

Ministry of Healthcare and Nutrition
The Democratic Socialist Republic of Sri Lanka

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT
OF
ANURADHAPURA TEACHING HOSPITAL
IN
THE DEMOCRATIC SOCIALIST REPUBLIC
OF
SRI LANKA**

JANUARY 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

**YAMASHITA SEKKEI INC.
INTERNATIONAL TOTAL ENGINEERING CORPORATION**

Preface

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for The Improvement of Anuradhapura Teaching Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a study team from June 18 to July 13, 2007.

The team held discussions with the officials concerned of the Government of Sri Lanka, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Sri Lanka from October 21 to October 30, 2007 in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Sri Lanka for their close cooperation extended to the teams.

January 2008

Masafumi Kuroki
Vice President
Japan International Cooperation Agency

January 2008

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for The Improvement of Anuradhapura Teaching Hospital in The Democratic Socialist Republic of Sri Lanka.

This study was conducted by the Consortium of Yamashita Sekkei Inc. and International Total Engineering Corporation under a contract to JICA, during the period from June 2007 to January 2008. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Sri Lanka and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Mineo Nagaoka

Project Manager,
Basic Design Study Team on
The Project for The Improvement of Anuradhapura
Teaching Hospital
In The Democratic Socialist Republic of Sri Lanka

The consortium of
Yamashita Sekkei Inc. and
International Total Engineering Corporation

Summary

Summary

1. Country Overview

The Democratic Socialist Republic of Sri Lanka (hereinafter called “Sri Lanka”) is an insular state situated in the Indian Ocean with a land area of 65,600 km² and an estimated population of around 19.40 million (as of 2004). With its per capita GNP at US\$ 1,350 (World Bank, 2006), it is a lower-middle-income economy but with sound economic development having a growth rate of 7.4% (2006). Although its basic stance for foreign policy is non-alignment, it has a deep historical and economic relationship with neighbouring India, and also gives weight to strengthening relationships with developed countries including Japan.

2. Background and Outline of the Project

The Government of Sri Lanka published its first Poverty Reduction Strategy Paper (hereinafter “PRSP”) in November 2002, and in November 2005, announced a new poverty reduction strategy with the formulation of the 10-year National Development Plan 2006-2016. During the subsequent 10 years up to 2016, Sri Lanka will promote the improvement of the health and welfare system to ensure that it is comprehensive, high quality, fair, cost efficient and sustainable. This in turn would foster healthy citizens that would contribute to the development of a sound economy and society.

Since independence, Sri Lanka has focused on welfare so that health services are available to all citizens free of charge. However, there is a great disparity in health services between the regions: in particular, the conflict-affected north eastern province as well as the north central and southern provinces suffer from poverty and lag behind other provinces in terms of various health and welfare indices.

The target site for the Project is situated in North Central Province, one of the poverty-ridden provinces in Sri Lanka. Although the number of doctors is higher than the national average, the under 5 infant mortality rate and maternal mortality rate are the highest out of all the Sri Lankan provinces, at 19.4 per 1,000 live births for the former and 19.1 per 100,000 live births for the latter.

Anuradhapura Teaching Hospital (hereinafter referred to as AT Hospital) is the only tertiary care hospital in North Central Province. The Government decided in March 2006 to raise the status of AT Hospital from a general hospital to a teaching hospital and to expand its roles, facility functions, equipment, and services. Approximately 1.8 million people live in the area served by this hospital, and many patients are transported from north eastern areas suffering from underdevelopment of medical

facilities due to long years of civil war. As a result, the hospital is chronically congested, hindering the provision of appropriate medical services: the hospital has approximately 1,050 outpatients per day and the occupancy rate is 115% on average. Most of the facilities that have been constructed since 1958 are decrepit. In particular, because many clinics of the outpatient department are dispersed into various buildings, the flow lines of patients and healthcare personnel are entangled.

In this situation, AT Hospital needs the construction of new facilities and prompt supply of medical equipment according to the newly developed Master Plan as a teaching hospital. However, the self-help efforts of Sri Lanka are limited to primary and secondary care facilities, and it is difficult to cover the improvement of a tertiary medical facility that would require a considerable sum of money. The Government of Sri Lanka, therefore, requested Japan's Grant Aid assistance in the construction of facilities and supply of equipment at AT Hospital.

In response, the Japanese government decided to conduct a Basic Design Study and dispatched Japan International Corporation Agency's study team from June to July of 2007. Upon returning to Japan, the team conducted an analysis to make out the basic design of the facility and the equipment plan, carried out Explanation on Draft Basic Design Report in Sri Lanka in October 2007, and compiled this Basic Design Study Report.

3. Summary of the Study and Contents of the Project

The study confirmed the urgency and the validity of this Project, which aims to improve the medical services as well as to promote the overall regional development in the North Central Province by enhancing and recovering the outpatient functions that is a key part of AT Hospital.

The outline of the Project is as follows:

- (1) Location: Within the premises of AT Hospital
- (2) Organization: Responsible Agency: Ministry of Healthcare and Nutrition;
Implementing Agency: Anuradhapura Teaching Hospital
- (3) Project Content Outline:
New Outpatient Department Block (Outpatient Department, Laboratory Department, OB/GYN Operation Department and Intensive Care Unit)
Construction of Facilities and Procurement and Installation of Medical Equipment

Summary of the Facility

Building	Details of the Structure	Floor	Details of the Facilities	Floor Area
Outpatient	Reinforced Concrete, independent footing, 3 stories	Rooftop	Air conditioning machine area, elevated water tank, elevator machine room, electricity room	68 m ²
		2F	OB/GYN Surgery Dept, Surgical Sterilization Dept, Pediatric ICU, Neonatal ICU	1,896 m ²
		1F	Special Outpatient Dept. (Internal Medicine, Ear, Nose and Throat Dept, Special Dentistry, etc.), Endoscopy Dept, Physiology Testing (ECG EEG, etc.), Laboratory	2,225 m ²
		GF	Emergency Treatment Unit, Walk-in clinic, Special Outpatient Dept (Surgery Dept, OB/GYN Dept., Pediatrics Dept., etc.), Pharmacy, Reception	2,769 m ²
			Subtotal	6,958 m ²
Power Generation	Reinforced concrete, independent footing, 2 stories	1F	Electricity Room	55 m ²
		GF	Power Generation Room	55 m ²
			Subtotal	110 m ²
Septic Tank	Reinforced concrete			157 m ²
Total Floor Area				7,225 m ²

Summary of Equipment

Category	Main Equipment
Surgery Dept	28 items including anesthetic apparatus, hand washing unit, laparoscope, hysteroscope, autoclave, etc.
Neonatal/ Pediatric ICU	36 items including incubator, ventilator with C-pap, blood gas analyzer, portable x-ray equipment, etc.
Outpatient Dept.	91 items including US scan, rigid nasal endoscope (adult, child), ENT treatment unit, dental unit with chair, panoramic-cephalo X-ray unit, broncho scope, colonoscope, OGD, ECG monitor, bone densitometer, EMG machine, hematology analyser, interferential therapy unit, traction unit, etc.

4. Project Implementation Schedule and Project Cost Estimation

Considering the scale of the facility, the construction situation at the site, the budgetary systems of the two countries, and the demolition work for the existing building, the estimated implementation schedule for the Project totals about 28 months (5 months for detailed design, 7 months for tendering and demolition of the existing buildings by the recipient country, 16 months for the construction and procurement/installation of equipment). The estimated cost for the project to be borne by the Sri Lankan government, is approximately Rs. 573 million (excluding the cost for relocation of medical services/equipment which will be necessary before the demolition of the existing buildings in the Project site).

The estimated maintenance and operation cost of the facility and equipment is approximately Rs. 24.58 million (JPY 25 million) annually, a 5% increase in AT Hospital's expenditure compared to the 2008

estimate. With AT Hospital now directly under the Ministry of Healthcare and Nutrition (hereinafter referred to as MOH), it is deemed that this financial cost can be fully borne by the recipient country as both AT Hospital and MOH have been notified of the budgetary requirement and have agreed to it at the explanation on the draft basic design report.

5. Project Evaluation

The following direct effects are expected from the Project:

1) Improved efficiency of hospital functions through the centralization and concentration of outpatient functions

By centralizing many clinics of outpatient departments currently dispersed into various buildings, the hospital functions will become more efficient and allow the hospital to better manage outpatients (209,291 cases/year increase in special outpatients).

2) Improved efficiency of the OB/GYN surgery room

By enhancing its decrepit facilities and equipment, the OB/GYN surgery department will be able to provide better quality services, and increase the number of surgeries (6,759 OB/GYN cases/year increase)

3) Improved efficiency of ICU

By enhancing its facilities and equipment, neonatal/pediatric ICU will be safer, and will be able to provide better services (bed occupancy rate of NICU will be less than the current 156%, number of PICU patients will increase by 252 persons/year).

Furthermore, the following indirect effects can be expected:

1) Contribute to decreasing Sri Lanka's maternal mortality and infant mortality rate.

2) Provide high quality medical services to the patients from the LTTE controlled Northern region, which the hospital also covers.

Based on the effects mentioned above, implementation of the Project will bring forth considerable benefits and contribute to fulfilling the BHN of the Sri Lankan people. Therefore, the necessity and relevance of the Japanese government to provide grant aid to a part of this Project is extremely high.

The following is advised for a smooth and effective implementation of the Project:

- (1) The Project only covers a part, and not the whole, of the Master Plan: Improvement of wards and delivery rooms are out of scope of the Project. To fully function as a teaching and tertiary medical facility, appropriate enhancement of wards and delivery rooms based on the Master Plan is advisable.
- (2) Currently, the lack of specialized outpatient services at primary and secondary medical care institutions is conducting the concentration of patients at AT Hospital. Considering the impracticality and inefficiency of allocating medical personnel across these lower level institutions, this trend is expected to continue. With the expected increase in inpatients resulting from improved outpatient facilities brought about by the Project, enhancement of the said facilities such as wards is immediately called for. Meanwhile, AT Hospital also attracts a large number of walk-in outpatients without referrals. Although it is understandable that some patients may find it more efficient to directly visit a tertiary hospital than be referred to one on a need-basis after visiting a local medical clinic, many of their conditions do not need an advanced tertiary service. AT Hospital, controlled under MOH, should build a close cooperative relationship with the area's lower level medical institutions and take measures to minimize its patients' burden.
- (3) In the Project, enhancement of the delivery rooms is not included, and is to be done in the next phase. Currently, AT Hospital has too many cases of delivery as a tertiary hospital. This is due to the fact that the lower level hospitals in the area do not have adequate facilities or personnel for Caesarean sections. The government of Sri Lanka intends to enhance base hospitals and above as secondary hospitals (68 sites). It is advisable to accommodate the Northern Central Province with these secondary hospitals, especially those specializing in OB/GYN at an early date so as to decrease the number of deliveries at AT Hospital and to allow it to concentrate on the provision of services as a truly tertiary hospital.
- (4) Currently, MOH's BES headquarters maintains the medical equipment at AT Hospital by stationing a BES engineer full-time; however, the operation and maintenance are ineffective due to the lack of adequate manuals. In the Project, in addition to the operation/maintenance manuals and initial trainings, which are included as components, strengthening of the maintenance system and continuous effective maintenance operation, including registering the equipment into the inventory list maintained at the BES headquarters and inventory management of consumables/parts, are desirable.

- (5) In the Project, two elevators, two emergency power generators and air-conditioning systems are planned for installation. The existing facilities are maintained by outsourcing contracts. As with the current facilities, these new installations also should be maintained by contracting with an outside service provider such as specialized manufacturers for proper maintenance. For items of medical equipment, which use certain electronic parts such as X-rays, or auto-analysers, maintenance by the BES engineer stationed at AT Hospital would be difficult, and annual service agreements should be made between the hospital and the agencies of the equipment manufacturers. In order for the equipment to be fully utilized, a robust maintenance operation based on service agreements is advisable.
- (6) The existing drainage treatment plant is already accepting more than twice its planned capacity. The treatment performance of the plant is no longer adequate according to water quality inspection: in fact, it does not meet the drainage water quality standard (General Standards For Discharge Of Effluents Into Inland Surface Waters-Sri Lanka). The Sri Lankan side should include a drastic renovation of the existing facility corresponding to the scale of the facility enhancement or a new construction in the Master Plan and implement this at an early date.
- (7) This Project will construct a new waste water treatment plant solely for the target project building. Unless appropriately maintained, this plant will not function properly; thus, ensuring the maintenance operation mentioned in this basic design study report is requested.

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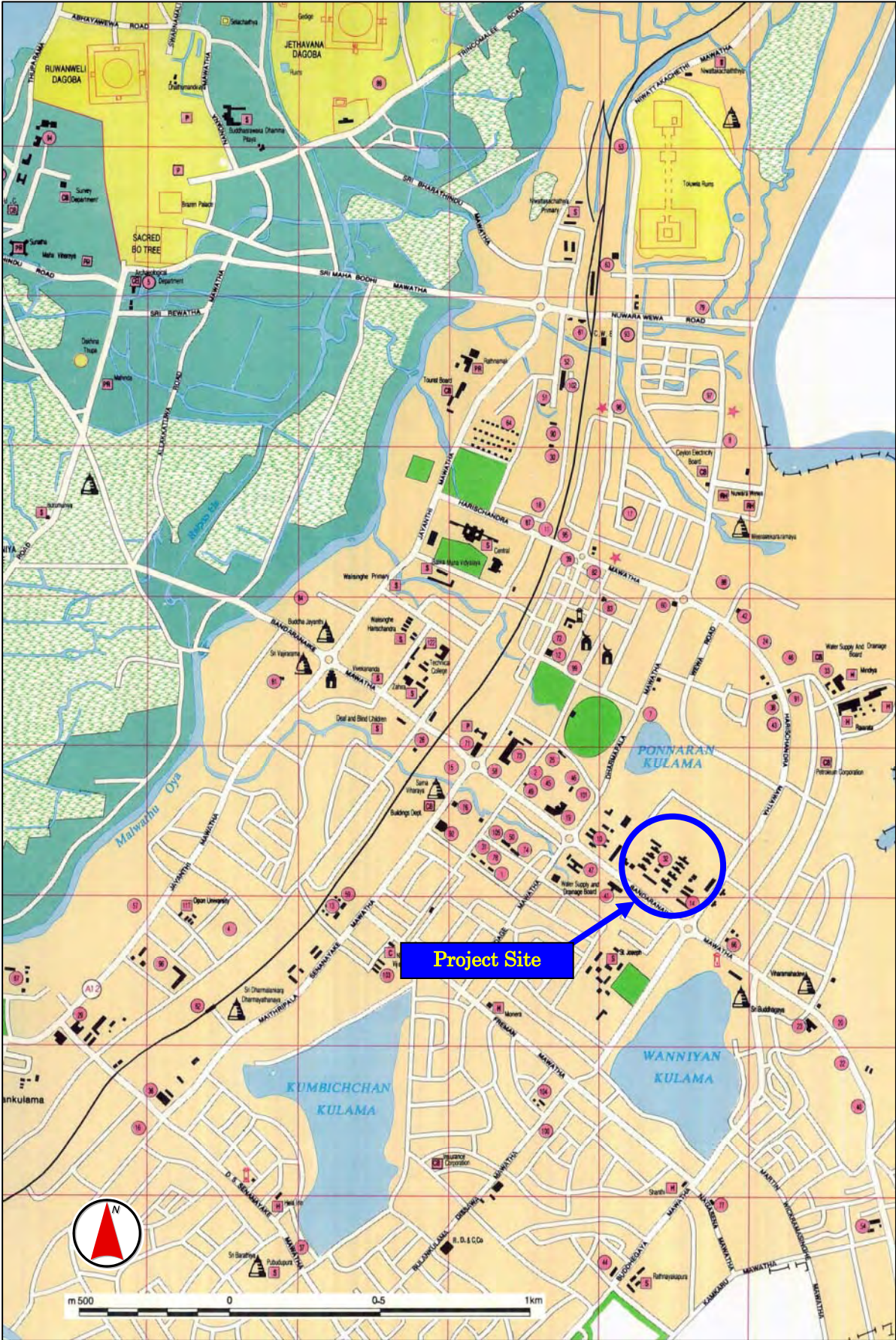
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Location Map



Anuradhapura

Anuradhapura City/Project Site





Perspective

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Abbreviations

ADB	Asian Development Bank
ATH	Anuradhapura teaching Hospital
AVR	Automatic Voltage Regulator
CSSD	Central Supply and Sterilization Department
BES	Bio-Medical Engineering Services
BH	Base Hospital
BHN	Basic Human Needs
BP	Blood Pressure
BS	British Standard
CEB	Ceylon Electric Board
CECB	Central Engineering Consultancy Bureau
COT	Central Operating Theatre
CPAP	Continuous Positive Airway Pressure (for ventilators)
CT	Computerized Tomographic X-Ray Unit
DB	Distribution Board (for electricity)
DH	District Hospital
DHS	Department of Health Service
DP	Drain Pipe
DPDHS	Deputy Provincial Director of Health Service
ECG	Electrocardiogram
EEG	Electroencephalogram
EMG	Electromyogram
ENT	Ear, Nose, and Throat
EPS	Electric Pipe Shaft
ETU	Emergency Treatment Unit
FORUT	Solidaritetsaksjon FOR UTvilking
GDP	Gross Domestic Products
GH	General Hospital
GNI	Gross National Income
GNP	Gross National Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
HEPA	High Efficiency Particulate Air filter
HIV	Human Immunodeficiency Virus
HT	High Tension power line
ICD	International Statistical Classification of Diseases and Related Health Problems
ICU	Intensive Care Unit
IEC	Information, Education, and Communication
IMR	Infant Mortality Rate
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JVP	Janatha Vimukthi Peramuna
LTTE	Liberation Tigers of Tamil Elam
LV	Low Voltage
MCC	Motor Control Center

MCH	Maternity Child Health
MOH	Ministry of Healthcare and Nutrition
MOH area	Medical Officer of Health area
MRI	Medical Research Institute
MSB	Main Switching Board
NGO	Non-Governmental Organization
NICU	Neonatal Intensive Care Unit
NHS	National Institute of Health Science
O.P.D.	Out-Patient Department
ORT	Oral Rehydration Therapy
PABX	Private Automatic Branch Exchange
PH	Provincial Hospital
PH	Pent House floor
PHC	Primary Health Care
PICU	Pediatric Intensive Care Unit
PRSP	Poverty Reduction Strategy Paper
PS	Pipe Shaft
PU	Peripheral Unit
SAARC	South Asian Association for Regional Cooperation
SCOPP	Secretariat for Co-ordinating the Peace Process
SIDA	Swedish International Development Agency
SIHRN	Secretariat for Immediate Humanitarian And Rehabilitation Needs In The North And East
SIRUP	Small Scale Infrastructure Rehabilitation and Upgrading Project
SLT	Sri Lanka Telecom
STD	Sexually Transmitted Diseases
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations International Children's Fund
UPS	Uninterrupted Power Supply
USAID	The United States Agency for International Development
WB	World Bank
WHO	World Health Organization
WHM	Watt Hour Meter

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Project

Anuradhapura Teaching Hospital (hereinafter referred to as AT Hospital) is the only tertiary care hospital in North Central Province. In March 2006, the Government decided to raise the status of the Hospital from a general hospital to a teaching hospital and to expand its roles, facility functions, equipment, and medical services. Approximately 1.8 million people live in the catchment area of AT Hospital, and many patients are transported from the northeastern areas arising from insufficient conditions of medical facilities due to long years of ethnic conflict. As a result, AT Hospital is chronically overcrowded. AT Hospital cares for approximately 1,050 outpatients and 300 inpatients everyday. The number of beds is 1,350. While the bed occupancy rate is 115% on average, major departments are very high: 180% in Obstetrics, 180% in Pediatrics, 130% in Gynecology, 180% in General Male's Ward, 200% in General Female's Ward. This lack of capacity is impeding appropriate provision of medical care services. Most of the facilities that have been constructed since 1958 are decrepit. In particular, because most of the outpatient clinics are located in a former administration building, it has no waiting areas for patients. Patients are crowded into the small corridor, and the flow lines of patients and healthcare personnel are entangled. Most items of medical equipment have exceeded their durable years, and even patients in serious condition cannot receive prompt diagnosis and treatment. Accordingly, AT Hospital, as the only tertiary care facility in the province, is not able to perform specialized medical care services that the hospital should provide because of the unsatisfactory conditions of necessary facilities and equipment.

Under such circumstances, AT Hospital needs the construction of new facilities and the procurement of necessary medical equipment according to the newly developed master plan as a teaching hospital. However, the self-help efforts of Sri Lanka are limited to primary and secondary healthcare facilities, and it is difficult to cover the improvement of a tertiary medical facility that would require a considerable sum of money. The Government of Sri Lanka, therefore, has requested Japan's grant aid assistance in the construction of facilities and supply of equipment at AT Hospital.

The contents of the request were as follows:

	Request		
Ob-Gyn Unit Building	Delivery room ICU Ward for 60 beds Post Natal Ward, 60 beds Gynaecology Ward, 60 beds	Outpatient Dept. Building and Dental Unit	ETU Pharmacy Supporting facilities Dental Clinic OMF Clinic Orthodontic Unit OPD Theater Administration Rooms Medico-legal Facilities
Paediatrics Unit Building	Immunization Clinic Consultation Unit, Pharmacy General Paediatrics Ward, 180 beds Special Care Baby Unit Laboratories & Thalasemia Ward, 12 beds		

The components listed above totalled over 20,000 square meters, and was considered too extensive for a project for general grant aid assistance. Therefore, it was decided that the Project would cover the Obstetrics and Gynaecology Department, Paediatrics Department, and Outpatient Department, which were urgently needed, and were given the highest priority by the Sri Lankan side.

Following a series of discussions in Sri Lanka, the request for the contents of the facilities regarding the Project were finalized. (see “2-1-2 Outline of the Project)

The Delivery rooms and Wards listed in the original request were decided to be excluded from the Project, but the necessity of further development of Delivery rooms and Wards in the master plan for AT Hospital was recorded in the minutes of discussion of the Basic Design Study on the Project.

1-2 Natural Conditions

(1) Climate

Anuradhapura City is located at latitude of 8.2° north and longitude of 80.2° east. In 2006, the city recorded a minimum temperature of 19.1°C, maximum temperature of 34.1°C, relative humidity in the range from 60 to 95%, annual precipitation of 1,138.8 mm, and maximum wind velocity of 18.2 m/s.

The climate consists of a rainy season and a dry season. The rainy season continues from October to December. Prevailing wind direction is southwest from April to October and northeast from November to March.

Table 1-1 Meteorological Record of Anuradhapura Province in 2006

Year 2006		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max. Temperature(°C)		31.8	34.7	35.4	34.0	33.4	33.9	33.7	34.1	33.7	32.8	31.6	29.8
Min. Temperature(°C)		20.2	19.1	21.1	24.7	25.4	25.5	25.6	25.0	24.9	24.2	23.8	22.5
Precipitation (mm)		49.6	37.2	83.3	91.1	77.5	0.0	0.0	0.0	23.7	357.8	287.6	131.0
Relative Humidity (%)	Day	77	73	69	67	68	63	63	60	64	73	80	79
	Night	95	94	92	91	89	87	85	86	88	92	95	94
No. of Rainy Day	0.3mm ≥	8	2	8	7	8	0	0	0	7	17	24	7
	1.0mm ≥	7	2	6	4	5	0	0	0	5	15	22	6
Main Wind Direction		NE	NE	NE	S	SW	SW	SW	SW	SW	SW	NE	NE
Max. Wind Velocity (m/s)		8.8	7.4	8.6	12.6	13.2	16.0	18.2	14.8	18.0	14.0	7.4	9.0
No. of Thunder Day		0	1	11	8	7	0	0	0	4	8	15	1

(Source: Anuradhapura City Meteorological Bureau)

(2) Geology

The test borings conducted at 3 points at the Project site revealed that the surface layer (1.5 m – 4.0 m) mostly consists of sand sedimentation mixed with gravel. Soil consisting of weathered granite appears at larger depths, and the bedrock appears at 8 m beneath the ground surface. According to the result of the survey, it has been reported that the sand/gravel layer at depths from 1.5 m to 2.0 m can be used as the bearing layer for low-rise buildings.

(3) Earthquakes

Natural disasters are relatively rare in Anuradhapura City. In particular, there are no past records of earthquake disasters. (See the Figure below, showing the expected value for ground acceleration assuming the return period of 475 years.)

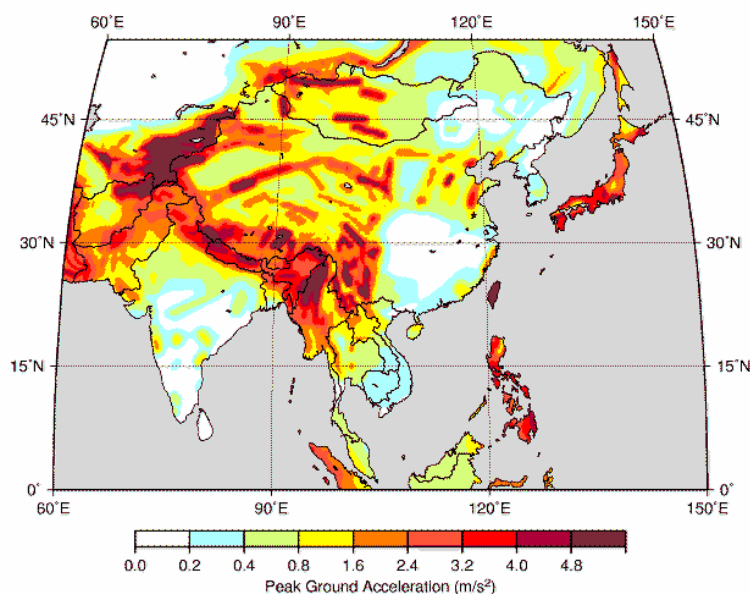


Figure 1-1 Earthquake Disasters

(4) Rainfall and Wind Force

Although Anuradhapura City has a rainy season, it is located in the dry zone as compared with other parts of Sri Lanka. However, there are reports of past flooding in Anuradhapura City, and these should be considered in the determination of the ground floor level of buildings.

The most important impact of wind is the impact of cyclones developing in the Bay of Bengal. In the classification of wind loading zones, the area with the severest wind impact is Zone 1 in the north-eastern part of Sri Lanka.

Anuradhapura is in Zone 3, where the impact of cyclones is relatively small.

Fig. 2-4 shows the map of wind loading zones in Sri Lanka.

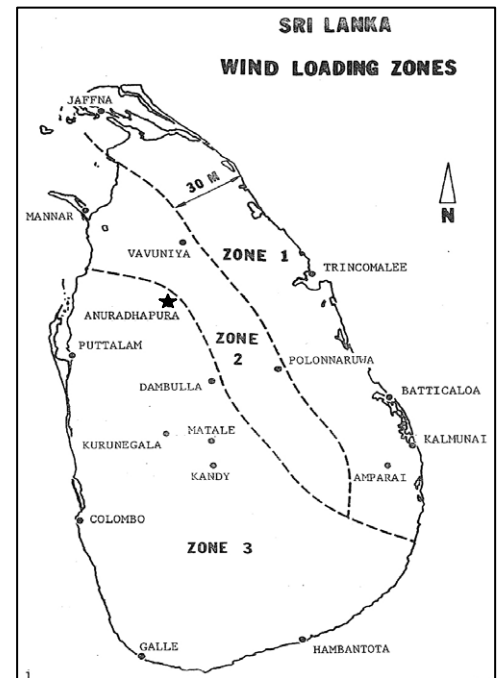


Figure 1-2 Wind Loading Zones

1-3 Environmental and Social Considerations

(1) Waste Water Management

Currently, there is no public sewerage system serving the vicinity of the premises of AT hospital. Waste water from the existing AT Hospital is treated in an oxidation ditch type sewage plant located in the north-eastern end of the premises and then discharged into an adjacent lake. Miscellaneous discharged water and rain water flow into the lake by open-gutters without being treated.

This drainage treatment plant was constructed in 1975, for the Hospital's exclusive use. However, the current volume of waste water far exceeds the treatment capacity envisaged at the time, and the treatment performance of the plant is no longer adequate. Therefore, it is planned to construct a new waste water treatment plant for the exclusive use of the new building to be built under the Project.

(2) Waste Disposal

The waste materials from the existing facilities are regularly collected by the municipality, after being temporarily piled up in the waste collection yard within the premises. The twice-daily collection is done by tractors, and ultimately, the waste materials are disposed of in a designated landfill site located about 2km away from AT Hospital. In general, infectious medical waste is appropriately managed, as they are landfilled after being incinerated first.

The geographic distance from the metropolitan area makes the demographic movement of Anuradapura city stable, and there are almost no factors that may contribute to a sudden increase in the volume of waste materials. Moreover, there are sufficient places in the peripheral areas of the city that could be used for waste disposal; therefore, there are no environmental and social concerns at present, regarding waste disposal management.

Therefore, the current waste disposal management system will also be adopted for the waste materials from the new building to be constructed under the Project.