

ANNEX 3.6.1
SOCIAL SURVEY

**THE STUDY ON WATER SUPPLY SYSTEM
FOR SIEM REAP REGION IN CAMBODIA**

**FINAL REPORT
Vol. III SUPPORTING REPORT**

ANNEX 3.6.1 SOCIAL SURVEY

Table of Contents

	<u>Page</u>
1. General Social Structure	A 3.6.1-1
1.1 Introduction	A 3.6.1-1
1.2 Society and Life	A 3.6.1-2
1.3 The Town of Siem Reap	A 3.6.1-3
1.4 The Development Trends.....	A 3.6.1-4
1.5 The Demographic Trends	A 3.6.1-5
1.6 Living Standard	A 3.6.1-6
1.7 Sector Situation - Education.....	A 3.6.1-7
1.8 Sector Situation - Health.....	A 3.6.1-9
1.8.1 Situation in Siem Reap	A 3.6.1-10
1.8.2 Mother / Child Health Activities.....	A 3.6.1-13
1.8.3 Family Planning.....	A 3.6.1-13
1.8.4 Extended Program of Immunization.....	A 3.6.1-14
1.8.5 Health Education	A 3.6.1-14
1.9 Mine Injury	A 3.6.1-15
1.10 Poverty Reduction	A 3.6.1-15
1.11 Public Sector Social Welfare.....	A 3.6.1-16
1.12 Critical Constraints in Social Sector.....	A 3.6.1-16
1.13 Agenda for Social Sectors	A 3.6.1-17
1.14 The Contribution of NGOs.....	A 3.6.1-17
1.15 Social Impact of Water Supply.....	A 3.6.1-17

2.	WID and GAD Aspects.....	A 3.6.1-18
2.1	Introduction.....	A 3.6.1-18
2.2	Women in Cambodia	A 3.6.1-18
2.3	The Social Status of Women	A 3.6.1-19
2.4	Status and Access to Health.....	A 3.6.1-20
2.5	Status and Access to Education.....	A 3.6.1-20
2.6	Economic Role and Access to Economic Resources	A 3.6.1-21
2.7	Programs for Women.....	A 3.6.1-22
2.8	The Situation of Children with Respect to Women	A 3.6.1-23
2.8.1	Orphaned and Abandoned Children	A 3.6.1-23
2.8.2	Children with disability	A 3.6.1-24
2.9	Impact of Water Supply Project on Women and Children.....	A 3.6.1-24
3.	Public Awareness and Water Use Survey	A 3.6.1-25
3.1	General.....	A 3.6.1-25
3.1.1	Objectives.....	A 3.6.1-25
3.1.2	Study Area	A 3.6.1-25
3.2	Organization	A 3.6.1-25
3.2.1	Procedure	A 3.6.1-25
3.2.2	Scope of Work	A 3.6.1-28
3.2.3	Data Collection Method.....	A 3.6.1-28
3.2.4	Questionnaire Design	A 3.6.1-28
3.2.5	Structure of the Questionnaire.....	A 3.6.1-29
3.2.6	Sample Size.....	A 3.6.1-30
3.3	Zoning for the Survey	A 3.6.1-31
3.3.1	Survey Zones Fixation	A 3.6.1-31
3.3.2	Sub Zones	A 3.6.1-36
3.4	Sampling.....	A 3.6.1-37
3.4.1	Distribution of Samples.....	A 3.6.1-37
3.4.2	Definition of the Type of Houses.....	A 3.6.1-38
3.4.3	Selection of House Samples	A 3.6.1-39

3.5	Survey Execution.....	A 3.6.1-39
3.5.1	Mobilization of Resources	A 3.6.1-39
3.5.2	Logistics	A 3.6.1-40
3.5.3	Recruitment of Enumerators.....	A 3.6.1-40
3.5.4	Training of Enumerators.....	A 3.6.1-40
3.5.5	Operation.....	A 3.6.1-41
3.6	Results of the Survey	A 3.6.1-42
3.6.1	Data Entry	A 3.6.1-42
3.6.2	Data Processing	A 3.6.1-42
3.7	Interpretation of the Result.....	A 3.6.1-42
3.7.1	General.....	A 3.6.1-42
3.7.2	General Particulars of Households	A 3.6.1-43
3.7.3	Persons who used earlier Piped Water Supply	A 3.6.1-44
3.7.4	Present Situation about the Water Source and Use	A 3.6.1-44
3.7.5	Social Relation.....	A 3.6.1-45
3.7.6	Questions Reserved for Women Only.....	A 3.6.1-45
3.7.7	Public Awareness.....	A 3.6.1-46
3.7.8	Non Household Survey.....	A 3.6.1-47
3.7.9	Summary.....	A 3.6.1-47
3.8	Supplementary Survey	A 3.6.1-48
3.8.1	Hotels	A 3.6.1-48
3.8.2	High School	A 3.6.1-49
3.8.3	Hospital.....	A 3.6.1-49
3.8.4	Fire Service.....	A 3.6.1-49

List of Figures

	<u>Page</u>
Figure 3.1.1 Area of Social Survey	A 3.6.1-26
Figure 3.2.1 Flow Diagram of Survey Procedures.....	A 3.6.1-27
Figure 3.3.1 Zoning and Sub-Zones.....	A 3.6.1-32

Figure 3.3.2 Zone Central (ZC) and Sub-ZonesA 3.6.1-33
Figure 3.3.3 Future Development PlanA 3.6.1-34

Attachment

Attachment-1 Questionnaire for Public Awareness and Water Use Survey
Attachment-2 Survey Summary, Public Awareness and Water Use Survey

ANNEX 3.6.1 SOCIAL STUDY

1. General Social Structure

1.1 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 underfunding, 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 very low.

The infrastructure of Siem Reap is also rather inadequate. For example, the condition of National Road No.6, which is the principal land communication link between Siem Reap and the capital, is so degraded that it is practically impossible to use that road for effective communication. This limitation of over land communication introduces a major limiting effect on the local exportation capacity and hence on production, in a region where agriculture and fishing offer enormous potential. The same situation prevails in other sectors also.

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. Indeed, in Siem Reap, there have already been cases of unacceptable cultural destruction caused, no doubt inadvertently, by overeager regional infrastructure development.

1.2 Society and Life

The society and life of the different community has its own characteristics throughout the plain from the Tonle Sap to the foothills of Kulan Mountains. Each of the groups occupies one of the major ecological zones. The sociocultural 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 main crop for these groups is rain-fed paddy which is usually harvested once a year. The population there is relatively closed because of the hardship due to limitation of water and productive land. Sugar production and resin collection are two other types of job in these areas.

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. In some of these areas, irrigation made it possible to get 2 to 3 successive harvests in a year, usually 1 or 2 paddy and 1 vegetable or other crops. As a result, these areas are well off. Siem Reap 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 Tonle Sap whose residents are specialized in fishing. These villages are typically found at the mouths of each of the major rivers. These communities are made of different ethnic groups. Apart from the Khmer, a large number of Vietnamese and Chinese along with a small number of Cham (Khmer Muslims) are living in this area. Fisheries are, in many instances, owned or managed by Chinese descent, a relatively well off sector of the local population.

1.3 The Town of Siem Reap

The town of Siem Reap 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 archeological site 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, there are very few industries in and around Siem Reap. The cottage industries include fish processing, handicraft, screen painting, etc.

As the provincial capital, Siem Reap contains the offices of each of the administrative branches of the state, military installations, political party offices, etc., next to provincial services. It also has public facilities of regional importance like schools, hospitals, and stadium. However, for the most part, the administrative buildings are grouped in the 'administrative area' occupying approximately 100 ha in the center of town.

As for the commercial exchange, there are three important markets, and three other commercial concentrations along the major roads in the south of the town. One large market is located on the eastern side on the National Road No.6 and the other is located near south. The third large market, the old market near the center of the town has been recently restarted after refurbished, which was abandoned for nearly two decades.

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 complementariness 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.

The administration employs a relatively large proportion of the active population (12%) and low government salaries have a limited impact on urban consumption, as this is among the least well off social categories of the town. As long as equilibrium is maintained between subsistence economics and monetary revenue drawn notably from the commercialization of agricultural products or associated urban activities, the villager feels relatively little attraction to the town, aside from a place to sell rural supplies. 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 Siem Reap 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 if it will be difficult to maintain an economic balance.

1.4 The Development Trends

The basic urban characteristics of the town of Siem Reap are determined by the two defining features of its location: the river, and the intersection of the region's two main roads. Flowing from the Kulen Mountains to the Lake Tonle Sap, the Siem Reap River plays the fundamental role in the large-scale organization of the entire inhabited area. It is the river that imposes the north-south orientation on the urban landscape, influenced by local geology as well as human hands. Indeed, this very river has been witness to some of the most audacious programs of hydrological management in the history, and the profound link between the river and the town, whose foundation and prosperity depend on the constraints and potential of water resources, continues to this day.

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 to push 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 town develops. Moreover, the space that will be indispensable for future development projects, and that is available today, will be wasted by inefficient usage pattern. These unchecked trends have already damaged certain historical sites, and could create major obstacles to the management of the cultural heritage protection zone.

It is also possible that a linear growth rate may not necessary be the best. A controlled growth may also save fragile resource-base required for infrastructure development.

1.5 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's population was multiplied three times to approximately 30,000 in 1979. According to the population survey conducted by UNTAC in 1992, the total population was 74,900, out of which 33,100 were living in the central urban core and the rest were in the peripheral regions (APSARA-UNESCO Report, 1996). The 1993 population of Siem Reap district is reported as 84,579 (Office of Planning, Siem Reap). With these figures, it can be possible to estimate the growth as 12.9%, which is much higher than the provincial growth rate of 3.51% (calculated on the information provided by Provincial Police Office).

Population distribution of Siem Reap district for 1993 is summarized below based on information provided to JICA Study Team by Office of Planning at Siem Reap.

Population Distribution of Siem Reap District in 1993

	Total	Women
Resident	84,579	44,037
Family	14,751	
Population under 16	41,882	20,629
Population over 17	42,697	23,408
Widow	2,853	
Handicapped	4,56	
Khmer Muslim	925	475
Vietnamese	1,533	810
Chinese	1,040	578

Source: Office of Planning, Siem Reap

It reveals that over 90% of the population is ethnic Khmer who are basically Theravada Buddhists. The notable point is that the number of women is more than that of men by 3,495, which means there are 92 males for every 100 females. However, the number of women is less than men in the age group of under 16. The table also states about the significant number of widow and handicapped persons. The average household size is 5.7.

According to the 'Provincial Development Plan of Siem Reap, 1998' the district population in 1997 is 98,816. Based on data of actual population census, the district population in 1998 is reported by District Office of Siem Reap as 103,752. So the actual growth rate for the 93 to 98 is 4.17%.

The Town of Siem Reap is subject to the flux of arriving populations due principally to the return of people who were originally from Siem Reap, the displacement of certain villages from the Park which was installed in the northwestern part of the town in the early 1990s, and the arrival of refugees from the north, the northwest and the west of the country. The massive return that began in 1989 seems to have slowed down in 1992 in spite of continued strong growth.

1.6 Living Standard

No data is available for the living standard in Siem Reap region. The first full-scale survey over last three decades was held in March 1998, the details of that census are yet to publish. 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).

For the purpose of visualization of the situation, data from limited scale survey for the whole country is presented here. All data is compiled from “Socioeconomic Survey, Ministry of Planning, 1995”. Siem Reap Town can be considered as a representative of the category ‘Other Urban’.

Sectoral Distribution of Employment (%)

	Phnom Penh	Other Urban	Rural	Cambodia
Agricultural	12.3	41.4	82.5	75.1
Industrial	11.9	6.9	3.7	4.5
Services	75.8	51.7	13.8	20.4

Service sector is predominant in Siem Reap Town closely followed by agricultural activities.

Households with Permanent Materials (including wood) for Walls in Housing Units

	Phnom Penh	Other Urban	Rural	Cambodia
Percent	84.3	56.8	25.0	32.1

This indicates around half of the people of Siem Reap area live in thatch house indicating poor living condition.

Households Using Mainly Firewood for Cooking

	Phnom Penh	Other Urban	Rural	Cambodia
Percent	54.2	88.6	95.3	92.1

Very high dependence on firewood is a poor indication of life style.

Households Using Mainly Electricity for Lighting

	Phnom Penh	Other Urban	Rural	Cambodia
Percent	67.3	30.2	3.0	9.5

Two-third of the population of Siem Reap Town are living without electric service.

Household with No Toilet Facilities

	Phnom Penh	Other Urban	Rural	Cambodia
Percent	22.0	53.3	88.3	80.0

Half of the Siem Reap population can be expected to be without any toilet.

Monthly Average Household Expenditure

	Phnom Penh	Other Urban	Rural	Cambodia
US\$	312	176	96	116

This indicates extremely strenuous situation of the average households.

1.7 Sector Situation - Education

Between 1975 and 1979, formal education, except for some vocational centers, was abolished. Since 1979, with considerable support from the local communities, the education system, especially at the lower level, has expanded in size but maintains a low level of quality, having been reconstructed virtually from scratch. The official adult literacy rate is 65.3%, while female adult literacy rate is 53.4% (Socioeconomic Survey, Ministry of Planning, 1995).

The statistics of educational system were obtained from the Department of Education, Sports and Youth Affairs. Recently a 12 year schooling system was introduced in Cambodia (earlier it was 11 year schooling). The first 6 years of schooling are called Primary while the next 3 years are known as secondary or junior high. The last 3 years of schooling is termed as high school.

The Statistics of Educational System for the Year 1996.

School type	Pre-school	Primary	Junior High	High School
Total number	11	310	13	6
Total class	64	2,273	124	125
Total student	1,906	100,207	5,358	5,522
Total Staff	109	2528	897	355
Graduation (total)	981	6,155	1,661	541
Graduation (female)	480	2364	582	185
Student per class	29.78	44.09	43.21	44.18
Student/teacher	17.49	39.64	5.97	15.55
Student contribution per year (range), R	2,500 - 5,000	1,000 - 3,500	2,500 - 5,000	2,500 - 5,000

Source: Written reply of Provincial Education Office to Study Team inquiry

In addition, there is a school that provides education as a part time basis for the students who have to work to support themselves and families. There are 54 student in that school with 7 female. Also there is a program aimed towards illiterate persons. 1,442 persons are instructed by 68 teachers who are divided into 68 groups.

For easy comparison, the population distribution up to 25 years old is briefly shown below.

Age group	Total	Female
0 to 5	101,826	51,132
6 to 17	170,412	54,026
18 to 25	70,635	41,528

Source: Written reply of Provincial Education Office to Study Team inquiry

In the Siem Reap 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 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 based on the table shown above as 96%, which is a horrifying figure. Situation of female student enrollment is alarming, 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.

The highly decentralized institutional arrangements in the sector are rather rudimentary. The Ministry of Education has the overall responsibility for establishing national policies, curricula, and standards, but provinces and districts have the financial and administrative responsibilities for operating most of the system. However, the system hardly works due to absence of administrative and financial links between the center and its local counterparts.

There are a number of NGOs working in Siem Reap area on education sector. Some of them help the school going children by providing dress and teaching materials. Others establish schools both for regular and drop out children. Some NGOs are carrying out program to educate the families to prevent drop out.

For the adult literacy there are 22 classes in Siem Reap district. Most of these schools are supported by UNESCO. UNESCO also has some moving library including one for the floating villages of Lake Tonle Sap. In most cases, the course duration is about 6 months, during which, the teaching is given for basic reading, writing and simple arithmetic. Some of the NGOs combine the adult literacy program with other income generation program, which makes the literacy program more effective. United Nations Volunteer (UNV) provides special English classes for the persons who want to be a tourist guide.

1.8 Sector Situation - Health

While, on paper, health facilities are in place in many areas, 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 is 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 US\$ 12 for the LDC countries as a group. Overall indicators for health sector is compiled from a report (Development Objectives, Strategies and Programs of the Royal Government of Cambodia) is given as follows.

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
Children Vaccination	TB 78%, Polio 54%, Measles 53%

Tuberculosis is the main cause of death among young adults in Cambodia. The annual risk of infection among all age groups is one of the highest in the world (Cambodia – From Rehabilitation to Reconstruction, World Bank, 1994). Malaria is another major cause of illness and death. Water-borne diseases also play havoc on the public health. All these indicate poor social condition prevailing in the country.

1.8.1 Situation in Siem Reap

Under the UNICEF collaboration, the 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 center 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 center is headed by a qualified nurse. The referral hospital is able to serve CPA (Complementary Package of Activities).

From the 1997 record provided by the Office of Health Service in Siem Reap, it is gathered that occurrence of preventable diseases including water-borne diseases is significant. The statistics is given below.

New Cases of Diseases Diagnosed in Siem Reap Operational District, 1997

Number of health Center	57
Population covered	346,705 (end of 1997)
Kind of disease	Number of new cases
Malaria	10,429
Other fever	26,461
Diarrhea	12,928
Dysentery	12,406
Upper respiration infection	8,275
Lower respiration infection	7,602
Cough more than 21 day	2,535
Measles	56
Poliomyelitis	0
Umbilical tetanus	02
Other tetanus	102
Whooping cough	451
Skin infection	5,022
Gynecological infection	3,848
Venereal disease for women	381
Urinary / ulcer of male genital organ	623
Other venereal disease for man	745
Wound / injury	4,647
Other	28,738
Total	125,249

Source: Based on information provided to the JICA Study Team by Provincial Office of Health Service.

It shows that 24% of the total cases is water related diseases and 42% of the total cases are preventable.

Situation in District Hospital

Name of the disease	Occurrence	Death
-Malaria	2,197	12
-Other fever	582	60
-Respiration infection	776	04
-Diarrhea	88	02
-Cholera	03	0
-Typhoid fever	109	0
-Dysentery	65	0
-Dengue	113	23
-Meningitis	05	0
-Measles	02	0
-Other tetanus	01	01
-Tuberculosis	1,014	14
-Marasme / kwashilorkor	03	0
-Delivery	529	01
-Gynecologic	160	0
-Traffic accident	465	02
-Mine accident	64	0
-Other	4,162	79
-Total	10,339	199

Source: Based on information provided to the JICA Study Team by Provincial Office of Health Service.

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.

In 1997, the provincial hospital treated 3,983 in-patient and the occupancy rate was 76%.

1.8.2 Mother / Child Health Activities

According to the information provided by the Office of Health Service in Siem Reap, the Mother / Child health activities are as follows.

Consultancy	
Prenatal consultation and search for difficulties in pregnancy:	10,619 person
2-Post natal consultation:	924 person
Delivery	
- Normal delivery	6,197
- Abnormal delivery	258
- <u>Total delivery:</u>	<u>6,455</u>
- Mother death	428
New born	
- Total baby	6,313
- Baby weight < 2 kg	68
- Baby weight > 2 kg and <2.5 kg	3,258
- Baby weight > 2.5 kg	2,887
- Born death	61
- Died after delivery	41

Source: Based on information provided to the JICA Study Team by Provincial Office of Health Service.

This reveals that people are less interested about post-natal consultation. It also shows a very high maternal mortality of 7% for hospital delivery.

1.8.3 Family Planning

Family planning program is not very well defined. NGOs providing family planning services report a strong demand for contraceptive services.

According to the information provided by the Office of Health Service in Siem Reap, the birth spacing activities in health centers are as follows.

<u>Method</u>	<u>Total number of person</u>
- Pill	1,443
- I.U.D	38
- Condom	79
- Injection	6,499
- <u>Total</u>	<u>8,059</u>

It shows that injection is the most popular method. However, total number of persons opting for birth spacing methods are rather insignificant.

AIDS is potentially one of the most serious public health problems that will face Cambodia over the next decade. A limited survey of commercial sex workers shows a 9% infection rate (Cambodia – From Rehabilitation to Reconstruction, World Bank, 1994). Other sexually transmitted diseases are also widely prevalent.

1.8.4 Extended Program of Immunization

The Extended Program of Immunization (EPI) aims at reducing the morbidity and mortality caused by tuberculosis, diphtheria, tetanus, measles, and poliomyelitis. The target population is all infants under one year of age and women in fertile age group (ages 15 to 45). UNICEF, along with Japan, is the major provider of funds and technical assistance for the implementation of EPI.

According to the information provided by the Office of Health Service in Siem Reap, the birth spacing activities in health centers are as follows.

a- Children under one year-old	
- B.C.G (No of children)	13,584
- Polio (No of children)	41,292
- D.T.C (No of children)	46,023
- Rubella (No of children)	11,749
b- Pregnant woman:	Total 11,356
c- Woman (15 to 45 year-old) but not pregnant:	Total 23,003
d- Children over one year-old:	Total 4,810

1.8.5 Health Education

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. In 1997, under the proposed 'Primary Health Care' program, 10 villages under 2 commune will be brought under extensive public awareness program.

Under the UNICEF supported health program, provisions are kept for community participation in the health centers through the Health Center Management Committee (HCMC) and Feed Back Committee (FBC). In this system, staffs of health centers visit the village to provide health education and also health centers get feedback from the villagers. It is proposed that through this program, health messages will reach four corners which include hygiene, proper water use, nutrition,

vaccination, birth spacing, and use of health centers.

1.9 Mine Injury

Cambodia is one of the most heavily mined countries in the world. One-third of the cultivable land is estimated to have been mined. 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 to the Study Team), with a decreasing but still significant monthly addition of between 200 and 300. It can be estimated that one in 267 persons is an amputee. The vast majority of victims are men between the ages of 18 and 35 years, while women are estimated to represent 5-8 percent and children about 7 percent (First Socioeconomic Development Plan, Ministry of Planning, 1996). This is a unique social problem of Cambodia.

There is a rehabilitation center for mine victim in Siem Reap, run by Handicap International with support from Department of Social Affairs. The center provided service to 1,800 persons from its establishment in 1983. Even as of February 1998, average number of mine victims who come to the center is between 40 and 45. 10% of the victims are women and children and 50% of the victims are recently injured person. Around 60% of the victims coming to this center are soldiers. This center has no medical facilities; they only provide artificial legs, wheel chair and crutch. The cost of one artificial leg is 50\$ for half and 60\$ for full. The center has facilities to manufacture artificial legs. The center has physiotherapy section, which gives training for about 2 weeks. An associate organization of this center tries to find jobs for the rehabilitated persons.

1.10 Poverty Reduction

Cambodia, with a 1998 population of 10.3 million boasts a total GDP of 3,089 million US\$ (World Development Report, 1999/2000, World Bank) with a growth rate of 5.5% from 1990 to 1998. The GNP per capita is 280 US\$ with 2.9% inflation. However, Cambodia, as one of the poorest countries in the world, suffers from uneven wealth distribution like any other developing countries. If poverty is interpreted as the number of people whose incomes fall below a subsistence level of consumption, then the rising of those incomes so as to permit consumption above that minimum level would be the practical objective of all development assistance.

According to World Bank Report, in 1997 around 36% of the population are living below the region-specific poverty line set by Ministry of Planning.

The poverty reduction will require adjustments in many factors. The most important factor is the increase in agricultural productivity to raise income level of agro based population, who constitutes well over 80% of the population. An efficient transport infrastructure is the next requirement for growth in investment, consumption, and trade. The vital role of mass education in developing an adaptive, skilled work force is a major determinant of poverty reduction. The education of girls in particular has been shown to exert a powerful impact on social well-being. The health status of the Cambodian population is among the lowest in the world, and as such, is both a symptom and a cause of severe poverty. The unusually high female gender ratio (52.2%, Socioeconomic Survey, Ministry of Planning, 1995) and significant female-headed households (21.2%, Socioeconomic Survey, Ministry of Planning, 1995) add another dimension to the importance of health services, particularly for preventive and maternal health. Access to safe water is closely linked with health interventions as a determinant of health status, especially that of children.

1.11 Public Sector Social Welfare

Department of Social Affairs in Siem Reap provides a limited social welfare support. This includes pension to 296 retired officers, and support to 233 officers who are not able to continue their work due to work related injuries. Also they provide money to handicapped military and police personnel. However, the department has no program like training or assistance in job finding. Recently, they are negotiating with construction companies and hotels in order to assist job finding.

1.12 Critical Constraints 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.

- Lack of planning, programming, budgeting, and control of recurrent and investment expenditures.
- 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.
- A very low level of staff qualifications and training in social sectors.
- Equity disparities in and poor financial sustainability of public sector social services.

1.13 Agenda for Social Sectors

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

- Budget preparation cycle has to be strengthened.
- Integrated planning, monitoring, and institutional reinforcement is a necessity.
- Improvement of staff competence by staff management and training.
- Rationalize of largely inequitable parallel cost-recovery scheme now present in social services delivery.

1.14 The Contribution of NGOs

Non-Governmental Organizations are playing a major role in the development effort in Cambodia as a whole. In Siem Reap region, the activities of NGOs are equally visible in most of the sectors including vital local capacity building. There is no information on the number of NGOs working in Siem Reap region, though it is reported that over 200 NGOs are working all over Cambodia. In 1995, 101 reporting organizations implemented projects valued at US\$ 59.1 million. The projected value of development projects to be implemented by NGOs in 1996-2000 is US\$ 375 million for all Cambodia and US\$ 14 million for Siem Reap (First Socioeconomic Development Plan, Ministry of Planning, 1996).

NGOs working in Siem Reap area is highly successful because they integrate their programs extensively and they carry out broad public relation. One NGO has found to integrate 7 objectives like capacity building, income generation, food security, environment preservation, education, Khmer culture and health. They provide small credit with 1% interest for income generation activities with a repayment period of 1-2 years. They also provide support for water well, water pump and sanitary latrine. In most cases, the NGOs adopt the 'revolving fund' approach.

1.15 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 of water makes possible a hygienic environment that prevents or limits the spread of diseases.

However, the benefits of safe water supply can not 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.

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

2.1 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 by and what degree they will be able to participate in any development project (Gender and Development – A Framework for Project Analysis, FAO, 1996).

2.2 Women in Cambodia

The animosities and their consequences left Cambodia with a population in which women account for 52.2% of the population and 21.2% of households are headed by women (Socioeconomic Survey, Ministry of Planning, 1995). 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. This means that women bear exceptionally heavy responsibilities in the socioeconomic life of Cambodia. As in any other country, families headed by women alone are in difficult economic conditions, a situation which is 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.

Living indicators pertaining to the women are listed below.

Female adult literacy rate	53.4% (male 65.3%)
Female higher secondary student	19%
Maternal Mortality	650 over 100,000 live birth

2.3 The Social Status of Women

Traditionally, Khmer women have borne heavy responsibilities in society from a very early age. A girl would be in charge of household or productive activities, which limits her chance of education. After marriage, the married woman took major responsibility for the care of children, domestic work as well as in the family income. A newly married couple would often go to live with the wife's family until they could have a house and land of their own. Women owned and inherited property and would inherit the same share of parents' property as men, and keep it in her name even if they were married. The legal age for marriage is 18 for women and 20 for men, but people tend to marry earlier. Marriage is still viewed as a socioeconomic deal rather than sentimental commitment. However, inside the family the wife has an important role. Not only she is responsible for all housework and child caring, but also for family budget.

The disproportional ratio between men and women is causing increased unfaithfulness, which leaves the woman in an affective and economic position of insecurity. Divorce is increasing, which often make the woman losers on the economic front. In addition, divorced women are not socially well accepted.

The constitution states that men and women are equal, however, the actual situation is different since there is no mechanisms to enforce the principles. Social services, which would improve the status of women, are only available to a few and are often inadequate. Basic labor laws such as equal pay for equal work are only applied in the state sector. Procreation and child raising are unfortunately not yet recognized as services to society. Women are under represented in high political, service and administrative sectors.

2.4 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 had 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. These are caused by poor personal habit, frequent pregnancies, inappropriate diet, overwork, and poor environmental hygiene.

An increasing number of people would like to have smaller families but do not know the way. Contraceptives are not well accessible and rather expensive. Sometimes, social tradition discourages many people to adopt family planning.

Curative medical care is usually sought at a late stage and women are not aware of the usefulness of preventive measures. People are reluctant to visit health centers for a number of factors like, poor condition prevailing in the medical center, distance to the health center, high cost, lack of trust on medical system.

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 taboos, economic constraints and the low educational level of women seem to account for this.

No data are available on domestic violence. However, the problem exists and it is usually connected to extreme poverty, lack of education and men's drinking, which is assumed to be fairly widespread given past trauma and the present precariousness of the present situation. There is also no support system for women and children suffered from domestic violence. This sometimes leads to divorce and relinquish of children. Ministry of Women Affairs is now preparing a law on domestic violence.

2.5 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, Redd Barna, 1990), the percentage of girls enrolled in school is lower than 50% at any level, 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.

Vocational training in secondary schools is limited and very few girls are involved because most of the courses available are in the fields, which are traditionally intended for male, except sewing and cooking.

2.6 Economic Role and Access to Economic Resources

Cambodia being primarily an agrarian country, a 75.1% of the active population are engaged in agriculture (Socioeconomic Survey, Ministry of Planning, 1995). On average, women make up to 60 to 65% of the agricultural workforce. Women are, in many cases, do most of the sowing, preparation of seedbeds, transplanting and harvesting of rice. Women also share the responsibilities of fertilizer use and irrigation. However, for supplemental income, women primarily engaged in agricultural activities are also involved in small business, like selling minor items or collecting firewood. All these they have to perform in addition to regular housework including child care.

In 1985, 31.4% of state cadres were women (Women in Cambodia, Redd Barna, 1990). This figure has probably not changed much. Many women work in the health, education and administration sectors, but the higher the positions, the less numerous they are. Women who work in the public sector, like their male counterparts, receive a salary, which is not sufficient for living. They or another family member must have another job. On the whole, women in the public sector often have two jobs, in addition to housework and caring for the children.

In some light industries, women outnumber men (60% in textile, 70% in salt preparation and 50% in rubber production), but in other industries, they only constitute 30% because of their low knowledge of science and technology. Many work in street cleaning and quite a few in house building and road construction. However, as women are regarded as less productive than men because they are physically weaker and may have to take time off to breast-feed babies or look after sick children, they are the first to be laid off.

The private sector is growing fast and many women are working in this sector now. Detail data are not available. In Siem Reap Town, there are a number of private shops, services, and restaurants where women are working. They have to work for long hours but their salaries are much higher than state sectors. In the markets, which are the main place for commercial transactions in Siem Reap Town, practically

all the shopkeepers are women.

In order to start practically any kind of income generating activity, women need capital, and many women do not have the money to buy tools and others to start economic activities. Hence access to soft credit is a must.

An alarming aspect of the lives of too many young girls and women is their “commoditisation”. Anxious to do what they can to provide financial support for themselves and their families, some of them are tricked into lives of debt and virtual slavery. Many have few alternatives but prostitution, with the high risks of contracting AIDS/STD, which such a life entails. Extreme poverty also lead young women to go to the town to look for a job and to be lured into prostitution against their will. Further, it is reported that a good number of commercial sex workers had been sold by parents, relatives, neighbors or friends whom the women had initially trusted. Most often, the reasons were to pay debts or for family survival. While it was not possible to quantify the numbers of women who live in such circumstances, there are too many; and the great concern families have about the safety of their daughters is sufficient testament that this is a social priority.

2.7 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 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 have family planning program with UNFPA, AIDS awareness program with CWDA, women literacy program with WFP, and a gender awareness program with CARERE.

2.8 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 infant and under 5 mortality was reported in the previous sections. Malnutrition is a major underlying cause of premature death. Nutrition data provide a good summary indicator not only of the well-being of individual children, but also of the community and the society in which they live. Available evidence shows that the nutrition of young children is very serious. Surveys conducted from 1991 to 1994 showed that 40-63% of children under 5 had weight-for-age less than 80% of the standard. Faltering growth, which results in stunting (a sign of chronic malnutrition), affected 38-62%; while wasting or acute malnutrition (low weight for height) affected some 4.4% of these children (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.

Micronutrient deficiencies are common, resulting generally in impaired capacity to withstand disease. For example, vitamin A deficiency among young children increases their risks of death from measles and of debilitating bouts of other diseases, notably diarrheal disease.

UNICEF compiles 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
 - 200 will have access to safe water

UNICEF information leaflet, 1998

2.8.1 Orphaned and Abandoned Children

An unusually high number of children continue to be orphaned and abandoned in Cambodia. Although there has been a significant decrease recently, numbers remain high due to widespread poverty, continued armed conflict in some areas, and family fragmentation. The vast majority of orphans live outside institutions, making it difficult to assess their numbers. However, a survey in 1991 shows that one out of every 13 children had lost one or both parents, 45% of these had lost both (First Socioeconomic Development Plan, Ministry of Planning, 1996). Being orphaned or abandoned puts a child at considerable risk of exploitation. Traditionally, the

extended family care for most of these children, where generally these children had their basic needs met. However, in some cases they are often expected to work in exchange for care, and they were also the most vulnerable to abuse and sexual 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 orphanage in Siem Reap. The biggest one is run by a NGO, which has a capacity to keep 40 children. As weak family structure is one of the reasons of high abandoned children, this NGO also tries to reintegrate such children with their families. The other orphanage is run by the Department of Social Affairs, which has a capacity of 25 children. Other children either stay in orphanage of other provinces or in the houses of care taker families. Government spends 13,000 R/person/month for the children who stay in the government orphanage while government also provides some support to the caretaker family.

2.8.2 Children with disability

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 disable people represent 2% of the total population: 21% of them children and 66% male (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.

2.9 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 form 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:

- Increase access to water supply facilities will reduce the incidence of diarrheal diseases and parasitic infections in children.

- Improvement of hygiene habits.
- Reduction in the labor burden of women.

3. Public Awareness and Water Use Survey

3.1 General

3.1.1 Objectives

A ‘Public Awareness and Water Use Survey’ was conducted by 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.

3.1.2 Study Area

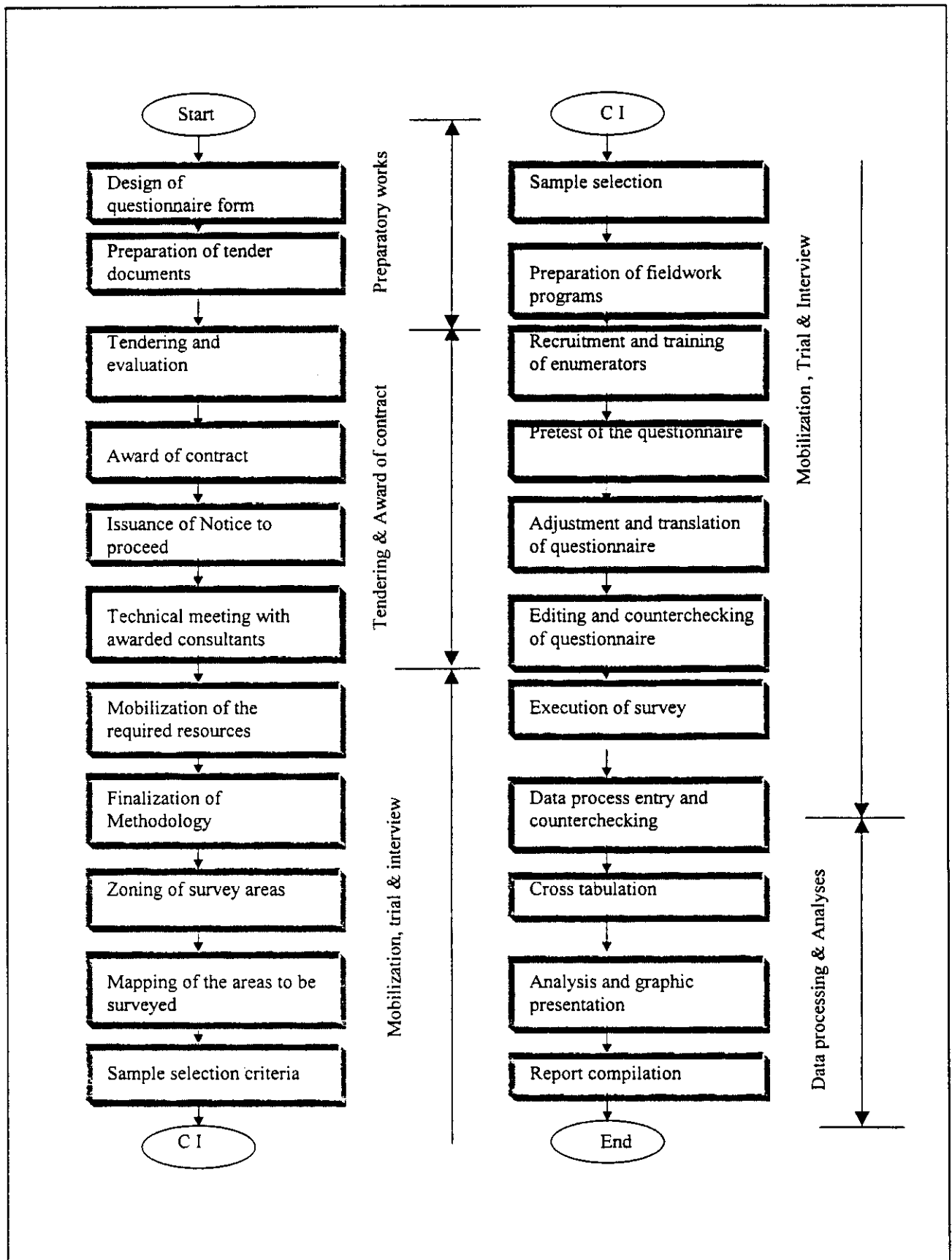
The Survey area was defined according to the requirement of the Study. The area includes the town of Siem Reap and its immediate surroundings. The justification of area selection is given in the following sections. A location map of the survey area is given in Figure 3.1.1.

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

3.2 Organization

3.2.1 Procedure

Field works of the Survey was entrusted to a local consultant (The Khmer Consulting Engineers Corporation). Prior to the initiation of the Survey, a questionnaire was prepared by the JICA Study Team. Preparatory works, field surveys, data collection, processing and analysis were carried out according to the procedures shown in Figure 3.2.1.



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

Japan International Cooperation Agency

Figure 3.2.1
Flow Diagram of Survey Procedures

3.3.2 Scope of Work

The work executed cover the following components:

- Fixation of survey area
- Mapping the survey area
- Selection of survey methodology
- Finalization of questionnaire
- Selection of sample
- Interviewing the households and filling the questionnaire
- Data entering and processing
- Data interpretation and editing
- Final reporting

3.2.3 Data Collection Method

Out of several methods generally applied for any survey, the method selected for the current survey was ‘Interview’ by local staff. This is the most effective and accurate in the given condition as compared with others such as mailing, telephone, and their combination. The following factors were considered in the selection process:

- Telephone lines are rather scarce in the survey area. Moreover, there is a possibility of misunderstanding regarding some questions.
- Mailing is a time consuming method. Further, considering the literacy rate in the survey area, less response was expected.
- Interview is an accurate method. In case of their misunderstanding, enumerators could immediately point out and clarify, which help extract a correct answer. Thus, this method minimizes misunderstandings of respondents, resulting in an increase of response rate.
- The use of local staff was considered as the best. They are familiar with the situation and have a command in local language. This organizational setup considerably reduces time required for the interview.

3.2.4 Questionnaire Design

Prior to developing a questionnaire, reconnaissance surveys were carried out in the Survey area by the JICA Study Team in January 1997 during the first field work of the Study Team. At that time, the Study Team analyzed the various responses to trial questions. A draft questionnaire was then prepared by the Study Team. The draft was disseminated to different local organizations including MIME and APSARA for

review. The aim was to incorporate their expertise and opinion in the questionnaire. The questionnaire was thus elaborated which reflects the views of local organizations. The local consultant then made the translation into Khmer language for the convenience of the enumerators. A test survey was carried out with the Khmer version of the questionnaire. After analyzing the response, the feedback was incorporated into the questionnaire. The final form developed is given in the Attachment-1.

3.2.5 Structure of the Questionnaire

The questionnaire consists of three categories for specific target group. The first portion was designed to collect general information about the localities, which had to be filled by the Team Leader of survey group. The primary intention of this portion is gather the collective information of the localities such as, population distribution, existing infrastructure, local economic situation, and overall social situation. The second portion of the questionnaire was prepared for the household survey. This portion, again, was consisted of five sub categories. Under each sub category, the following were considered relevant to the present study.

a. General particulars of household

- Family size
- Household facilities
- Economic activities
- Education status

b. For persons who used earlier water supply

This section was intended to the persons who used the piped water supply system available in Siem Reap area before 1995. The topics are as follows:

- Type of service
- Duration of flow
- Water quality
- Supplemental source
- Cost of the service
- Satisfaction level

- c. Present situation of water source and usage
 - Water source, distance, dry season availability, water quality
 - Water consumption
 - Disinfection practice
 - Storage
 - Willingness to use, preferred level of service
 - Willingness to pay, present cost

- d. Social relation
 - Community activities
 - Family and village problem
 - Women's activities
 - Gender disparities

- e. Public awareness
 - Hygiene education
 - Prevalence of water related diseases
 - Awareness on link between water and disease
 - Sanitation system
 - Awareness on link between sanitation and disease
 - Personal Hygiene

The third portion is prepared for hotel, guesthouses, and restaurants. Here the principal focus was on room number, peak and average occupancy rate, present water use and cost, source and treatment used.

The above inquires were arranged in the form to flow smoothly and not to give any misunderstanding to the responding person.

3.2.6 Sample Size

The total number of samples for the survey area was limited to 300 households. This figure represents 2.14% of the households living in the Survey area, which is composed of 5 districts of a total of 14,045 families and a population of 81,792.

3.3 Zoning for the Survey

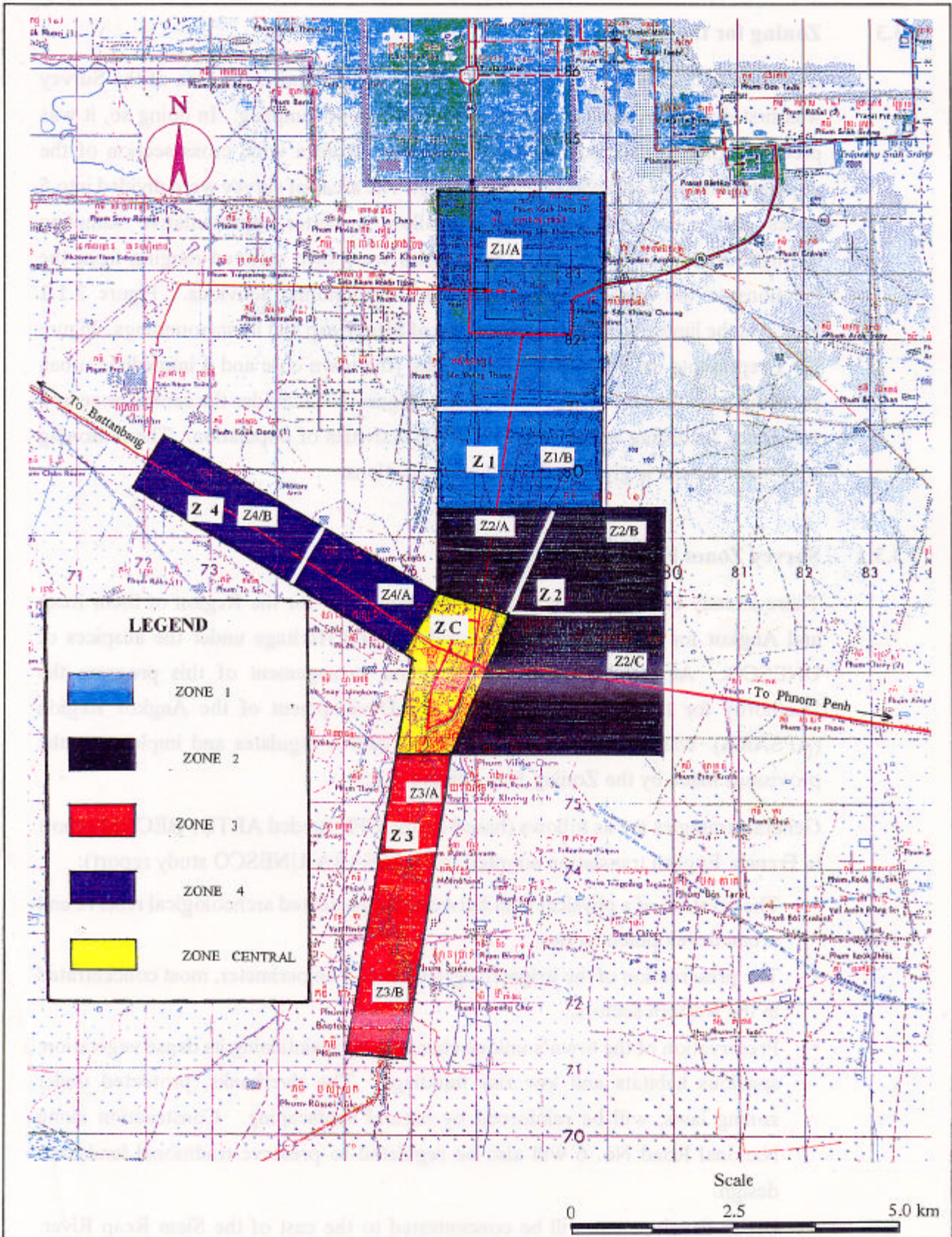
Considering the scale of the present Study of water supply, the area of the Survey was first defined in order to optimize the impacts of sampling. In doing so, it was predicted that this would reflect the responses from a wide cross section of the population both geographically and socially. The areas 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. Figure 3.1.1 indicates the limits of the survey, the town of Siem Reap and its surroundings. Figure 3.3.1 represents the 5 zones and sub-zones, (the town core and 4 immediate urban areas in which the survey was conducted). Figure 3.3.2 divides the central zone into sub-zones according to the density and the activities of population. The reasoning with other details is given in the following sections.

3.3.1 Survey Zones Fixation

There already exists ‘Zoning and Management Plan’ for the Region of Siem Reap and Angkor for the protection of World Cultural Heritage under the auspices of UNESCO. At the same time, for a better management of this program the ‘Authority for the Protection of Site and Development of the Angkor Region (APSARA)’ was created in 1994. A royal decree regulates and implements the provisions made by the Zoning Plan (Figure 3.3.3).

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

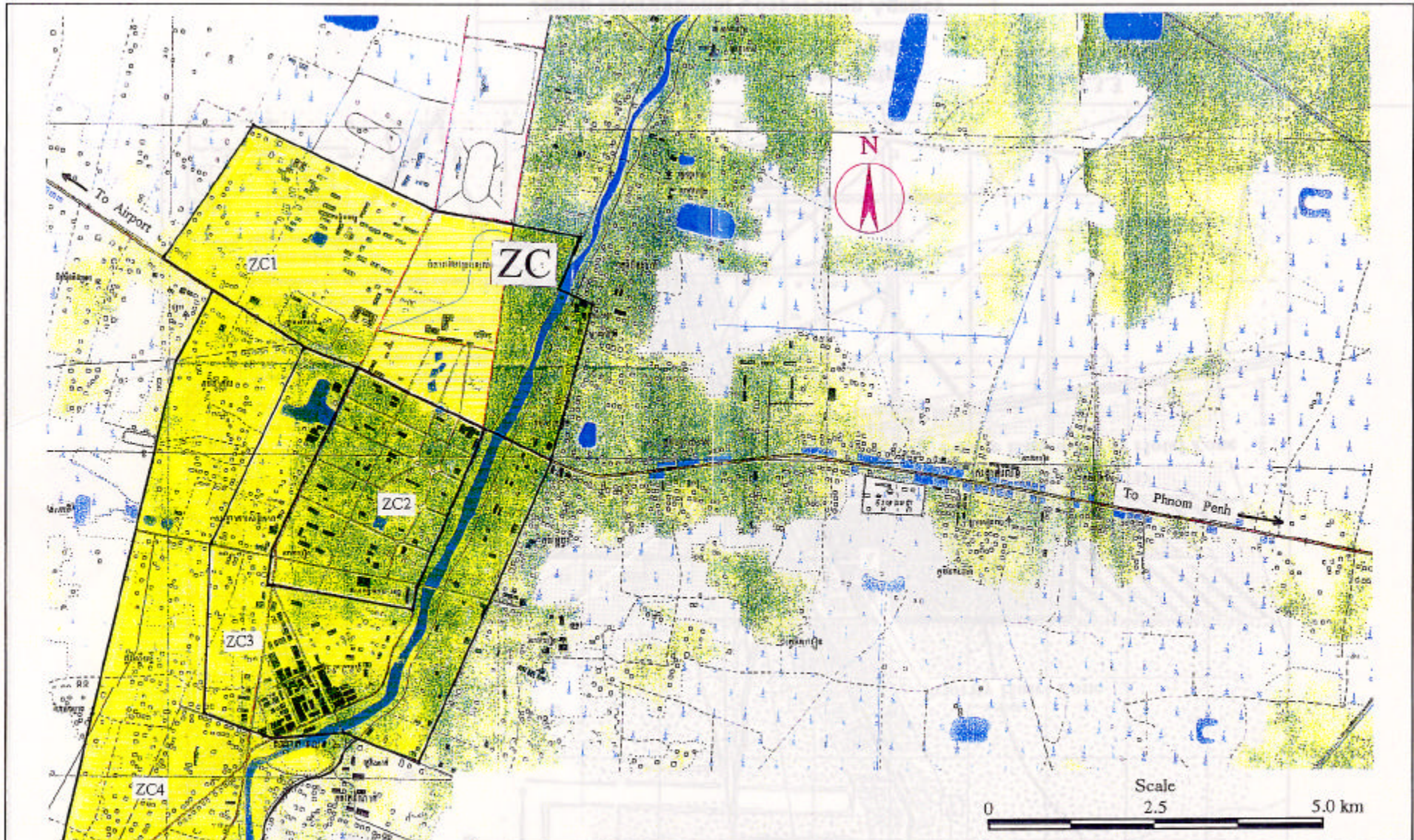
- The creation of a physical limit between the protected archeological reserve and urban development zones.
- The preservation of the irrigated agricultural town perimeter, most concentrated in the western sectors.
- Preservation of the town’s unique character by maintaining its dense vegetation; spacious habitats and low rise buildings. The riverbanks, 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 Siem Reap 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.



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

Figure 3.3.1 Zoning and Sub-Zones

Japan International Cooperation Agency



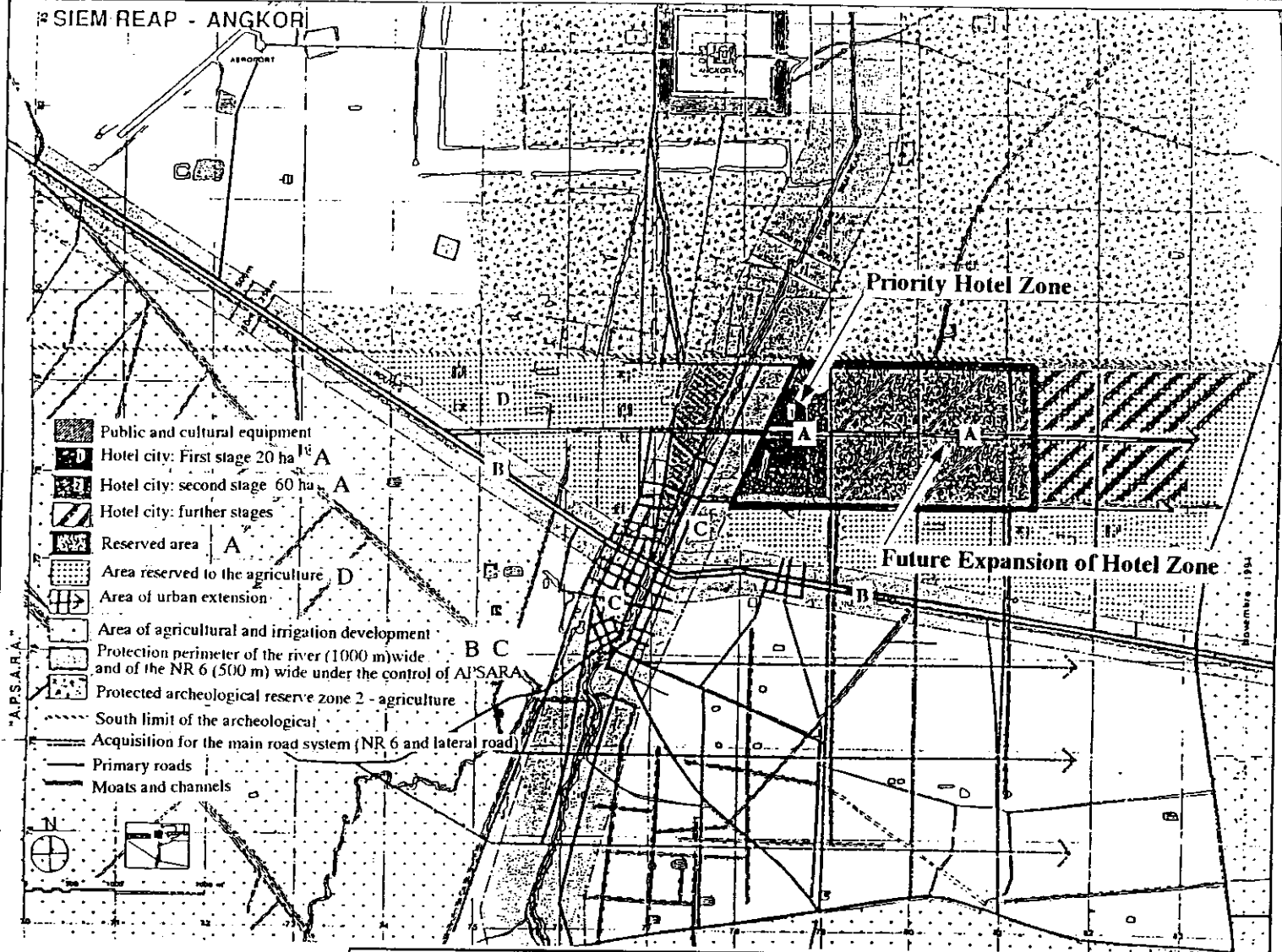
**The Study on Water Supply System
for Siem Reap Region in Cambodia**

Japan International Cooperation Agency

**Figure 3.3.2
Zone Central (ZC) and Sub-Zones**



SIEM REAP - ANGKOR



- Public and cultural equipment
- Hotel city: First stage 20 ha A
- Hotel city: second stage 60 ha A
- Hotel city: further stages A
- Reserved area A
- Area reserved to the agriculture D
- Area of urban extension
- Area of agricultural and irrigation development
- Protection perimeter of the river (1000 m) wide and of the NR 6 (500 m) wide under the control of A.P.S.A.R.A.
- Protected archeological reserve zone 2 - agriculture
- South limit of the archeological
- Acquisition for the main road system (NR 6 and lateral road)
- Primary roads
- Moats and channels

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

Japan International Cooperation Agency

Figure 3.3.3 Future Development Plan

A3.6.1-34

- A vast reforestation campaign to the south of the Archeological Park is to be undertaken. Preliminary studies are to determine species compositions most useful to local populations. 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

The 5 zones of this survey were fixed in accordance with the Development Plan of Siem Reap (Figure 3.1.1.). The location, boundaries, and the reasoning for the selection for each zones are described in the following.

ZONE 1 (Z1) situated on the north of the town, which has a very low density of land use in terms of population. This zone is located in the area of protection of Angkor archeological sites and national parks. The few left in this area are living on a temporary basis and will be moved away from the site and will be taken care of by a resettlement plan already under way. Considering all these factors, Z1 of this survey was selected as a narrow strip up to Angkor Wat.

ZONE 2 (Z2) is located on the eastern site of the town, which is demarcated for the future town expansion. In addition to the high density of land use for housing and commercial activities along the National Highway No. 6 to Phnom Penh, this area also consists of plenty of important space, and offers a great potential of urban extension in the future. The 'Hotel Zone', planned for the hotel development and related tourism infrastructures and facilities, is located in this area on the border of the town limit. The land situated on both sides of the National Highway shows the sign of town expansion by new constructions for housing, as well as for services and commercial activities.

ZONE 3 (Z3) was selected for the survey area because of its significant number of population, who live along the paved road leading to the Lake Tonle Sap, and who live along the Siem Reap River, from where the poor families get their water. Due to immediate proximity to the town, this area is densely inhabited. Many of them are considered to be as middle income households. Most of the houses in this area is made of wood, while some of them are made of concrete and the rest are of thatch. This reveals an unique socioeconomic level and living standard.

ZONE 4 (Z4) is situated along the National road in the direction of west towards the West Baray leading to Battambang. The Development Plan of Siem Reap classifies this area for the agriculture and rural development. The increased number of tourists at certain time and a perspective of tourism development in the future pushed the local investors in the construction of hotels and guesthouses on both sides of the road. However, beyond 3 km from the center of the town, and approximately 500 meters from the road, the area is composed of rural area with mainly agricultural activities. Considering these factors, this zone is selected as a narrow strip up to the road junction leading to airport.

ZONE CENTRAL (Zc) constitutes the core of the town of Siem Reap, where the urban density is high compared to the other zones. Most of the administrative, social and economic activities are concentrated in this urban space, which is well preserved from urban disorder despite the limited capacity of organization as well as the weak financial resources for the maintenance of the government buildings, services and road infrastructures.

Zc, due to the increasing tourism activities and related services (houses, hotels, guesthouses, restaurants, markets, etc.), seems to be the first and the right target worth to be taken into consideration for the water supply project.

3.3.2 Sub Zones

To allow a better sampling, to have a good idea of the people's need, the behavior in using water and in particular to take a closer look of the reality of the situation, all the 5 zones were divided into sub-zones according to their predominant activities (Figure 3.3.1). In this manner, the results of survey would have the chance to be more accurate and reliable in terms of information. The sub-division of zones was proceeded as the following:

ZONE 1 (Z1) into: Sub-Zone 1/A (Z1/A): Archeological sites and parks
 Sub-Zone 1/B (Z1/B): Sub-urban small villages

ZONE 2 (Z2) into: Sub-Zone 2/A (Z2/A): Tourism and sports
 Sub-Zone 2/B (Z2/B): Tourism, future hotel zone
 Sub-Zone 2/C (Z2/C): Housing, commercial

ZONE 3 (Z3) into:	Sub-Zone 3/A (Z3/A): Middle income housing area Sub-Zone 3/B (Z3/B): Low income housing area
ZONE 4 (Z4) into:	Sub-Zone 4/A (Z4/A): Hotels, services Sub-Zone 4/B (Z4/B): Semi-rural, agriculture
Zone Central (Zc):	Sub-Zone c/1 (Zc/1): Hotels, parks Sub-Zone c/2 (Zc/2): Administration Sub-Zone c/3 (Zc/3): Services, commercial Sub-Zone c/4 (Zc/4): High and middle income areas

3.4 Sampling

To have a well balance in distribution of samples and a maximum variety of answers, the 300 samples required for the survey were distributed depending on economic activities and the income level.

3.4.1 Distribution of Samples

- **10** samples for **ZONE 1 (Z1)** because of its very low density of population and its location in the protection area of Angkor archeological site and National Park. This low number is justified as the urban development plan of Siem Reap has a resettlement plan for most of the population living in this zone. Among 10 samples, 4 is selected for Z1/A and 6 for Z1/B, considering the fact that Z1/A is far from the town center.
- **80** samples for **ZONE 2 (Z2)** because of the fact that this area is very active at present and is billed for future urban extension. There exist a number of hotels and tourist infrastructures. Present population density is rather high. Among 80 samples, 70 samples are set for Z2/C, the densest sub-zone among the three sub-zones in this zone. 5 is set for Z2/A, which has only a few houses and some hotels, while the last 5 is set for Z2/B, which is future hotel zone and is insignificantly inhabited at present.
- **50** samples for **ZONE 3 (Z3)** because of its important number of population. However, most of these people are middle and low-income people and the area is far from the town center. Z3/A is billed for 40 while Z3/B is billed for 10 samples. This is because; Z3/B is rather far from the town center.

-
- **15** samples for ZONE 4 (Z4) in the north of the town because of low population density of this area. However, there are a number of hotels operating in the area with some more is under construction. 10 sample is selected for Z4/A while 5 sample is selected for Z4/B. This is because very few infrastructures are located in the Z4/B.
 - **145** samples for the ZONE CENTRAL (Zc), which is the core of the town. The economic activities are predominant here. The inhabitants could be the main potential customers for the water supply project. Zc/1 is basically service and hotel area, which justifies the selection of 8 samples. Zc/2 is the administrative area, hence only 2 samples are taken from this sub-zone. Zc/3 is the town center and can be expected to reflect homogeneous response, which prompted to set 45 sample for this area. Zc/4 is an area with great social and economic diversities, which led to fix 90 samples for the area.

An important percentage of samples was used for housing survey. In all, 254 houses (85%) were surveyed, while the rest includes hotels, restaurants, schools, firms, markets, shops, and offices.

3.4.2 Definition of the Type of Houses

In Cambodia, the type of the house construction plays an important role in the social hierarchy. It reflects the social level of its occupants, determines and/or symbolizes the living standard, and ultimately determines the scale of the family income.

The houses are defined in this survey as follows:

- Concrete House: House constructed with at least one story in bricks and concrete
- Wooden House: House constructed with at least 70% of wood (wall, floor), except columns, which could be made of brick or concrete
- Thatch House: House constructed with palm leaves, bamboo, and/or with recuperated construction materials like wooden boxes, hard paper boxes, etc.

From the type of construction, a reasonable distribution is made to cover all three income group.

3.4.3 Selection of House Samples

The houses chosen for survey were selected according to three main criteria:

- Type of construction: To cover all three income group in reasonable distribution.
- Location: This can give useful information of origin and ethnic group.
- Random: To get more variety of answers and possibility to cover most of the opinions.

A simple rule was followed to select the number of different type of houses in each zone.

Percentage of type of houses chosen for the Survey

Type of Construction	Zones Z1, Z2, Z3, Z4	Zone Central Zc
Concrete	20	80
Wood	40	20
Thatch	40	20
Total	100	100

This thumb rule was used considering the distribution of different type of houses in different zones and also due to the fact that concrete houses outnumber other type of houses in the Zc.

3.5 Survey Execution

3.5.1 Mobilization of Resources

Survey team of the local consultant was comprised of:

- Project Manager (1 No.)
- Team Leader (1 No.)
- Deputy Team Leader (1 No.)
- Group Leader (3 Nos.)
- Surveyor (6 Nos.)
- Driver (3 Nos.)
- Computer Expert (2 Nos.)

Most of the team members were stationed in Siem Reap during the survey period. After the field work, the team returned to Phnom Penh for data entry and compilation.

The equipment mobilized included 3 vehicles, 2 computers with necessary software, a fieldwork office with a meeting room, and adequate stationery including 4 hand held wireless set for easy communication.

3.5.2 Logistics

In consideration of the constraints and difficulties that existed for the survey, the logistics for the operation was set up in the following manner.

Temporary headquarter of local consultant in Siem Reap: For the convenience of the operation, a headquarter was set up by the local consultant near the site. In doing so, all necessary materials like questionnaire, maps could be provided within a short distance. This place was also used for surveyor training, meeting with JICA expert, regular operational meeting and data entry.

Main Headquarter of the local consultant in Phnom Penh: Extended data entry and compilation was done in the Phnom Penh Office of the local consultant using all available logistics.

3.5.3 Recruitment of Enumerators

The successfulness of the survey would largely depend upon a well trained and motivated team of enumerators. Thus the key imperative was to recruit local personnel, who would be trained and engaged to administrate the survey.

Three teams of enumerators were recruited for the survey. The enumerators were either sociologists or engineers already having experiences in the field of socioeconomic survey. The enumerators were divided into 3 groups of 3 persons. Each group was conducted by a group leader, selected with consideration of their previous experiences in the matter. The 3 group leaders were supervised by the Team Leader, who was responsible for the operation. The Team Leader was assisted by a deputy who was permanently stationed in Siem Reap in order to have better supervision.

3.5.4 Training of Enumerators

Once selected, the enumerators were briefed and trained about the survey, data collection techniques and the associated fieldwork logistics. The surveyors and group leaders were trained by the Team Leader and during the training, the following issues were stressed:

- The importance of this survey
- Planning
- Demarcation of zones and sub-zones with graphic documents
- Explanation of questionnaire

-
- Target response
 - How to evaluate social and economic conditions of household
 - How to approach – introduction, establishing a rapport, asking
 - How to ask the questions in order to get the correct answers
 - Method of recording the response.

After that they were taken to the site to get familiar with the areas, limits of zones and sub zones. They were also given training to spot possible samples and to feel the willingness of the person to cooperate. The training was conducted with the cooperation of JICA Expert who constantly provided suggestions and/or recommendations in order to make the execution better.

3.5.5 Operation

One advanced team of the local consultant along with JICA Expert made an evaluation of the project by reconnaissance survey of the site. The evaluation concerned the constrains that could be met during the operation phases. Some test interview was also conducted on a set of critical questions that must be answered correctly in order to reach the right target required by the survey. After the test, reevaluation and modification of the questionnaire were accommodated. For the smooth operation, the questionnaire was translated into Khmer language.

The three teams were assigned in the following manner:

- Team 1 responsible for Z1, Z3, Z4 for a total of 75 samples.
- Team 2 responsible for Z2 for 80 samples.
- Team 3 responsible for Zc for 145 samples.

However, it was planned that after completion of their designated work, both team 1 and 2 will move to support team 3. A target of 30 samples per day was imposed for each team. A standby team was also foreseen to avoid any delay.

Sample selection was done by the group leaders according to the guideline set by the Team Leader and JICA expert. The salient features of sample selection is explained in the earlier sections.

A program designed for monitoring the whole operation was implemented and checked constantly. The key of the program is as follows:

- Briefing enumerators by team leader of the local consultant each morning
- Reporting the position to local headquarter
- Supervising trip by the team leader along with JICA Expert
- Assist the survey team by the team leader in order to get proper answer from the household

-
- Mid day meeting between the team leader and survey teams
 - Reporting the whole operation at the end of the day
 - Meeting at the end of day's operation. During the session, formal or informal discussions were held to spot the difficulties encountered in the field. Solutions to minimize these difficulties were given to the survey teams. The meeting was designed to assist surveyors in their interview, to readjust and/or improve their work. Optimizing the performance of teamwork and their capacity to operate was the main responsibility of the team leader.
 - All along the survey constant coordination and consultation with JICA Expert were maintained in order to optimize all the operation.

3.6 Results of the Survey

3.6.1 Data Entry

The raw data was taken to Phnom Penh Headquarter of the local consultant every 3 days. The raw data was then entered into the computer. The Microsoft Excel application software for Windows95 was used to develop a data book. Each of the variables was quantified to economize memory space and to make use of automated calculation. The data book contains all information obtained from all sample.

3.6.2 Data Processing

The data processing had been done by the Excel program to calculate summation, average, maximum, minimum, and percentage as well as for the sub-total for each zone and sub zones and also for the whole area. Questionnaires B and C had been compiled separately. For convenience, only the results of the compilation for the whole survey are shown in Attachment-2.

3.7 Interpretation of the Result

3.7.1 General

The five districts (Khum) of Siem Reap region were covered in this survey. They are

- Kok Chhak
- Siem Reap
- Svay Dangcum
- Slar Kram
- Sala Kamroeuk.

The total population of all these districts is 81,792 with 39,704 of males and 42,088

of females. The Percentage of male is 48.54% against 51.46% 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.

3.7.2 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. However, within the population under the age of 15, male percentage (18.6%) is more than that of female (16.3%). The average family size is found to be 6.8 per household. Around 15% households are headed by female and most significant reason for that is the death of husband (88.9%). Land area per plot is rather big, the average being 1,120 m².

It is found that 46.7% of the household surveyed are made of concrete, a fact attribute due to more number of samples were selected in the Zc, the town core area. However, the data shows that the socioeconomic status is low; very few households have TV (3.8%), and Refrigerator (10.7%). High percentage of motor cycle ownership (79.3%) shows that motorcycle is the most significant public transport mode.

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 monthly income is less

than 100US\$, indicating an annual per capita income of only 175 US\$. The most of the remaining families (46.5%) also earn less than 40 US\$ per month. This fact is also supported by the average monthly expense, which is mere 123 US\$.

3.7.3 Persons who used earlier Piped Water Supply

Until 1995, there was a piped water supply system available in the Siem Reap Town. However, there were only 170 connections with that supply system within the core area. 97.7% of the respondents who used that system mentioned about the poor water quality. 99% of the respondents were not satisfied with that system; 98% stated about the poor water quality as the reason for not being satisfied.

3.7.4 Present Situation about the Water Source and Use

98.4% of the households surveyed have wells. Out of these 78.5% is tube-well and 19.9% is open well. Only 1.5% use surface water as their water source. 99% 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 in dry season.

There is no pattern of water collection. This can be concluded based on following facts. 88.1% collect their water throughout the day; around 60% collect their water more than three times per day; for 71.6% of the families, all members of the family collect water. As a collection method, 75.9% use hand pump or motor pump, while the rest use rope and bucket.

Estimated average water use per family is 1,250 liters, which means the average water demand is 183 lpcd (liter per capita per day). Interpretation of result for the question regarding the present cost of water is rather difficult. In most cases, people indicated the total cost of well construction, cost of container or reservoir and the cost of hand or motor pump. The average investment is around 126 US\$ per family, a result requires careful judgement before application. However, in most cases, the running cost is negligible to get water from a well except for the cases where motor pump is used for water lifting. On the other hand, 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. However, the people have no opinion about which type of authority (private, public, communal) should run the water supply system.

3.7.5 Social Relation

91.2% of the surveyed population mentioned that they have past experience in community activities and 87.3% of the population are willing to participate in future water supply project if required. This indicates a very close social bond among the local persons.

About women's economic activities, 54% of the respondents indicated that they think women should involve in economic activities. Surprisingly, it is found that for the same percent of households (54%), women are actually involved in some economic activities. It is also observed that among the work profile of women and children, household activities secure the top position (79.3%). About the seasonal work profile of women and children, it is seen that in 72% cases, they work throughout the year.

As the most important family problem, the respondents rank lack of water supply, economic hardship and lack of electricity, in that order. As the most important problem of village or locality, they ranked lack of water supply, economic hardship, lack of school and lack of electricity, in that order. However, these results need cautious interpretation because, for most persons, acceptable water is available at nearby place during most of the time of the year. One possible reason for this deceptive response is face saving, as the respondent is aware of the topic for the survey.

3.7.6 Questions Reserved for Women Only

There were a number of questions reserved for only women to evaluate the WID aspects of the water supply project. 95% of the respondents said that they think water supply system will make significant impact on women. A high number of women (87%) also mentioned that if required they want to contribute in the water supply project.

Regarding the women's status in the society, the female respondents feel that they have a lower position. 83.5% of them mentioned that women are not given equal and proper access to the schooling. 86.6% of them never get any special education. 57.1% of women believe that they are not getting equal medical service. 50.6% of female feel discrimination in work place and job seeking.

3.7.7 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%). It is understood that 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. Alarmingly, 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. Sludge 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 opted for ‘water supply’ after knowing the relation of this survey with water supply project.

There were a number of questions regarding personal hygiene practice. 98.9% referred that they use shoe or sandal and 95.4% are aware that wearing shoes can prevent some disease. 92.3% of the respondents revealed that they cut their nail regularly and 98.1% are aware that regular nail cutting can prevent diseases. It may be mentioned here that Cambodians use hand for eating. About 94% of the respondents stated that they wash their hand after using latrine. Water and hand is the anal cleansing practice of Cambodia. However, 65.5% use soap for hand washing. 71.6% mentioned that they clean their toilet regularly.

Transmission of diseases is linked to peoples’ 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.

3.7.8 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%. Most of these holdings are made of concrete (75%). 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 depth of well drilling is 33 meter with average pipe diameter of 9 cm. The average water use per room is reported as 225 liter, prudence is advised to interpret this value as in most cases there is no meter to quantify water use. In most cases, motor was used for water lifting (87.5%), only small restaurants use manual method. 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.

3.7.9 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 inadequate in quantity and especially 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 the present study, it appears that water supply project in Siem Reap could be a practicable operation due to significant potential client.

3.8 Supplementary Survey

The JICA Study Team separately conducted some supplementary survey independent of 'Public Awareness and Water Use Survey'. This included big hotels, high school, hospital, and fire service, since these calls for significant water demand.

3.8.1 Hotels

The JICA Study Team visited 5 big hotels in Siem Reap to evaluate present water supply situation. The total room available in these hotels was varied between 50 and 130. Out of 5, there is swimming pool in 4 hotels. In all cases, water of swimming pool is recycled. The total number of employees in these hotels varied between 30 and 170. The average occupancy was reported as 65%, while the high season occupancy was reported as 90%.

All of these hotels use well water for their requirement. Most of them have more than 1 well; there are 7 wells for one of these hotels. The water quality varied depending on the location of hotel. In worst case, the water color is brown due to high iron content. It was not ascertained regarding water use per room. However, it is estimated and reported as 400 to 1000 liters per room, which is higher than typical value of 500 liters per room.

In all cases, hotels adopted treatment system. The method varies from as simple as sedimentation in one case, to highly sophisticated system. In one hotel, the treatment included sand filtration, ion exchange followed by activated carbon. In another hotel, the process included cartridge filter, sand filter followed by chlorination. Sand filtration and activated carbon are the two most popular treatment processes for the big hotels in Siem Reap.

3.8.2 High School

There is only 1 high school in Siem Reap Town area. In two shift, 1,700 students are enrolled in the school. There are 96 teachers working in the school. There are 2 wells in the school area but the water is highly turbid indicating high iron content. The water is used for washing, cleaning and gardening. There are no facilities of drinking water in the school. There are also no facilities of toilet for the students in the school compound. The water demand would be rather high considering field watering.

3.8.3 Hospital

There is only 1 hospital in Siem Reap Town area. Around 200 staffs including 15 doctors and 15 medical assistants are working in this hospital. The hospital has 340 beds. There are 2 wells for water supply, whose water quality is not good. However, there is no treatment process now.

3.8.4 Fire Service

The fire service of Siem Reap is functioning under the provincial police department, which was established in 1987. Their jurisdiction covers only Siem Reap District except airport. There are 4 fire engines, out of which 1 is out of order. Another 2 engines are also very old and can not function properly. The old trucks can carry 2,500 liter while the new one has a capacity of 6,500 liter. The discharge capacity is 250 and 325 liter per minute, respectively. At present, most of water demand is fulfilled by using the water from the Siem Reap River. In dry season, the fire service reported acute problem of water availability.

It is reported that the number of fire incident is around 20 per year, out of which around 5 is large and around 7 is of medium scale. According to their estimation, around 50,000 liters of water is required for large fire extinction, while around 30,000 liters of water is required for medium fire incidents. The incidents are mainly concentrated near Angkor area and near central market area. The major cause of fire is electric short circuit and spill of cooking fire. Uncontrolled burning of forest for agricultural land near Angkor area is another major cause of fire incident.

There are 23 firefighters working in shifts and at any given time one truck with 6 persons remain standby. They also instruct hotels and fuel stations time to time about the safety precautions. However, few of the firefighters received any kind of formal training.