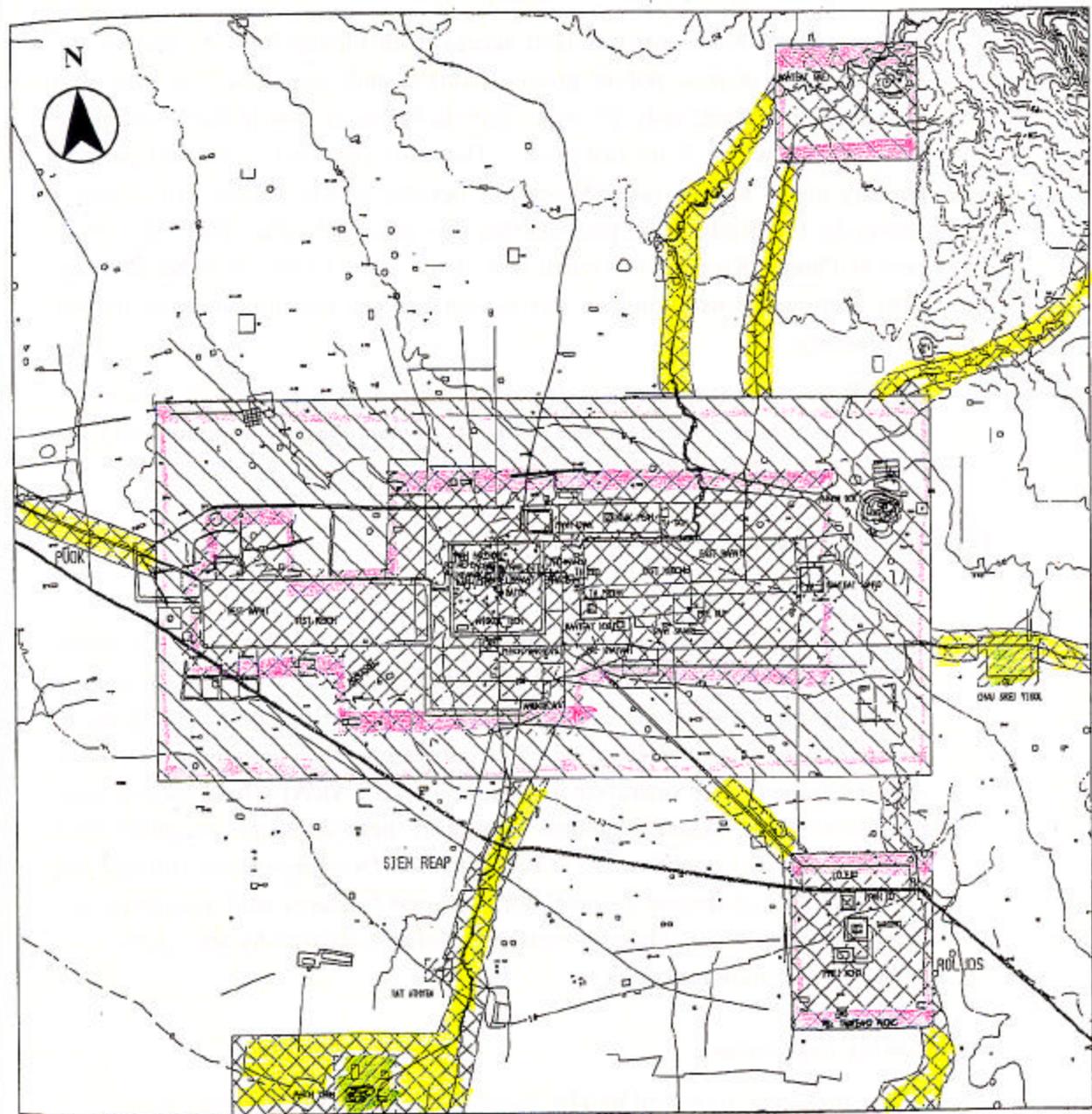
(2) The On-going and Proposed Planning

1) Urban Planning

The total responsibility of the urban development will be soon put under APSARA. While the 'Office for Land Transactions' and the 'Urban Affairs Office' (these are two of the three technical divisions under APSARA) are to ensure the overall administration of city planning, the 'Urban Development Agency' (one of two operational agencies of APSARA) will carry out field operations. The formal structures of each of these divisions are established with the aid of the *CFD (Caisse Francaise de Developpement)*. Integrating certain SCNC (Supreme Council for National Culture) staff members and personnel from other related government offices assisted by an experienced team of international experts.

Zoning Regulation

A Royal Decree approved by His Majesty the King in May 1994 defines the perimeter of protection of the Siem Reap Region, the nature of four other national categories of protected sites, and corresponding management regulations. The demarcations of five protected zones are fixed by this decree. Zoning is shown in Figure 3.6.1.



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|--------|---------------------------------|------------------|
| Zone 1 | Archaeological sites | National route |
| Zone 2 | Contours, 5 m | Provincial route |
| Zone 3 | Permanent rivers, barays, moats | |
| Zone 4 | | |

The Study on Water Supply System for Siem Reap Region in Cambodia

Japan International Cooperation Agency

Figure 3.6.1 Protected Zones in the Siem Reap / Angkor Region, close-up

ZONE 1: Monumental Sites: Areas containing the most significant archaeological sites, which deserve the highest level of protection, for example, Angkor, Roluos, and Banteay Srei.

ZONE 2: Protected Archaeological Reserves: Areas rich in archaeological remains which need to be protected from damaging land use practice and inappropriate development. They most frequently surround Zone 1.

ZONE 3: Protected Cultural Landscape: Areas with distinctive landscape characteristics which should be protected on account of their traditional features, land use practices, varied habitats, historic building, or man-made features that contribute to cultural values. The river valley of Siem Reap and Roluos river from their origin at Kulen mountain to their mouth at the Lake Tonle Sap have been designated in this zone. Some ancient causeway is also included in this zone.

ZONE 4: Sites of Archaeological, Anthropological or Historical Interest: This includes all other important archaeological sites, but of less significant than Zone 1, that requires protection for research, education or tourist interest.

ZONE 5 : Socioeconomic and Cultural Development Zone: This comprises the whole of the Siem Reap Province. This zone covers an area of 10,000 km². This zone is to be managed as a multiple-use area with an emphasis on economic and social development through sustainable use of natural resources, and to be developed for cultural tourism. Archaeological and environmental impact assessments are to be carried out in advance of any project proposed in the zone. The intention is not to hold back development but to ensure that it be appropriately located and directed, at all times taking into consideration the requirements of heritage conservation.

Urban Development Strategy

The Urban Development Agency and associated divisions aim to promote and regulate socioeconomic and infrastructural development in the Siem Reap Region in accordance with the zoning regulations.

General strategies for attaining these objectives are as follows (based on the CFD funded ARTE / BECOM report in French, English translation adopted from APSARA-UNESCO study report):

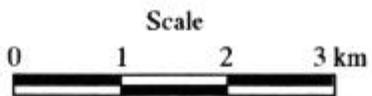
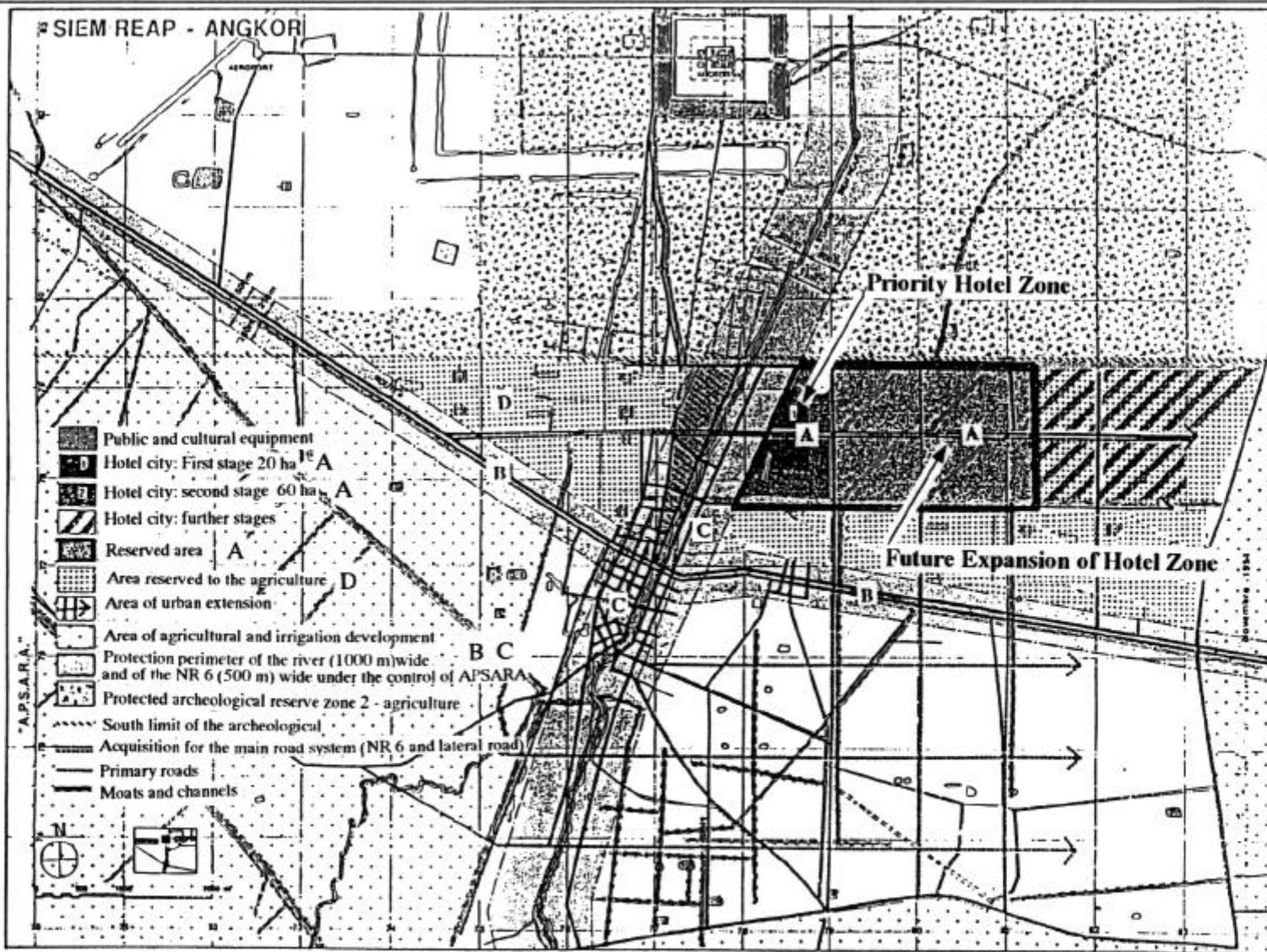
- The creation of a physical limit between the protected archeological reserve and urban development zones.
- The preservation of the irrigated agricultural town perimeter, most concentrated in the western sectors.

- Preservation of the Siem Reap Town's unique character by maintaining its dense vegetation; spacious habitats and low sky line. The river banks, protected under zoning laws, will be reinforced by natural landscaping. Construction along National Road No. 6 will also be regulated to preserve traditional landscape design.
- Urban development will be concentrated to the east of the River. Residential areas and new public services will be extended south of National Road No. 6. An international hotel district will be developed to the north of the highway. At present this area, unfavorable to agriculture exploitation, remain sparse. Land will be replanted with native species.
- A vast reforestation campaign to the south of the Archeological Park is to be undertaken. The establishment of new access to the park from the eastern hotel zone will significantly decrease traffic on the present access road passing just north of the Grand Hotel, running along the western bank of the river and leading directly to Angkor Wat. This area will be re-landscaped and reserved primarily for local traffic.

To achieve these ends, a number of priority projects are to be implemented over the first five years. Preliminary studies have recommended further research into the reinforcement of existent water resources networks through two principal projects: the stabilization of the riverbed and the rehabilitation of the Northern Baray. Existent road systems are to be improved and extended. Drinking water, sanitation, and electricity systems are to be developed.

Hotel Zone

A related zoning sub-decree, serving to demarcate a hotel district in the town, was adopted by the Government in October 1995. Creating a hotel district in the largely unoccupied and non-arable land situated in the northeastern sector of the town (Figure 3.6.2). Under this law the entire hotel zone comprising 560 ha were transferred to the authority of APSARA. In this area, about 20 hotels of four to five stars with 200 - 250 rooms will be constructed in the next 10 years.



**The Study on Water Supply System
for Siem Reap Region in Cambodia**

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**Figure 3.6.2
Hotel Zone**

2) Tourism

A series of studies concerning tourism development at Angkor has been carried out over the past few years. These studies point unanimously to the necessity of making a harmony between the protection of the cultural and environmental heritage of Angkor on the one hand, and tourism development on the other.

Like the 'Urban Development Agency', the 'Operational Agency' specialized in tourism development, which will initially be integrated into the 'Central Management Bureau' of APSARA, is in the advanced planning stage. The following general strategies have been formulated in view of reaching the principal objectives of the Tourism Development Agency (APSARA-UNESCO Report, 1996) :

- Promote only quality tourism, to protect the heritage from the brutal onslaught of mass tourism.
- Control the flux of visitors entering Siem Reap and the archaeological park, to reduce possible negative effects of huge tourist volume.
- Secure financial benefits for the public sector.

Priority projects aim to solidly establish basic infrastructure in personnel, information systems, and physical facilities in the park.

Tourist Projection

The final report of the study carried out under UNDP assistance named 'Tourism Development Strategy for Siem Reap' was published in July 1996. According to that study, there would be 380,000 tourists visiting Angkor in 2001. In another study done by the Ministry of Public Works and Transport states that, in the year 2005, the total number of visitor to Siem Reap will be around 400,000 and out of which around 350,000 will be foreigners (*Etude des aeroports du Cambodge*, December, 1994)

Tourism Development Strategy

In the various studies, a multi-pronged strategy was proposed. A brief summary is as follows.

- The airport should be improved according to the present plan.
- Transportation facilities should be upgraded.
- Conservation of the monuments should be carried out.
- Reforestation in the monument area should be carried out.
- Interpretation of the Angkor monuments should be improved through creation of a visitor center with exhibits, on-site information sign, good guide service, perhaps a sound and light show, traditional cultural

performances at the monuments and other means.

- Provision of town tour and village tour.
- Organization the lake tour.
- Improvement and construction of hotels and restaurants.
- Improvement of medical facility.
- Improvement of environmental quality.
- Offer of low promotional airfares, entrance fee and hotel rates in low season to offset seasonal fluctuation.
- Provision for safe water supply and adequate sanitation.

3) Transportation

Although the National Road No. 6 up to Phnom Penh is very strategic, there is no plan for total renovation. In near future, the portion of this road from Siem Reap to Kompong Thom will be repaired with international assistance.

To ensure the year round navigability up to Phnom Penh, a deep channel will be prepared up to the existing port to ensure use of the port even in the dry season. At present, as the existing port near Phnum Krom can not be used in dry season, people have to travel downstream through a road whose condition is extremely poor.

Under ADB funding, airport renovation is underway. The works include runway lighting, improvement of terminal building, apron and car park. This already helped nighttime operation and also allowed handling of B737 type aircraft. At the end of the renovation work, an estimated 9,942 flights can be operated through this airport per year by 2005, out of which 5,412 will be B737 type of aircraft and others will be ATR types. The estimated passenger handling capacity will be around 760,000 per year in 2005 [CFD estimated as 631,501 and Sofreavia estimated as 761,509 (Cambodia Airports Improvement, July 1995)].

3.6.2 Social Survey

(1) General Social Structure

1) Introduction

Despite impressive quantitative achievements in the human resources and social sectors since 1979, social indicators in Cambodia are still at very low levels, even compared with neighboring countries, and show wide disparities in access for the poorest segments of the population, especially in the rural areas, and for women. This is the result of a number of factors, including the hostilities and their aftermath, widespread poverty, the very low level of staff qualifications and training in the social sectors, provincial and district

disparities, systematic and severe public under-funding, and the shortage of both strategic management and implementation capabilities. The rapidly increasing budgetary difficulties and their corresponding inflationary effects on the purchasing power have further eroded the capacity of the public sector to deliver its service efficiently and equitably.

Siem Reap, like all other Cambodian provinces, suffers from the poor social conditions like high unemployment, low level of education access, poor health condition, and gender disparities. Being a popular tourist spot, the social life of Siem Reap is highly influenced by the tourism-related activities. However, the overall social indicator still remains low.

If urgent measures are not taken, the factors that disrupt the delivery of services in the social sectors (fiscal pressures, uncoordinated multiple actions, population displacement) could seriously endanger the gains achieved so far while jeopardizing the long-term reconstruction effort.

Nonetheless, uncontrolled development, especially in the socially weakened Cambodian context, will have an unprecedented destructive effect on the viability of Khmer culture and traditional belief and value systems in ensuring social cohesion. In this sense, structural limitations on the rate of expansion, insofar as they can serve to regulate massive social evolution, thereby giving traditional cultural networks the needed time to adapt to and integrate new factors, can give at least in part a salutary effect in development. The crucial national and international investments to be made in public works and infrastructure equipment must be accompanied by equally important investment in cultural preservation and promotion, even where these later vital needs may seem infinitely less tangible than the former.

2) Society and Life

The society and life of the different communities has their own characteristics throughout the plain from the lake to the foothills of Kulen Mountains. Each of the groups occupies one of the major ecological zones. The socio-cultural differences observed are largely determined by geographical and environmental factors. The first group consists of villages on the upper plain, whose principal occupation is agriculture. The second group is made up of areas in the central portion along the rivers. Agriculture is also the major activity in these areas; however, these people enjoy the benefits from very fertile land. The town is also located in this area, which translates into enormous job opportunity in tourism industry and other service or trade sector. The third community group consists of the 'floating villages' on the lake whose residents are specialized in fishing.

The town is the administrative center of the province and its only important urban center. However, there are very few industries in and around Siem Reap. The cottage industries include fish processing, handicraft, screen painting, etc.

3) Living Standard

No data is available for the living standard in Siem Reap Region. However, the Office of Planning in Siem Reap tried to estimate different vital data based on localized survey. The per capita annual incomes of a farmer in rural areas, a fisherman in Tonle Sap area and a trader in urban area are estimated as US\$ 80, US\$ 120, and US\$ 150, respectively. A survey conducted in Siem Reap Area by a NGO shows that more than two-third of the population can have only two meals per day (Survey Summary, ADRA Cambodia, 1996).

4) Sector Situation – Education

Recently, a 12-year schooling system was introduced (earlier it was 11-year). The first 6 years is defined as primary school, while the next 3 years is known as junior high school. The last 3 years is called high school. The statistics of educational system can be found in Supporting Report. In the town, there is only one high school. The sanitation system of that school is not satisfactory. There is no drinking water facility and no toilet in the school of about 1,700 students. However, there is a toilet facility for about 96 teachers. For gardening and washing, there are 2 dug wells.

Achievements in qualitative terms, while impressive under the circumstances, are uneven in comparison. The district wide drop out rate is high, especially among girls, with only 37% of children enrolled in the first grade completing

education of primary level in due time. The graduation rate is 29% for high school level. The drop out rate for entire school level can be calculated as 96%, which is a shocking figure. Nation wide situation of female student enrollment is also unimpressive, only 19% of students in higher secondary education are female (Development Objectives, Strategies and Programs of the Royal Government of Cambodia). Problems of quality stem from several factors, the primary one being the low level of education of the teachers themselves. Also important to the quality of education are the considerable variations in the quality of school buildings, the class size, and the quality of instruction offered. Educational support materials are inadequate, and the physical facilities at all levels are in poor condition.

There are a number of NGOs working in Siem Reap area on non-formal education sector. UNESCO and UNV also supporting adult education.

5) Sector Situation - Health

While, on paper, health facilities are in place in many areas of the country, the quality of health services is extremely low. Basic facilities are either absent or are poorly utilized. There is a tremendous shortage of qualified medical staff. In the area of Pharmaceuticals, the levels of production and distribution are insignificant. Few of the districts can deliver even a basic health service. Rural community health services spend an annual average of less than US\$ 1 per person compared with an average of \$12 for the LDC countries as a group. Overall indicators for health sector for all Cambodia compiled from the report (Development Objectives, Strategies and Programs of the Royal Government of Cambodia) are given below.

Maternal Mortality	650 over 100,000 live births
Infant Mortality	115 per 1,000 live births
Under 5 Mortality	181 per 1,000 live births
Malnutrition	40-50% of under 5 children
Major cause of Infant Mortality	Diarrheal diseases, respiratory infection, Vaccine preventable disease
Annual death by Malaria	5,000
New infection of TB	18,000 p.a.
Children Vaccination	TB 78%, Polio 54%, Measles 53%

Under the UNICEF collaboration, the Siem Reap Department of Health has taken up an ambitious program to be implemented within 1996 - 2000. Under the new 2 tier system, there will be 4 referral hospital located

regionally with the level of present provincial hospital, and 57 health centers located in the center of an area with about 8,000 to 12,000 people. The health center is defined as to serve MPA (Minimum Package of Activities) which includes simple curative, preventive, and referral service, among others. The chief nurse of the central hospital is by a qualified person. The referral hospital is able to serve CPA (Complementary Package of Activities).

According to the 1997 record provided by the Office of Health Service in Siem Reap Province, occurrence of preventable diseases including water-borne diseases is significant. The statistics are given in Supporting Report. It shows that 24% of the total cases is water related diseases and 42% of the total cases are preventable. In the district hospital, it shows that 32% of all occurrences and 20% of death are related with water. It also shows that 42% of all occurrences and 28% of all death are preventable diseases.

The present situation in the health education is not well organized. There are some topics related to hygiene and health care in the textbook of the school curriculum. Health Office also promotes the aspects of public health by poster, video, audio, and group discussion from time to time. However, because of the lack of financial support, water-borne diseases are less focused than, for example AIDS, the campaign of which is well supported.

6) Mine Injury

Cambodia is one of the most heavily mined countries in the world. One-third of the cultivable land is estimated as having mines. The families living in these areas are affected not only by the direct impact of death and injury and the loss of family members but also by the loss of farm animals and land which are critical to the family's livelihood. Mine injury victims with permanent disability are estimated at around 40,000 in the country (information provided by Handicap International), and it is reported that one in 267 persons is an amputee.

There is a rehabilitation center for mine victims in Siem Reap, run by Handicap International with support from Department of Social Affairs. The center has provided service to 1,800 persons since its establishment in 1983. This center has no medical facilities; they only provide artificial legs, wheel chair and crutch.

7) Critical Constraints and Agenda in Social Sector

The low level of human resources in Cambodia severely hinders the capacity of the social sectors. Four main constraints can be identified.

- i) Lack of planning, programming, budgeting, and control of recurrent and investment expenditures.
- ii) Absence of a strategic policy framework as well as shortage of technical expertise and basic data to orient, modify, evaluate, and quantify policies, programs, and projects in the social sectors.
- iii) Very low level of staff qualifications and training in social sectors.
- iv) Equity disparities in and poor financial sustainability of public sector social services.

A multi-prong strategy should be implemented to arrest further deterioration immediately, and push the social status up ultimately.

- i) Budget preparation cycle has to be strengthened.
- ii) Integrated planning, monitoring, and institutional reinforcement is a necessity.
- iii) Competence improvement of management and training.
- iv) Rationalization of largely inequitable parallel cost-recovery scheme in social services delivery.

8) Social Impact of Water Supply

Water is literally life. At the same time, it can be a carrier of suffering and death. The ready accessibility to water makes possible a hygienic environment that prevents or limits the spread of diseases.

However, the benefits of safe water supply can not be acclaimed without health/hygiene education and social mobilization. The objective of these activities is to increase awareness and to generate positive behavioral changes among the population, which are crucial elements in the efforts to reduce water- and fecal-borne diseases. The Ministry of Health, with active support from UNICEF and NGOs organize workshops and educational sessions for political and religious leaders, teachers, and members of the Women's association, who afterwards become community health educators and hygiene promoters. The social mobilization component of UNICEF Water and Environmental Sanitation (WES) Program has already developed a series of videos promoting household and individual hygiene practices.

(2) WID and GAD Aspects

1) Introduction

Women in Development (WID) approach means implementing development projects with fair consideration of the gender division of labor, as well as different social needs between men and women in the target society. Many women living in developing countries are economically and socially disadvantaged, which prohibits just and equitable development of the society. Therefore, it is important to plan and implement development projects with a view to improve the social and economic status of women and to change gender relations (Manual on Integrating WID Considerations into Development Programs, JICA, 1994).

There are differences between men and women that are biological and social. 'Sex' refers to the biological differences that are universal and unchanging. 'Gender' refers to the social differences that are learned, changeable over time, and have wide variations within and between cultures. Gender and Development (GAD) approach tries to relate any development works with the gender issues considering the division of labor for both productive and reproductive activities, and resource utilization. This helps to predict how different members of the society will be affected and to what degree they will be able to participate in any development project (Gender and Development – A Framework for Project Analysis, FAO, 1996).

2) Women in Cambodia

The animosities and their consequences left Cambodia with a population in which women account for 52% of the population. More than 20% of household are headed by women. In addition, with many men serving in the military or handicapped as a result of the war, women constitute a significant portion of the labor force. As in any other country, families headed by women alone are in difficult economic conditions, a situation aggravated here because of the particularly low socioeconomic level. Although women, by their sheer number form the majority of the productive force, they are less educated than men and few of them are in decision-making positions. Cambodian women are responsible for raising many children, for all housework as well as for a great part of family economy, yet the society lacks the resources and mechanism to provide them with due social services such as health facilities, education, and child care. Agriculture is the major sector of female labor.

3) The Social Status of Women

Traditionally, Khmer women have borne heavy responsibilities in society from a very early age. A girl is in charge of household or productive activities, which limits her chance of education. After marriage, the married woman takes major responsibility for the care of children, domestic work as well as in the family income. A newly married couple is often lives with the wife's family until they can have a house and land of their own. Women own and inherit property and inherit the same share of parents' property as men, and keep it in her name even if they are married. The legal age for marriage is 18 for women and 20 for men, but people tend to marry earlier. The constitution states that men and women are equal, however, the actual situation is different since there is no mechanisms to enforce the principles. Basic labor laws such as equal pay for equal work are only applied in the state sector. Women are under represented in political service and administrative sectors.

4) Status and Access to Health

The high birth rate has major consequences on Cambodian women's health and economic burden. Child and infant mortality rates remain high and it is generally estimated that the average number of children per mother is five, and many women have between 6 and 10 children. Bearing many children at a limited interval and raising them combined with a heavy workload and a health status already weakened by previous hardship means that women's health is poor. Other health problems affecting women include gynecological problems, anemia, and malnutrition. Major causes are by poor personal habit, frequent pregnancies, inappropriate diet, overwork, and poor environmental hygiene. Curative medical care is usually sought at a late stage and women are not aware of the usefulness of preventive measures.

Women bear the main responsibility for children's health. In this regard, it has been noted that many mothers have poor practices, especially in the area of nutrition. Cultural habits like food taboo, economic constraints and the low educational level of women seem to account for this.

5) Status and Access to Education

Although government policy states that men and women have equal access to education and all should be educated, there is no practical measure to ensure that girls remain in school. Girls often do not complete primary education because they have to look after younger siblings, help with housework and economic activities, and because being educated is not regarded as useful for a girl. Economic factors play a part too. According to a report (Women in Cambodia, Red Barna, 1990), the percentage of girls enrolled in school is lower than 50% at all levels, and starts to become lower towards the end of primary school and drops sharply in secondary school. It may be noted here that there is no governmental program for adolescents who dropped out of school. Also, there is no official program for adult literacy.

6) Programs for Women

There is only one women's organization named 'Women's Association of Cambodia (WAC)'. The WAC is committed to promote women's equal rights, to encourage women to participate in all aspects of political, economic, social and cultural life of the country, to increase the educational level of women and to improve the welfare of women and children. However, detail information is not available on their activities in and around the Siem Reap Town.

Many international organizations and non-governmental organizations are active in the women development issues. These include International Women's Development Agency (IWDA), UNICEF, UNDP, PADEK, ADRA, and many others. Most of them are focusing on education, health and income generation.

On the contrary, few projects are taken up in Siem Reap Area by the Department of Women Affairs. They have some economic development programs like cow bank, pig bank, credit, and mix agriculture. These income generation programs are supported by WFP. The department also has family planning program with UNFPA, AIDS awareness program with CWDA, women literacy program with WFP, and a gender awareness program with CARERE.

7) The Situation of Children with Respect to Women

The poor state of women will always cause destitute situation with respect to children. The high rate of mortality for infant and under 5 is reported in the previous sections. Malnutrition is a major underlying cause of premature death. Surveys conducted from 1991 to 1994 showed that 40-63% of children under 5 had weight-for-age less than 80% of the standard (First Socioeconomic Development Plan, Ministry of Planning, 1996). Such malnutrition has not only physical effects but also intellectual, affecting cognitive development and learning capacity. The high number of children already stunted will pose a major constraint to future development.

UNICEF compiled a quick overview of the 'state of children' as the following.

- Of 1000 children born in Cambodia,
- 250 live in a female headed household
 - 90 will die before 1st birthday
 - 300 will never go to school
 - 175 will be severely malnourished
 - 350 will be moderately malnourished
 - 800 will not have access to safe water

UNICEF information leaflet, 1998

An unusually high number of children continue to be orphaned and abandoned in Cambodia. A survey shows that one out of every 13 children had lost one or both parents, 45% of these had lost both (by First Socioeconomic Development Plan, Ministry of Planning, 1996). Being orphaned or abandoned puts a child at considerable risk of exploitation. According to the information provided by the Dept. of Social Affairs, the number of orphan and abandoned children in Siem Reap Province is 663 in 1997. There are 2 orphanages in Siem Reap. The biggest one is run by a NGO, which has a capacity to keep 40 children. The other orphanage is run by the Department of Social Affairs, which has a capacity of 25 children. Government spends only 13,000 R/person/month for the children who stay in the government orphanage.

While amputees of mine accidents are visible victims, the disabled children, most often by preventable diseases such as polio, are the less visible victims. Limited access to primary health care and vaccination services, extremely poor sanitary conditions, low level of literacy, and limited health education, continue to place children at high risk of disability. A recent survey shows that disabled people represent 2% of the total population: 21% of them children (First Socioeconomic Development Plan, Ministry of Planning, 1996). Polio-related disability continues to be the most prevalent among children, followed by hearing impairment and blindness.

8) Impact of Water Supply Project on Women and Children

Women and children of developing countries are the chief beneficiaries of improvement in water supply and sanitation. Women benefit because they spend considerable time collecting, transporting, and storing water. Children benefit because the heaviest burden of morbidity and mortality from water-related diseases falls upon them. Generally, to improve the living conditions of people, improvement of access to safe water is a must.

The general impact of the Water Supply Project in Siem Reap would be as follows:

- Increased access to water supply facilities will reduce the incidence of diarrheal diseases and parasitic infections in children.
- Improvement of hygiene habits.
- Reduction of water transportation work by women.

(3) Public Awareness and Water Use Survey

1) General

The survey for public awareness and water use survey were conducted by the JICA Study Team in February 1998. The objectives of the survey are to appreciate and to evaluate the knowledge and attitudes of the people of Siem Reap Town and its immediate vicinities in terms of water sources and use as well as sanitation awareness and behavior. This survey also focuses on willingness to use and pay for piped water supply system in addition to some key features of social and gender aspects. The results of this survey are considered as a key criterion for formulating a long-term water supply development plan in the Study Area.

The survey area was defined as five communes of the Siem Reap District (Svay Dangkum, Sala Kamaeuk, Sla Kram, Siem Reap, and Kout Chek) according to the requirement of the Study. The area includes the Town of Siem Reap and its immediate surroundings. The total survey area is

approximately 3,560 ha and divided into 5 different zones. This area is the most important one due to its present and future impacts on the city in terms of tourism development, its population growth and services that will be generated by great potential of economic activities of the Siem Reap Region.

2) Organization

Field works of the survey was entrusted to a local consultant. Prior to the initiation of the survey, questionnaire was prepared by the JICA Study Team. The method selected for this survey was 'Interview' by local staff based on the questionnaire. The questionnaire consists of three categories for specific target group. The first portion was designed to collect general information about the localities. The second portion of the questionnaire was prepared for the household survey. The third portion is prepared for hotels, guesthouses, and restaurants.

The total number of samples for the survey area was limited to 300 households. This figure represents 2.13% of the households living in the survey area, which is composed of 5 communes of a total of 14,105 families and a population of 81,937 (1998).

3) Zoning for the Survey

Considering the scale of the present Study of water supply, the area of the survey was first defined in order to optimize the impacts of sampling. In doing so, it was predicted that this would reflect the responses from a wide cross section of the population both geographically and socially. The areas of survey were divided into 5 zones and subsequent sub-zones to allow a better representative sampling throughout the key locations. The samples were then selected ranging from the locations to the house construction style to economic activities. Details can be found in Supporting Report.

4) Results of the Survey

General

The total population of survey area is 81,937 with 39,716 of males and 42,221 of females (1998). The percentage of male is 48.5% against 51.5% of female. The average family size is between 5.8 and 6. They have some common characteristics:

- Major water source is well
- Water quality is bad to fair especially from the point of iron content
- Water-borne disease is widely prevalent

Concerning the household income, the distribution between strata is very evident. The high-income families live in and around the town core, the middle income in the suburbs and the low-income group live mainly in the outer ring of the town limit.

It can be noted here that living conditions, household economy, water sources, sanitary facilities and water use practice are closely related to each other. For example, public awareness for hygiene closely relates to living circumstances and educational background of the person. People's willingness to pay for water also relates to household income and availability of water sources. Details of the survey results can be found in Supporting Report ANNEX 3.6.1.

General Particulars of Households

The results of the survey indicate that 46.7% of the population surveyed are male while 53.3% are female. This is similar to the national and regional trend showing that females outnumber males.

Within the survey area, agriculture is not a major economic activity (16%). Most of the persons are engaged in business activities (53.6%) like small shops, service and tourism related activities. The literacy rate is rather high compared with national trend as the people in the Town area is highly influenced by tourism related activities. However, female literacy (50%) is less than average literacy (55.6%). 1.5% of the population surveyed are recent migrant.

Even after tremendous involvement into tourism related activities; the average monthly family income remains critically low. Half of families (50%) monthly income is less than 100 US\$, indicating an annual per capita income of only 175 US\$. The most of the remaining families (46.5%) also earn less than 400 US\$ per month. This fact is also supported by the average monthly expense, which is mere 123 US\$.

Present Situation about the Water Source and Use

Out of the households surveyed, 98.4%, have wells. Out of these 78.5% is tube-well and 19.9% is open well. Only 1.5% of the household are using surface water as their water source. Ninety-nine percent of the household surveyed said that their present water source is located immediately near their house. The water quality appeared as good for 35.2% and as acceptable for 64.4% of the respondents. However, 89.7% of the respondents use boiling as the method of disinfection. The water in the well is available throughout the year in Siem Reap Area as only 10.3% mentioned that they

could not get water from the well in dry season.

Estimated average water use per family is 1,250 liters, which means the average water demand is 183 lpcd (liter per capita per day). 75.9% of the respondents are willing to pay for future piped water supply. Only 11.1% denied paying money for piped water supply. 13% of the respondents were not sure, as they would like to take careful consideration about the cost of water. About the type of water supply mode, 72.4% opted for house connection while 11.1% preferred yard connection.

Public Awareness

Statistics on the incidence of diseases indicate that malaria is the major disease in the survey area, accounting for 36.8%. The other two major diseases are typhoid (11.5%) and dysentery (9.6%). The situation could drastically be improved if water supply, sanitation, and health education are provided to the people.

Knowledge and attitudes affect the way people perceive their health situation. In the sample, 63.5% said that they are never exposed to hygiene education. In the sample, people were asked whether they knew water related diseases. The result is that only 28% knew. The pattern coming from the above scenario indicates that people's knowledge of diseases is not enough to prevent them from getting sick. Attitudes and beliefs affect the way people perceive illness. People may know the symptoms and signs, but they may not know the cause, this may be due to lack of education, and cultural beliefs, which associate sickness with other factors such as witchcraft, bad omen, harvest, etc. Alarming, it is found that 63.6% prefer not to go to doctors when they suffer from such diseases. Instead they prefer local medicine of own choice, a popular belief is scratching the skin by a coin can cure most of the diseases.

Unsanitary means of excreta disposal contribute to the spread of intestinal microorganism, which can be later carried by water to complete fecal-oral route. In the sample, latrines are the main forms of excreta disposal, only 5.4% use open defecation. There is no sewer system in the survey area. The major types of excreta disposal include water seal pit latrine (71.3%) and pit latrine (21.8%). However, 97.3% mentioned that they are aware of the fact that open defecation can cause spread of diseases. On the matter of importance of having a latrine, people put convenience (52.9%) ahead of disease prevention (19.5%).

In the survey area, there is no organized system for handling refuse. Most of the people (69.3%) practice burning as the disposal method. Sullage water is disposed outside the house, mostly into backyard. The results indicate that

the households are not aware that poor disposal of refuse may cause diseases.

The awareness regarding safe water is rather high. 99.6% cited that they should drink safe water to prevent diseases. On the perception of the impact of a water supply system, 86.7% marked that it will improve the hygiene condition, followed by the opinion that it will change the household activities (8.4%) and it will decrease hard work (3.8%).

The surveyed persons were asked to rank the development projects according to their importance. The order is water supply (77%), road (7.3%), school (6.1%), and hospital (5.4%). The tilt towards water supply seems to be over weighted. This is because people may opt for 'water supply' after knowing the relation of this survey with water supply project.

Transmission of diseases is linked to people's behavior, and it can be controlled by interventions such as health education, which seeks to change that behavior. Other interventions may include infrastructure improvement. For example, there is evidence that an improved level of water supply provision can cause increased domestic water consumption, and much of the increased consumption is used for hygiene purposes.

Non Household Survey

In the Study area, 40 hotels, restaurants, guesthouses and other holdings were also surveyed. It is found that average occupancy is 56.9%. The high season (December to February) occupancy is 81.2%. For the water source, 100% of them use well water. Depending on the scale of activities, they have more than 1 well, the average being 1.5. The average water use per room is reported as 225 liters, prudence is advised to interpret this value as in most cases there is no meter to quantify water use. Electric motor is the most popular (87.5%) lifting device.

Regarding the quantity and quality of water, 95% indicated that the quantity is enough and 82.5% stated that the quality is good. Only 10% of the respondents use some sort of treatment process. It is rather difficult to calculate the cost of water, as in most cases, there is no water meter installed.

Summary

The results for key questions of the survey can be summarized as follows:

All the population agrees that safe water is indispensable for their life.

- At present, water is adequate in quantity but inadequate in quality.
- All want to have an early water supply system.
- Demand will be more intensified after proper health education exposure.

- Women and children will be principal beneficiaries of the water supply project.
- Willingness to pay depends on household income, cost of water and type of service provided.
- There is a tremendous demand for water in non-household holdings like hotels and restaurants.

From this study, it appears that water supply project in Siem Reap will be a practicable operation due to significant potential client.

3.6.3 Environmental Investigation

Environmental investigations were carried out to grasp the current situation in water sources, water supply, water use, sanitary condition and social relation. Similar kinds of investigation were carried out both in dry and wet season to understand the seasonal difference on various aspects. Findings of these investigations are compiled for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).

This investigation concerns with the environmental characteristics in the project area. These include the area's physical, and ecological conditions, laws and regulations related with environment, water quality, water and sanitary related infrastructure and system, environmental management, the major features of human and economical development and quality of life values. These factors contain both the elements that determine the nature of the Siem Reap Water Supply Project and those that may be affected by the project.

(1) Physical Condition

1) Topography

The Siem Reap Region is located on the gently undulating plains (elevation 10-80m) between the Lake Tonle Sap and the Kulen Mountains (whose maximum altitude is 487m). The lake is the largest freshwater body in Southeast Asia with a maximum area of 13,000 km². It is entirely surrounded by marshy plains generally 10-20 km wide. The Kulen Mountains, oriented in a NW-SE line, cover about 500 km². It is around 53 km far from the Siem Reap Town. The southeast portion rises steeply from the surrounding plain and is topped by a plateau from which the river originates. Northwestern part of the Kulen Mountains has a gentler relief.

More detail information about topography investigated by the Study Team can be found in Section 3.1.

2) Geology

The town is located in the Tonle Sap basin. The area is principally covered with Tertiary and Quaternary sediments. The Kulen Mountains are made of predominantly sandstone of Mesozoic. The foot of the mountain is made of alluvial fans of gravel-sand sediment. These also occur along the flood plain of the river. Particle sizes become finer towards the lake along the river and eventually fine-grained alluvial deposits cover much of the basin. An earthquake was reported to have occurred in the early 1980s but no specific information is available. There are no seismic records for this part of Cambodia.

More detail information about geology investigated by the Study Team can be found in Section 3.3.

3) Soil

A variety of soil types occur in Siem Reap Province such as red-yellow podzols, acidic lithosols, lateritic clays, hydromorphic soils, alluvial soils, lacustrine (lake) sediments and laterites (Cambodia Airports Improvement, January, 1996).

Alluvial soils predominate in the town area. Topsoil of the southern part of the region is made of fine clay soil with high moisture content. These areas are covered by annual lake floods and become the most fertile soils in the region. Under topsoil, there are deposits of lateritic soils. These ancient and heavily weathered clays are rich in iron and harden upon exposure to air, as the unstable aluminum ferrous dioxide is oxidized to produce a very stable aluminum ferric trioxide.

The choice of basic building materials for the permanent components of Angkor's monuments was closely related with the local geology and soil characteristics. Secondary clays from the riverbeds served to make brick, which was used massively in the earliest monuments. Laterite, mined just below the water table, was employed in abundance, notably for foundations or bases or enclosures. Sandstone from Kulen Mountains was used for decorative elements and also for basic structural elements like lintel and column.

In wet season, it is observed that erosion of the topsoil is significant in the Town and its vicinity. The major reason is lack of proper storm drainage, unpaved roads, decreasing vegetation cover, and unplanned construction. Most of the eroded soil flow by the river, but a large portion is also transported through canals and irrigated fields towards the lake.

4) Rivers

The basic drainage pattern of the area consists of a series of meandering streams that rise in the Kulen Mountains at north and flow across alluvial fans to the lake. The three major river system flowing across the region are known as the Puok, the Siem Reap, and the Roluos (Figure 3.6.3).

The Puok River, which is the furthest west, has a catchment area of 670 km². Rising at an elevation of 420 m, the river is joined in its northern part by a number of tributaries, and flows southwest into the marshes of the lake. The Siem Reap River, rising at the plateau on the Kulen Mountains at around 330 m, flows through the urban area before discharging into the near Phnom Krom. This river feeds temple moats, canal systems and artificial reservoir, thereby becoming the principal watercourse in the region. The easternmost of the three rivers, the Roluos rises from Kulen foothills at an elevation of 70 m, also discharges into the marshes of the lake.

According to the current JICA Study, the depth of the river near the town is about 0.25 to 1 m in dry season and 1 to 5 m in the wet season. Width is around 20 m in dry season, and around 30 m in wet season. The peak flood discharge is estimated by the Study to be 150 m³/s at the UNTAC Bridge, and the 10-year drought flow is assumed as 0.48 m³/s at the French Weir. The annual runoff volume for the river catchment is estimated by the Study as 91 million m³. More detail information about the river investigated by the Study Team can be found in Section 3.2.

The nearest weir from the town in the River is Crocodile Weir with 3 gated sluice and 2 ungated sluice. In wet season, wood log is used to close the open sluice. It is also observed that because of excess water abstraction from the river for irrigation, the stream width decreases in the downstream.

It is observed in the wet season that river flow increase is rather quick after a storm in the upstream region. After reaching the peak, the flow then decreases very quickly. The most probable reason is the low time lag for the overland flow in the upstream region. This indicates huge deforestation in the Kulen Mountain area.



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Figure 3.6.3
Major River Systems of the Angkor Plain